

Article

Use of Causal Language in Studies on the Relationship between Spiritually-Based Treatments and Substance Abuse and Relapse Prevention

Iván Sánchez-Iglesias ¹, Marta González-Castaño ² and Antonio J. Molina ^{2,*} ¹ Psychobiology & Behavioral Sciences Methods, Complutense University of Madrid, 28040 Madrid, Spain; i.sanchez@psi.ucm.es² Social, Work and Differential Psychology, Complutense University of Madrid, 28040 Madrid, Spain; martagc@ucm.es

* Correspondence: antmolin@ucm.es

Abstract: The main goal of scientific research is to explain what causes a phenomenon. However, only well-controlled studies guarantee sufficient internal validity to support causal explanations (i.e., experimental and some quasi-experimental designs). The use of causal claims in non-experimental studies can mislead readers into assuming a cause–effect relationship when alternative explanations have not been ruled out, undermining the principle of scientific rigor and the credibility of scientific findings. Although spiritual practices form part of some interventions for health and behavioral problems, their effectiveness cannot often be assessed via experimental methodology. This paper assesses the validity of causal inferences in published non-experimental studies, and more specifically in studies on the relationship between spiritually based treatments and substance abuse improvement and relapse prevention. We conducted a systematic review using Scopus, Pubmed, and several databases included in ProQuest, for the period 2015 to 2020. Out of 16 studies selected, six studies (37.5%) used correct language in the title, abstract, and discussion sections; 10 studies (68.8%) used tendentious or incorrect language in at least one section. Spiritually based treatments show promising results in some health improvement outcomes. Most studies show transparency when reporting results. However, researchers should be careful not to make causal assertions unless the internal validity of the research is sound.

Keywords: casual language; scientific writing; causality; spiritually based treatment; substance abuse



Citation: Sánchez-Iglesias, Iván, Marta González-Castaño, and Antonio J. Molina. 2021. Use of Causal Language in Studies on the Relationship between Spiritually-Based Treatments and Substance Abuse and Relapse Prevention. *Religions* 12: 1075. <https://doi.org/10.3390/rel12121075>

Academic Editor:
Christian Zwingmann

Received: 11 November 2021
Accepted: 30 November 2021
Published: 3 December 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The ultimate goal of scientific research is to explain phenomena, which implies establishing a causal relationship between a specific phenomenon and its cause. In this paper, we will focus on the use of causal language when interpreting the findings of research in the field of spirituality, religion, and substance abuse. Written language is the medium through which we transfer knowledge obtained from a scientific study, and it should be used in accordance with the methods employed for data collection and analysis. However, some studies use language inappropriately, implying cause and effect relationships between variables when the methods employed are unsuitable for this purpose. This can mislead readers, especially those untrained in research methods, such as members of the general public, reporters, or politicians. As scientific claims of causality have a considerable impact not only on other scientists but also on general opinion (Hall et al. 2019), social media (Haber et al. 2018), and social and health policies, the use of appropriate language is key to scientific writing.

1.1. The Role of Methodological Design in Causal Inferences

Various categories have been proposed to classify studies according to methodological design. Nevertheless, in essence, all classifications can be divided into two broad categories:

experimental and non-experimental studies. The former is endowed with greater internal validity, and therefore the capacity to establish a causal relationship between the study variables, even when this is a practical inference (Cook and Campbell 1979, 1986; Shadish et al. 2002).

The inferential superiority of randomized controlled experiments (referred to as experiments) over quasi-experiments or non-experimental designs has been well argued over the decades (Campbell and Stanley 1963; Cook and Campbell 1979). Campbell and Stanley (1963) tried to renew emphasis on experiments as the only means for settling disputes regarding educational practice, as the only way of verifying educational improvements, and as the only way of establishing a cumulative tradition in which improvements can be introduced without the danger of a faddish discard of old wisdom in favor of inferior novelties (p. 2).

In experimental designs, we manipulate the independent variable (IV, the presumed cause) before potentially observing a variation in the dependent variable (DV, the presumed effect), while ruling out alternative explanations of that variation—if any—by controlling for the extraneous variables. However, non-experimental studies (also called observational, non-randomized, epidemiologic, or correlational studies) are also useful. In fact, sometimes manipulation of the IV is not possible (or ethical) and a non-experimental methodology is the only means to study the relationship among variables, although it only enables us to draw conclusions about the direction and size of that relationship. In other words, non-experimental designs do not allow statements about causation. Quasi-experimental designs lie somewhere in between. They consist of experimental designs in which subjects are not assigned to conditions at random, but the independent variable can be actively manipulated by the researchers. They share the objective of experimental designs but have less internal validity. We can improve the casual inferences a quasi-experiment is able to support by adding structural details such as control groups or pretest or posttest measures. However, as a quasi-experimental control group may differ from the treatment group in many ways, it is always possible to propose alternative explanations of variation in the dependent variable other than the effect of the independent variable.

