Die Bedeutung der Interpretation und der Kontrolle von Publikationsverzerrungen in der klinischen Psychologie und Forschung

Eine systematische Analyse (PRISMA)

On the importance of understanding and controlling publishing bias in clinical psychology and research

A PRISMA Systematic Review

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Kurzzusammenfassung

Zahlreiche Reviews haben bereits belegt, dass klinische psychologische Behandlungen positive Auswirkungen auf die Ergebnisvariablen haben. Einige Studien weisen jedoch methodische Einschränkungen auf, welche auf starke Publikationsverzerrungen im klinischen Bereich hindeuten. Publikationsverzerrungen in klinischen Studien scheinen einen direkten Einfluss auf die Gesundheitsversorgung zu haben, da des Öfteren nur signifikante Ergebnisse veröffentlicht werden, die falsche Eindrücke über die Wirksamkeit einer psychologischen Behandlung hervorrufen können. Ziel dieses Reviews ist es, spezifische klinische Fragen zum Einfluss der Publikationsverzerrungen in der klinischen Psychologie zu beantworten und einen Weg zu finden, diese zu verstehen und zu kontrollieren. Daher zielt dieser systematische Aufsatz darauf ab, relevante Studien zu identifizieren, die sich mit spezifischen klinischen Fragestellungen zum Einfluss der Publikationsverzerrungen befassen. Anhand der Checkliste 2009 zur systematischen Überprüfung und Metaanalyse (PRISMA), konnte die Bedeutung und der Einfluss der Publikationsverzerrungen auf dem Gebiet der klinischen Psychologie bestätigt werden. Der Einfluss solcher Verzerrungen ist inzwischen so offensichtlich, dass Forscher eine Vielzahl von Strategien vorgeschlagen, um wiederkehrende Probleme aufzuklären und diese zu korrigieren. Aus diesem Grund stützt sich dieses Review hauptsächlich auf die Verwendung von PRISMA, um eine systematischere Metaanalyse zu gewährleisten. Es wurde eine Recherche von Januar 2012 bis September 2018 unter Verwendung der folgenden Datenbanken durchgeführt: PsycInfo, PsyARTICLES, PsycNET, PubMed, Google Scholar. Die Ergebnisse weisen auf eine Verzerrung

der Publikationen in der klinischen Psychologie und auf die Notwendigkeit der Entwicklung einer gemeinsamen Strategie hin, die darauf abzielt diese zu verstehen, zu kontrollieren und zu reduzieren. Abschließend werden Implikationen und Vorteile für die klinische Forschung und Praxis besprochen und Empfehlungen für die weitere Forschung vorgeschlagen.

Schlüsselwörter

psychologische Behandlung; klinische Psychologie; klinische Forschung; evidenzbasiert; methodische Einschränkungen; Publikationsverzerrungen

Abstract

The positive effects of psychological treatments regarding outcome variables have been reported extensively in the literature. Yet, despite the wide-range of methodological limitations, publishing bias still remains yet to be further explored and understood. It poses dangers that may jeopardise treatment effectiveness while distorting the perceptions and observations of the practitioners impacting heavily on follow-up health care provision. This review aims to identify what might be influencing publishing bias in psychology and suggest ways it can be understood and controlled in a systematic way. In this light, this systematic review explores discipline-specific research evidence that poses critical clinical questions regarding publishing bias influence on health care provision. Moreover, following a meta-analysis (PRISMA) checklist 2009 on cognitive-behavioural treatment, this review will attempt to elucidate how different variables or limitations are linked to publishing bias in psychology. In order to succeed in determining how publishing bias may be directly associated with follow-up psychological treatment choices, several researchers have employed a range of strategies to decipher publishing bias impact and either monitor or resolve recurring issues. The procedure followed herein uses PRISMA systematic meta-analysis in order to provide reliable and relevant insights. During data collection and analysis, other databases have also been utilised including PsycInfo, PsyARTCILES, PsycNET, PubMed, Google Scholar in order to identify scientific publication bias in the field of psychology and provide adequate research input that supports our analysis of benefits, potential implications and future recommendations.

keywords

psychological treatment; CBT; clinical psychology; research; evidence-based; methodological limitations; publishing bias.

1 Introduction

1.1 Evidence-based moment in clinical psychology

Clinical psychology is defined as a "clinical discipline that involves the provision of diagnostic, assessment, treatment plan, treatment, prevention, and consultative services to patients of emergency room, impatient units, and clinics of hospitals" (APA, 2010). Given this wide range of prevention applications and practices, psychologists play an indispensable role that is not limited in public health decision making initiatives and policies but it is prevalent in relevant research and service providers (Lorion, 1994), while providing health and clinical services to impatient and outpatient units and evaluating new patients or independent stakeholders (Sernberg, 1997).

Psychological interventions were fist launched in the seventies before they were established as a standard clinical practice. Aiming at upgrading health care quality within health care systems and inform future policy initiatives, evidence-based intervention successfully managed to understand the nature of psychopathology and patho-psychology discipline-specific treatments. Such interventions were also successful due to the clinical research improvement over the years and the increased adoption of such practices by governments, policy makers and health care systems (Hofman & Barlow, 2014).