1.2. Questionable Research Practices and Causal Language

The use of inappropriate causal language in non-experimental studies remains an issue in several (if not all) scientific disciplines. Thapa et al. (2020) addressed this topic in clinical and nursing settings, while Lipton and Ødegaard (2005) did so concerning results in epidemiology. Cofield et al. (2010) reviewed 525 non-experimental studies published in 2006 in the four highest ranking journals in the field of nutrition and obesity. They found causal language in the title and or abstract of 31% of the reviewed papers, in some cases even in studies with no significant results (i.e., with $ps \geq 0.05$). Yu et al. (2019) analyzed over 29,000 non-experimental studies published in PubMed using a machine learning prediction model trained in health issues (nutrition, diabetes, obesity, breast cancer, and cholesterol); they found direct causal language in 32.4% of the studies. Varady et al. (2021) found casual language in 60% of 400 observational orthopedic studies.

This tendentious language may be related to lack of training or a poor understanding of research methods but may also be due to growing competition in academic institutions. As the number of publications—and the impact factor of the journals they are published in—is one of the parameters used to evaluate a researcher's career, scientists are under pressure to produce “publishable” papers, which are ostensibly those with significant, relevant, and novel results. This “publish or perish” culture in academia is further accentuated in the most competitive academic environments (Fanelli 2010), and such competition may jeopardize the integrity of scientific research (Anderson et al. 2007). Questionable (or bad) research practices are known to be a threat to the credibility of scientific research (Banks et al. 2016; Xie et al. 2021), and may occur not only during statistical analyses, but also before, during, or after research (Picho and Artino 2016) through the use of inadequate

techniques, cherry picking, p-hacking, variable slicing, not publishing negative results, etc. (Wicherts et al. 2016).

1.3. An Applied Setting: Spirituality, Religion, and Substance Abuse

The role of psychological and social aspects in health issues is well known. Some authors have specifically studied spirituality and religiousness as relevant variables in this regard (e.g., Contrada et al. 2004; Koenig et al. 2012; Saiz et al. 2020), and religiousness is considered a relevant variable in health improvement (Bergin 1991; Koenig et al. 1993; Steffen et al. 2001). Religion has been defined as “an organized system of beliefs, practices, rituals, and symbols designed (a) to facilitate closeness to the sacred or transcendent (God, higher power, or ultimate truth/reality) and (b) to foster an understanding of one’s relationship and responsibility to others in living together in a community” (King and Koenig 2009, p. 2). The concept of a transcendent higher power varies from Western to Eastern traditions. Spirituality, meanwhile, is a broader concept that ranges from a characteristic that we could use to identify deeply religious people (Koenig et al. 2012), to a descriptive aspect of superficially religious people, religious or well-being seekers, and even secular individuals (Koenig 2008).

Spiritual beliefs and practices have been linked to recovery from other health and behavioral problems, such as gambling disorder (Gavriel-Fried et al. 2020; Gutierrez et al. 2020). These problems, although sometimes labeled as addictions, are not directly related to substance abuse, and therefore will not be considered in this paper. Substance use disorders are recognized in the DSM-5 (American Psychiatric Association 2013) as a pattern of problematic symptoms derived from substance use. They cover 11 criteria, which include taking more of a substance than you are supposed to, not managing to cut down, spending a lot of time on activities related to the substance, experiencing cravings for the substance, not managing to do everyday tasks or giving up other activities because of it, continuing to use the substance even when it causes problems (psychological, in relationships, or physical danger), and developing tolerance and withdrawal symptoms. The range of substances is wide, from common legal drugs such as alcohol, caffeine, or tobacco to cannabis, hallucinogens, opioids, anxiolytics, stimulants such as cocaine, and even other, unknown substances.

At present, treatment networks include harm reduction programs, recovery/therapeutic community programs, and psychosocial integration programs (Best et al. 2017). Recovery programs have long been identified with therapeutic communities, but now also include peer support, empowerment, social support, and active participation (Best 2012) rather than solely the presence or absence of substances. Health system therapy intervention is usually based on an individual approach (cognitive behavioral therapy) that includes relapse prevention. Other kinds of services, such as psychosocial support, self-help groups, peer-support groups (social support programs), supporting programs, and intervention with minorities, can be difficult to integrate in treatment networks. Another facet not usually included in treatment is spirituality.

Spirituality has been related to improvement in some health outcomes, including state anxiety in alcohol recovery (Andó et al. 2016) and relapse prevention (Magura et al. 2013), in the context of recovery interventions such as the 12-step programs of Alcoholics Anonymous, which advocate acceptance of a “higher power”, promote spiritual awakening, and use prayer and meditation as tools for recovery and healing (Alcoholics Anonymous 2001).

Using multiple databases, we conducted a systematic review to obtain a non-biased sample of non-experimental (observational) studies that linked treatments or interventions based on spirituality (which includes religion) to an improvement in substance abuse disorders (including relapse prevention). Then, we described the validity of reported statements about the relationship between these interventions and substance abuse outcomes.

2. Methods

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al. 2021) for the systematic review procedure.

2.1. Eligibility Criteria

To be included in the review, the studies had to be scientific papers published between 2015 and 2020, in Spanish or English. The studies also had to meet the following inclusion criteria: (a) non-experimental designs, (b) using participants with a problem of substance abuse (any substance), (c) at least one intervention group, (d) an intervention program based on spiritual or religious beliefs, and (e) the study presented at least one outcome measure assessing the relationship between the intervention and a decrease in the abuse, relapse prevention, or a theoretically related variable. Studies with non-significant outcomes and qualitative methodologies were excluded.

2.2. Information Sources

We conducted a systematic literature search for relevant studies using several ProQuest databases (PsycINFO and the Sociology Collection, which includes the Sociology Database, Applied Social Sciences Index & Abstracts [ASSIA], and Sociological Abstracts), Scopus, and Pubmed, for the period 2015 to 2020.

2.3. Search Strategy

We entered the same search terms in each selected database, in English and Spanish, using the Boolean expression “(addiction OR “substance abuse”) AND (spirituality OR spiritual) AND (relapse OR treatment)”, adapted to the specific syntax rules of each database. We restricted the search by title, abstract, and keywords. We also restricted the search to peer-reviewed scientific papers, excluding theses, dissertations, books, and gray literature reports. Another restriction was the publication date, from 2015 to 2020 (both inclusive).

2.4. Selection Process

The records obtained in the previous step were entered into a single Excel spreadsheet, using its built-in tools to detect and eliminate duplicate records. Two reviewers independently screened each record by title and abstract to assess whether it was suitable for retrieval and reading. Disagreement between the reviewers was resolved by consensus and, where necessary, the final decision was reached with the help of a third researcher.

2.5. Data Collection Process

All eligible records were retrieved. These reports were read by the two reviewers to determine final inclusion and data extraction.

2.6. Determination of Causal Language

Both reviewers independently searched for the presence of language implying causation in the title, abstract, or discussion section of each report.

The language used was coded separately for title, abstract, and discussion, in three distinct categories: “Correct” if casual language was not used in non-experimental studies; “tendentious” when a non-experimental study included ambiguous expressions that could be interpreted as implying causation; and “incorrect” where expressions clearly suggested causal relationships between variables in non-experimental studies. When we found mixed categories in a given study, it was classified in the worst category assigned. In addition, the reviewers searched for disclaimers presented immediately after causal expressions, disavowing causation in non-experimental designs (for instance, suggesting alternative explanations). When such a disclaimer was present, the study was classified as “correct”. As in the previous step, disagreements were resolved by consensus and with the help of a third researcher.

3. Results

3.1. Study Selection

Figure 1 shows the flowchart of the search and selection of studies. A total of 477 studies were identified, and 294 non-duplicate records were screened. After excluding 269 records (241 by title and 28 by abstract), 24 were retrieved and assessed for eligibility. Some articles were excluded for several reasons: the studies used experimental (McClintock et al. 2019; Temme and Kopak 2016; Yeterian et al. 2018) or quasi-experimental (Mallik et al. 2019) designs; the outcome was non-significant (Webster 2015; Yeterian et al. 2015) or was not related to decrease in substance abuse or relapse prevention (Luna et al. 2016); the intervention was not spiritually based (Nurulhuda et al. 2018). Finally, 16 studies were included in the review.

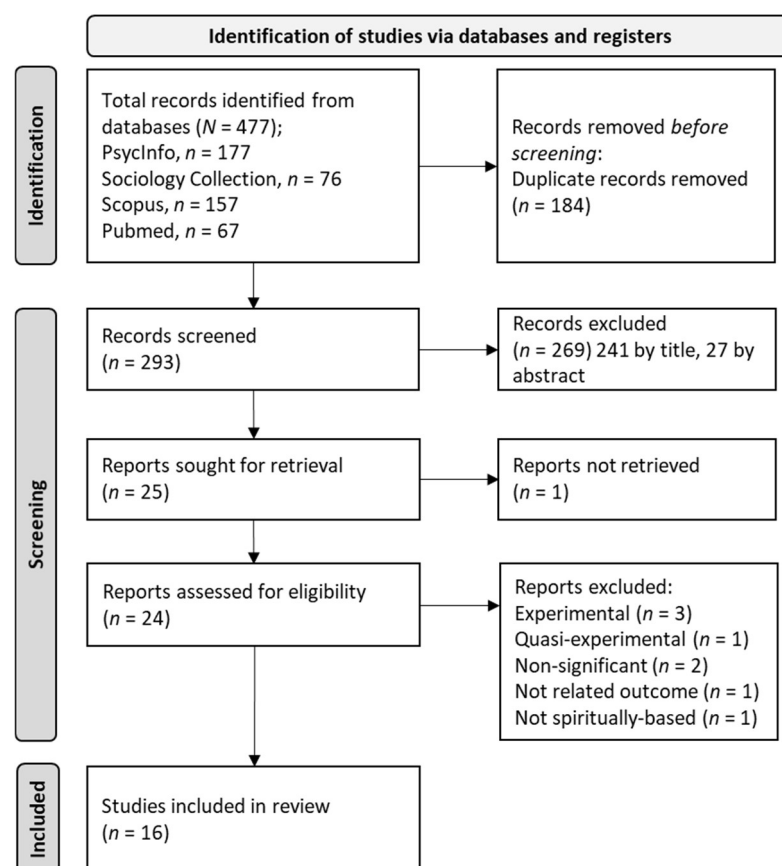


Figure 1. Flowchart of the search and selection of studies based on the PRISMA Statement (Page et al. 2021).

3.2. Study Characteristics

We found different designs in the sixteen studies selected: Cross-sectional, six studies (37.5%) (Abdollahi and Talib 2015; Crutchfield and Güss 2018; Dickerson et al. 2021; Kelly and Eddie 2020; Medlock et al. 2017; Shorey et al. 2015); longitudinal, five studies (31.3%) (Lashley 2018; Lee et al. 2017; Montes and Tonigan 2017; Ranes et al. 2016; Ransomea et al. 2019); pre-experimental (one-group pretest-posttest design), four studies (25.0%) (Beckstead et al. 2015; Kerlin 2017; Saari et al. 2020; Tianingrum et al. 2019); and one study (6.3%) used a three static, non-equivalent groups design (Andó et al. 2016).

By title, 13 studies (81.3%) were coded as “correct”, one study (6.3%) as “tendentious”, and two studies (12.5%) as “incorrect”. By abstract, seven studies (43.8%) were coded as “correct”, four studies (25.0%) as “tendentious”, and five studies (31.3%) as “incorrect”. In the discussion section the results were the same as by abstract, (43.8% “correct”, 25.0% “tendentious”, and 31.3% “incorrect”). We found a disclaimer disavowing causation in two

occasions; for instance, “... randomized and follow-up studies are needed to clarify the interrelationship between spiritual orientation and mental health status indices.” (Andó et al. 2016, p. 5). However, the disclaimers were not located immediately following causal claims, but in another section.

Taking into account all three sections altogether, six studies (37.5%) used correct expressions in all sections; five studies (31.3%) used tendentious (but not incorrect) language in at least one section; five studies (37.5%) used incorrect language in at least one section; and only two studies (12.5%) used incorrect language in all three sections, title, abstract, and discussion. Table 1 shows examples of tendentious and incorrect expressions.

Table 1. Verbatim examples of tendentious and incorrect causal language in the studies selected.

Tendentious	Incorrect
“... hardiness <i>may be a protective factor</i> for individuals with substance abuse ... ”	“Objective: To <i>determine the impact</i> of length of stay ... ”
“It is <i>possible that</i> mindfulness-based interventions <i>may have</i> the concurrent benefit of reducing substance use ... ”	“Faith-based programs <i>play a vital role in the treatment</i> of substance use disorders.”
“Mindfulness-based interventions <i>may hold promise</i> as an effective intervention for reducing substance use ... ”	“... is a healthy sign that Shalom Recovery’s treatment protocol <i>is having a positive and therapeutic effect</i> ... ”
“... youths with low service, with or without high love, were <i>more likely to relapse</i> than ... ”	“The study shows that religion and spiritual teachings specifically Sufi techniques <i>are important to the rehabilitation</i> of drug addicts.”
“... it is <i>likely that</i> Step-work <i>played a key role in fostering</i> change.”	“The study also concludes that Sufi Healing Therapy Model <i>are effective</i> to be used on drug addicts ... ”
“... Spiritual virtue as a <i>pathway towards</i> [...] recovery ... ”	“... NA meeting <i>produce more positive effect toward</i> relapse prevention ... ”
“... suggests interventions [...] <i>may improve</i> relapse prevention ... ”	“The role of spirituality in the <i>decrease of state anxiety</i> indicates acute <i>beneficial effect</i> ”.
“... interventions applying spirituality <i>could help</i> relapse prevention ... ”	“... attending NA meeting once a week <i>gave a significant change</i> ... ”
“Religious involvement <i>may be important</i> for prevention and treatment practices ... ”	“The <i>impact</i> of length of stay on recovery measures ... ”

Note: Italics added to highlight terms that imply causation.

4. Discussion

This paper discusses the importance of only using causal language in research papers when the methodology employed in the research supports the causal claims. We conducted a systematic review of a specific health-related topic to illustrate our point in an applied setting. We studied whether non-experimental studies on spiritual or religious interventions in substance abuse were written using appropriate language, or if they contained ambiguous, tendentious, or even outright incorrect causal claims.

Roughly a third of the studies selected used a correct language in title, abstract, and discussion sections. The remaining studies used tendentious or incorrect language in at least one section, approximately the same proportion that Varady et al. (2021) found in observational studies. If we consider only incorrect language, our results are similar to those found in other scientific disciplines (Cofield et al. 2010; Yu et al. 2019). Thus, the topic of inappropriate causal claims is also an issue in non-experimental research on spirituality-based interventions.

The literature contains promising data on spirituality in recovery-oriented programs—especially those employing a participative action approach, a biopsychosocial perspective, and a social support and recovery capital focus—in terms of treatment, social reintegration,

and relapse prevention (Best 2012; Best et al. 2017). The development of any complete treatment network for addictive behaviors must include programs based on previously validated evidence. This proposal coincides with the recommendations given in the Quality Standards for Drug Dependence Treatment and Care Services issued by the United Nations Office of Drugs and Crime (UNODC 2012). However, we should not confuse promising data linking spiritual interventions for substance abuse recovery and relapse prevention with the claim that the former is responsible for the latter. Without the support of an experimental methodology, other alternative explanations could be proposed, such as other informal social support networks, greater individual motivation to change, or any other behavioral pattern that favors improvement.

A single study cannot confirm—or reject—any substantive hypothesis, regardless of its statistical support (Harcum 1990), even if an experimental methodology has been used. However, a well-controlled experimental design may contain causal claims about the relationships of the specific variables included in that study. On the other hand, multiple non-experimental studies can contribute (they usually do) to accrue evidence supporting cause–effect relationships, but no single non-experimental study may contain causal claims. All these considerations apply to any scientific field, including empirical studies on religion or spirituality.

Several works have summarized reporting standards for scientific publication (e.g., American Psychological Association 2019; Appelbaum et al. 2018; Levitt et al. 2018), and various handbooks (e.g., Cohen et al. 2018; Hancock et al. 2019) have also covered this topic extensively. These texts thus provide applied researchers in the health and social sciences with comprehensive guidelines on selecting the most suitable method to design a study in line with their specific interests. Use of these guides should instruct researchers of the consequences of their choices, even if they have no specific training in methodology or research methods.

4.1. Limitations

There are some limitations to our study. First, we searched for a very specific subject—spiritual interventions—and their effect on relapse in substance abuse, and the search terms we used were limited. In addition, we only reviewed a small number of papers ($n = 16$) considered suitable according to the inclusion and exclusion criteria. We could have carried out a search with different parameters: more databases, a wider range of publication dates, synonymous search terms, etc., in order to obtain a larger sample of papers. We could even have searched papers related to a broader subject, such as the effectiveness of spiritual interventions on several health variables. However, the main objective was to address the importance of using appropriate language in scientific papers on the issue of spiritual interventions. The systematic review was carried out to obtain a non-biased selection of articles. Furthermore, there is no evidence that our chosen research topic is addressed differently than any other. Nevertheless, we should be cautious about generalization based on our limited results. Further studies may tackle this same objective using a different applied research question.

4.2. Conclusions

Scientific claims about a given study must be in accordance with the methodology used. The inappropriate use of casual language may mislead readers into assuming a causal relationship between independent and dependent variables when it is not possible to rule out alternative explanations. Therefore, the use of inappropriate causal language is at the very least negligent (when it is caused by lack of training in research methods or scientific reporting), and bad praxis when the authors are trying to overstate the importance of their results.

Readers should be warned: Casual expressions in published peer-reviewed articles (particularly when in the title or abstract) may not be backed up by solid experimental methodology. Even when in a hurry, readers should devote some time to assessing the

design, analyses, and interpretation of a study; this is the only way to determine whether an inference of causation is accurate and appropriate. Researchers should be encouraged to revise submissions for misleading reporting, particularly when highlighting the main findings and when summarizing them in the title and abstract.

Studies on the effectiveness of spiritual interventions in health issues, such as relapse in substance abuse, have built up a promising body of evidence. In a non-experimental design, to conclude that a spiritually oriented intervention is related to a lower relapse incidence—in plain language, that it seems to be effective—is not a demerit of the research. On the contrary, honesty when interpreting results leads to more rigorous science and should be always welcomed.

Author Contributions: Conceptualization, I.S.-I. and M.G.-C.; methodology, I.S.-I.; formal analysis, M.G.-C.; investigation, A.J.M. and I.S.-I.; writing—original draft preparation, M.G.-C.; writing—review and editing, I.S.-I.; supervision, I.S.-I. and A.J.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Abdollahi, Abbas, and Mansor Abu Talib. 2015. Hardiness, spirituality, and suicidal ideation among individuals with substance abuse: The moderating role of gender and marital status. *Journal of Dual Diagnosis* 11: 12–21. [\[CrossRef\]](#) [\[PubMed\]](#)
- Alcoholics Anonymous. 2001. *Alcoholics Anonymous, the Big Book*, 4th ed. New York: A.A. World Services.
- American Psychiatric Association. 2013. *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. Arlington: American Psychiatric Publishing. [\[CrossRef\]](#)
- American Psychological Association. 2019. *Publication Manual of the American Psychological Association*, 7th ed. Washington, DC: American Psychological Association.
- Anderson, Melissa S., Emily A. Ronning, Raymond De Vries, and Brian C. Martinson. 2007. The Perverse Effects of Competition on Scientists' Work and Relationships. *Science and Engineering Ethics* 13: 437–61. [\[CrossRef\]](#) [\[PubMed\]](#)
- Andó, Bálint, Péter Zoltán Álmos, Viola L. Németh, Ildikó Kovács, Anna Fehér-Csókás, Ildikó Demeter, Sándor Rózsa, Róbert Urbán, Eszter Kurgyis, Zoltán Janka Petronella Szikszay, and et al. 2016. Spirituality mediates state anxiety but not trait anxiety and depression in alcohol recovery. *Journal of Substance Use* 21: 344–48. [\[CrossRef\]](#)
- Appelbaum, Mark, Harris Cooper, Rex B. Kline, Evan Mayo-Wilson, Arthur M. Nezu, and Stephen M. Rao. 2018. Journal article reporting standards for quantitative research in psychology: The APA Publications and Communications Board task force report. *American Psychologist* 73: 3–25. [\[CrossRef\]](#)
- Banks, George C., Steven G. Rogelberg, Haley M. Woznyj, Ronald S. Landis, and Deborah E. Rupp. 2016. Editorial: Evidence on Questionable Research Practices: The Good, the Bad, and the Ugly. *Journal of Business and Psychology* 31: 323–38. [\[CrossRef\]](#)
- Beckstead, D. Joel, Michael. J. Lambert, Anthony. P. DuBose, and Marsha Linehan. 2015. Dialectical behavior therapy with American Indian/Alaska Native adolescents diagnosed with substance use disorders: Combining an evidence based treatment with cultural, traditional, and spiritual beliefs. *Addictive Behaviors* 51: 84–87. [\[CrossRef\]](#) [\[PubMed\]](#)
- Bergin, Allen E. 1991. Values and religious issues in psychotherapy and mental health. *American Psychologist* 46: 394–403. [\[CrossRef\]](#)
- Best, David. 2012. *Addiction Recovery: A Movement for Personal Change and Social Growth in the UK*. Brighton: Pavilion Publishing.
- Best, David, Ana-Maria Bliuc, Muhammad Iqbal, Katie Upton, and Steve Hodgkins. 2017. Mapping social identity change in online networks of addiction recovery. *Addiction Research & Theory* 26: 163–73. [\[CrossRef\]](#)
- Campbell, Donald T., and Julian C. Stanley. 1963. *Experimental and Quasi-Experimental Designs for Research*. Ravenio Books. Available online: <https://www.amazon.com/Experimental-Quasi-Experimental-Designs-Research-Campbell/dp/0395307872> (accessed on 11 November 2021).
- Cofield, Stacey S., Rachel V. Corona, and David B. Allison. 2010. Use of causal language in observational studies of obesity and nutrition. *Obesity Facts* 3: 353–56. [\[CrossRef\]](#)
- Cohen, Louis, Lawrence Manion, and Keith Morrison. 2018. *Research Methods in Education*, 8th ed. Abingdon-on-Thames: Routledge.
- Contrada, Richard J., Tanya M. Goyal, Corinne Cather, Luba Rafalson, Ellen L. Idler, and Tyrone J. Krause. 2004. Psychosocial factors in outcomes of heart surgery: The impact of religious involvement and depressive symptoms. *Health Psychology* 23: 227–38. [\[CrossRef\]](#)

- Cook, Thomas D., and Donald T. Campbell. 1979. *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston: Houghton Mifflin.
- Cook, Thomas D., and Donald T. Campbell. 1986. The causal assumptions of quasi-experimental practice. *Synthese* 68: 141–80.
- Crutchfield, Daniel A., and C. Dominik Güss. 2018. Achievement Linked to Recovery from Addiction: Discussing Education, Vocation, and Non-Addict Identity. *Alcoholism Treatment Quarterly* 37: 1544–4538. [\[CrossRef\]](#)
- Dickerson, Daniel L., Elizabeth J. D’Amico, David J. Klein, Carrie L. Johnson, Benjamin Hale, and Feifei Ye. 2021. Mental health, physical health, and cultural characteristics among american indians/alaska natives seeking substance use treatment in an urban setting: A descriptive study. *Community Mental Health Journal* 57: 937–47. [\[CrossRef\]](#) [\[PubMed\]](#)
- Fanelli, Danielle. 2010. Do Pressures to Publish Increase Scientists’ Bias? An Empirical Support from US States Data. *PLoS ONE* 5: e10271. [\[CrossRef\]](#) [\[PubMed\]](#)
- Gavriel-Fried, Belle, Tania Moretta, and Marc N. Potenza. 2020. Modeling intrinsic spirituality in gambling disorder. *Addiction Research & Theory* 28: 204–10. [\[CrossRef\]](#)
- Gutierrez, Ian A., Heather Chapman, Joshua B. Grubbs, and Jennifer Grant. 2020. Religious and spiritual struggles among military veterans in a residential gambling treatment programme. *Mental Health, Religion & Culture* 23: 187–203. [\[CrossRef\]](#)
- Haber, Noah, Emiliy R. Smith, Ellen Moscoe, Kathryn Andrews, Robin Audy, Winnie Bell, Alana T. Brennan, Alexander Breskin, Jeremy C. Kane, Mahesh Karra, and et al. 2018. Causal language and strength of inference in academic and media articles shared in social media (CLAIMS): A systematic review. *PLoS ONE* 13: e0196346. [\[CrossRef\]](#) [\[PubMed\]](#)
- Hall, Marissa G., Anna H. Grummon, Olivia M. Maynard, Madeleine R. Kameny, Desmondn Jenson, and Barry M. Popkin. 2019. Causal language in health warning labels and US adults’ perception: A randomized experiment. *American Journal of Public Health* 109: 1429–33. [\[CrossRef\]](#)
- Hancock, Gregory R., Ralph O. Mueller, and Laura M. Stapleton. 2019. *The Reviewer’s Guide to Quantitative Methods in the Social Sciences*, 2nd ed. Abingdon-on-Thames: Routledge.
- Harcum, E. Rae. 1990. Distinction between tests of data or theory: Null versus disconfirming results. *The American Journal of Psychology* 103: 359–66. [\[CrossRef\]](#)
- Kelly, John F., and David Eddie. 2020. The role of spirituality and religiousness in aiding recovery from alcohol and other drug problems: An investigation in a national U.S. *Psychology of Religion and Spirituality* 12: 116–23. [\[CrossRef\]](#)
- Kerlin, Ann M. 2017. Therapeutic change in a Christian SUD program: Mental health, attachment, and attachment to God. *Alcoholism Treatment Quarterly* 35: 395–411. [\[CrossRef\]](#)
- King, Michael B., and Harold G. Koenig. 2009. Conceptualising spirituality for medical research and health service provision. *BMC Health Services Research* 9: 1–7. [\[CrossRef\]](#)
- Koenig, Harold G. 2008. Concerns about measuring “spirituality” in research. *The Journal of Nervous and Mental Disease* 196: 349–55. [\[CrossRef\]](#)
- Koenig, Harold G., Stephen M. Ford, Linda K. George, Dan G. Blazer, and Keith G. Meador. 1993. Religion and anxiety disorder: An examination and comparison of associations in young, middle-aged, and elderly adults. *Journal of Anxiety Disorders* 7: 321–42. [\[CrossRef\]](#)
- Koenig, Harold G., Dane E. King, and Verna B. Carson. 2012. *Handbook of Religion and Health*, 2nd ed. New York: Oxford University Press.
- Lashley, Mary. 2018. The impact of length of stay on recovery measures in faith-based addiction treatment. *Public Health Nursing* 35: 396–403. [\[CrossRef\]](#) [\[PubMed\]](#)
- Lee, Matthew T., Maria E. Pagano, Byron R. Johnson, Stephen G. Post, George S. Leibowitz, and Matthew Dudash. 2017. From defiance to reliance: Spiritual virtue as a pathway towards desistence, humility, and recovery among juvenile offenders. *Spirituality in Clinical Practice* 4: 161–75. [\[CrossRef\]](#)
- Levitt, Heidi M., Michael Bamberg, John W. Creswell, David M. Frost, Ruthellen Josselson, and Carola Suárez-Orozco. 2018. Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist* 73: 26–46. [\[CrossRef\]](#)
- Lipton, Robert, and Terje Ødegaard. 2005. Causal thinking and causal language in epidemiology: It’s in the details. *Epidemiologic Perspectives & Innovations* 2: 8. [\[CrossRef\]](#)
- Luna, Naelys, Gail Horton, David Newman, and Tammy Malloy. 2016. An empirical study of attachment dimensions and mood disorders in inpatient substance abuse clients: The mediating role of spirituality. *Addiction Research & Theory* 24: 248–60. [\[CrossRef\]](#)
- Magura, Stephen, Charles M. Cleland, and J. Scott Tonigan. 2013. Evaluating Alcoholics Anonymous’s Effect on Drinking in Project MATCH Using Cross-Lagged Regression Panel Analysis. *Journal of Studies on Alcohol and Drugs* 74: 378–85. [\[CrossRef\]](#)
- Mallik, Debesh, Sarah Bowen, Yang Yang, Richard Perkinsc, and Emily K. Sandoz. 2019. Raja yoga meditation and medication-assisted treatment for relapse prevention: A pilot study. *Journal of Substance Abuse Treatment* 96: 58–64. [\[CrossRef\]](#)
- McClintock, Clayton H., Patrick D. Worhunsky, Jiansong Xu, Iris M. Balodis, Rajita Sinha, Lisa Miller, and Marc N. Potenza. 2019. Spiritual experiences are related to engagement of a ventral frontotemporal functional brain network: Implications for prevention and treatment of behavioral and substance addictions. *Journal of Behavioral Addictions* 8: 678–91. [\[CrossRef\]](#)
- Medlock, Morgan M., David H. Rosmarin, Hilary S. Connery, Margaret L. Griffin, Roger D. Weiss, Sterling L. Karakula, and R. Kathryn McHugh. 2017. Religious coping in patients with severe substance use disorders receiving acute inpatient detoxification. *The American Journal on Addictions* 26: 744–50. [\[CrossRef\]](#)

- Montes, Kevin S., and J. Scott Tonigan. 2017. Does age moderate the effect of spirituality/religiousness in accounting for Alcoholics Anonymous benefit? *Alcoholism Treatment Quarterly* 35: 96–112. [\[CrossRef\]](#) [\[PubMed\]](#)
- Nurulhuda, Mat H., Haneem M. Najwa, Che M. Khairi, Daud Norwati, and Abd. A. Aniza. 2018. Spiritual influence towards relapse in opioid addicts in therapy. *IIUM Medical Journal Malaysia* 17: 71–74. [\[CrossRef\]](#)
- Page, Matthew J., Joanne E. McKenzie, Patrick M. Bossuyt, Isabelle Boutron, Tammy C. Hoffmann, Cynthia D. Mulrow, Larissa Shamseer, Jennifer M. Tetzlaff, Elie A. Akl, Sue E. Brennan, and et al. 2021. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* 372: 1–9. [\[CrossRef\]](#)
- Picho, Katherine, and Anthony R. Artino. 2016. 7 Deadly Sins in Educational Research. *Journal of Graduate Medical Education* 8: 483–87. [\[CrossRef\]](#) [\[PubMed\]](#)
- Ranes, Bethany, Ryan Johnson, Lindsay Nelson, and Valerie Slaymaker. 2016. The role of spirituality in treatment outcomes following a residential 12-Step program. *Alcoholism Treatment Quarterly* 35: 16–33. [\[CrossRef\]](#)
- Ransomea, Yusuf, Angela M. Haenyb, Yoanna E. McDowellc, and Ayana Jordan. 2019. Religious involvement and racial disparities in opioid use disorder between 2004–2005 and 2012–2013: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence* 205: 107615. [\[CrossRef\]](#)
- Saari, Che Z., Sharifah Basirah, Syed Muhsin, Mohd Syukri, Zainal Abidin, Syed Mohammad, Hilmi Syed, Abdul Rahman, Siti S. Ahmad, Zaizal B. Ab Raman, and et al. 2020. Critical review of Sufi healing therapy in drug addiction treatment. *Journal of Critical Reviews* 7: 1155–60. [\[CrossRef\]](#)
- Saiz, Jesús, Meredith A. Pung, Kathleen L. Wilson, Christopher Pruitt, Thomas Rutledge, Laura Redwine, Pam R. Taub, Barry H. Greenberg, and Paul J. Mills. 2020. Is Belonging to a Religious Organization Enough? Differences in Religious Affiliation Versus Self-ratings of Spirituality on Behavioral and Psychological Variables in Individuals with Heart Failure. *Healthcare* 8: 129. [\[CrossRef\]](#) [\[PubMed\]](#)
- Shadish, William R., Thomas D. Cook, and Donald T. Campbell. 2002. *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Boston: Houghton Mifflin.
- Shorey, Ryan C., Michael J. Gawrysiak, Scott Anderson, and Gregory L. Stuart. 2015. Dispositional mindfulness, spirituality, and substance use in predicting depressive symptoms in a treatment-seeking sample. *Journal of Clinical Psychology* 71: 334–45. [\[CrossRef\]](#)
- Steffen, Patrick R., Alan L. Hinderliter, James A. Blumenthal, and Andrew Sherwood. 2001. Religious coping, ethnicity, and ambulatory blood pressure. *Psychosomatic Medicine* 63: 523–30. [\[CrossRef\]](#) [\[PubMed\]](#)
- Temme, Leslie J., and Albert M. Kopak. 2016. Maximizing recovery through the promotion of mindfulness and spirituality. *Journal of Religion & Spirituality in Social Work: Social Thought* 35: 41–56. [\[CrossRef\]](#)
- Thapa, Deependra K., Denis C. Visentin, Glenn E. Hunt, Roger Watson, and Michelle Cleary. 2020. Being honest with causal language in writing for publication. *Journal of Advanced Nursing* 76: 1285–88. [\[CrossRef\]](#) [\[PubMed\]](#)
- Tianingrum, Niken A., Pipit Feriani, Erni W. Susanti, Kartika S. Purdani, Yuliani Winarti, and Bachtiar Safrudin. 2019. The Effect of Narcotics Anonymous Meeting toward Relapse Prevention among Prisoners. *Indian Journal of Public Health Research & Development* 10: 634–38. [\[CrossRef\]](#)
- UNODC. 2012. *TREATNET Quality Standards for Drug Dependence Treatment and Care Services*. Vienna: UNODC.
- Varady, Nathan H., Aliya G. Feroe, Mark A. Fontana, and Antonia F. Chen. 2021. Causal Language in Observational Orthopaedic Research. *The Journal of Bone and Joint Surgery* 103: e76. [\[CrossRef\]](#)
- Webster, Darryl. 2015. The effects of spirituality on drug use. *Journal of Human Behavior in the Social Environment* 25: 322–32. [\[CrossRef\]](#)
- Wicherts, Jelte M., Coosje L. Veldkamp, Hilde E. Augusteijn, Marjan Bakker, Robbie C. Van Aert, and Marcel A. L. M. Van Assen. 2016. Degrees of freedom in planning, running, analyzing, and reporting psychological studies: A checklist to avoid p-hacking. *Frontiers in Psychology* 7: 1832. [\[CrossRef\]](#)
- Xie, Yu, Kai Wang, and Yan Kong. 2021. Prevalence of research misconduct and questionable research practices: A systematic review and meta-analysis. *Science and Engineering Ethics* 27: 1–28. [\[CrossRef\]](#) [\[PubMed\]](#)
- Yeterian, Julie D., Krisanne Bursik, and John F. Kelly. 2015. Religiosity as a predictor of adolescents' substance use disorder treatment outcomes. *Substance Abuse* 36: 453–61. [\[CrossRef\]](#) [\[PubMed\]](#)
- Yeterian, Julie D., Krisanne Bursik, and John F. Kelly. 2018. "God put weed here for us to smoke": A mixed methods study of religion and spirituality among adolescents with cannabis use disorders. *Substance Abuse* 39: 484–92. [\[CrossRef\]](#) [\[PubMed\]](#)
- Yu, Bei, Yingya Li, and Jun Wang. 2019. Detecting causal language use in science findings. Paper presented at the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP), Hong Kong, China, November 3–7; pp. 4664–74.