Following such success, the American Psychological Association (APA) continually updated their database and briefs relevant stakeholders with detailed treatment guidelines in conjunction with research. and provided instructions to clinicians treating psychiatric disorders. Not surprisingly, there is plethora of good patient outcomes that are inclusive of research, clinical expertise and patient characteristics (APA, 2006). As such, a systematic outline of empirically supported therapies (ESTs) compiled in FORCE is constantly revised (Chambeless et al. 1996; Task Force on Promotion and Dissemination of Psychological Procedures, 1995), along with online updates for adults and children (APA, 2010: Evidence-based Approaches). See http://www.PsychologicalTreatments.org and Division 53 by the Association for Behavioural and Cognitive Therapy (ABCT).

Robust positive effects on outcome variables following well-developed psychological treatments have been reported extensively in published meta-analysis systematic reviews. (Lipsey & Wilson 1993). More specifically, cognitive behavioural interventions for common psychiatric disorders are deemed by the experts to be efficacious (Nathan and Gorman, 2015) as they can improve quality of life and functionality. Other studies suggest that when combined with other forms of psychological treatments or psychiatric medications (Arch et al., 2012), cognitive-based treatment (CBT) efficacy is even more evident. Fundamental principles of CBT further support its positive effects. These principles pre-suppose that emotions and behaviours are mediated by our thinking processes. Along these lines, the extend of faulty cognitions may lead to increased or lower psychological distress and disfunction and they may even lead to modifications or complete symptom alleviation (Trower, 1988; Vonk and Early, 2009). These three principles are facilitated by subsequent assessment, intervention and evaluation practices (Treater, 2010) that determine its efficacy.

Best practices of training clinicians have significantly contributed to the wealth of evidence-based information and research suggesting that the uptake of CBT is imperative in the field. (Institute of Medicine, 2015). As a result, unlike empirically supported treatments, systematic reviews and meta-analysis study aspects of research in order to gauze the efficacy of such interventions drawing on issues of relevance and sampling, availability and delivery of such interventions. Despite their useful insights, systematic reviews are often criticised for their intrinsic limitations and their positive findings are questions on the assumption of oversampling, a possible over reliance on a certain group representation and the discrepancy between effective psychological treatment availability and delivery of follow-up interventions (Lipsey & Wilson, 1993).

In this context, we aim to elucidate how different variables or limitations are linked to publishing bias in psychology. Publishing bias has been discussed extensively in the last decade and it largely entails overt or covert misrepresentation of the outcomes of a study or failure to publish due to lack of strong evidence. In order to succeed in determining how publishing bias may be directly associated with follow-up psychological treatment choices, several researchers have employed a range of strategies to decipher publishing bias impact and either monitor or resolve recurring issues.

1.2 Limitations of meta-analysis

Meta-analysis has been subject to criticism due to some of its intrinsic limitations. The lack of well-informed and trained CBT practitioners often intensify a negative stance towards it. As Nakamura et al. (2011) stated it is often considered as ill-suited to client populations in the community or it may disrupt client-practitioner relationships due to lack of loyalty or confidentiality (Woody et al., 2005). Another issue that may challenge the validity of meta-analysis is the number of self-reports by researchers that often provide behavioural observations of treatment sessions that do not tally with others observations (Brosan er al, 2008). This could be resolved by providing individualised CBT interventions to clients upon which evidence can be based, disseminated and implemented (McMain et al., 2015).

Meta-analysis involves pooling results from several studies to generate an overall effect size (Cumming, 2014) and are necessary to provide findings that are more conclusive and to provide findings from all the smaller studies. The statistical models used in meta-analysis assume by default that the primary studies included have been carried out using a conventional strategy of sampling and data analysis (Borenstein et.al., 2009; Botella et.al. 2009). To acquire more conclusive and inclusive data, meta-analysis pools measurable and qualitative data from a respectable overall effect size (Cumming, 2014) including smaller studies. Conventional sampling and data analysis strategies are traditionally employed in order to conduct primary meta-analysis studies with the help of statistical models (Borenstein et al., 2009; Botella et al. 2009). They ensure validity tests of meta-analysis itself (Villar et al, 1995) while focusing on particular methodological aspects such as assessment of publication bias determinants or using criteria and tests with a heterogeneity ascertainment focus (Palma et al. 2005). In this light, research on publication bias is strengthened. In brief, systematic reviews of meta-analyses are essential when it comes to statistical determination of frequency of publication bias in meta-analysis as they raise awareness regarding research

characteristics such as heterogeneity across primary studies and provide summative insights that may provide even more definite evidence (Egger et al, 1997).

The aforementioned limitations coupled with a significant gap between effective treatment availability and chosen intervention delivery (Institute of Medicine, ed. Psychological Interventions for mental and substance use disorders: a framework for establishing evidence-based standards, 2015) may lead to inconsistent practices and conclusions and may mislead or misinform practitioners or policy makers who rely on systematic reviews and meta-analyses.

Methodological limitations have been examined by numerous research studies and this trend could suggest a greater tendency towards publication bias in psychology. It is relatively easy to notice if publishing papers with strong findings can lead to misinformed or distorted views regarding the efficacy of a treatment method but this is not always attainable with unpublished papers due to lack of availability, although both types may have a direct impact on certain patient health. Another issue that needs to be considered is the degree of replication studies, repetition or recycling of previously approved conclusions, a tendency often described as a “replication crisis”. All the aforementioned limitations render the use of systematic reviews imperative as they constitute a viable way to identify publishing bias influence and, if possible, eliminate it. Therefore, it is within the scope of this review to clarify the determinants of publishing bias in psychology and suggest a way to control them.

2 Materials and Methods

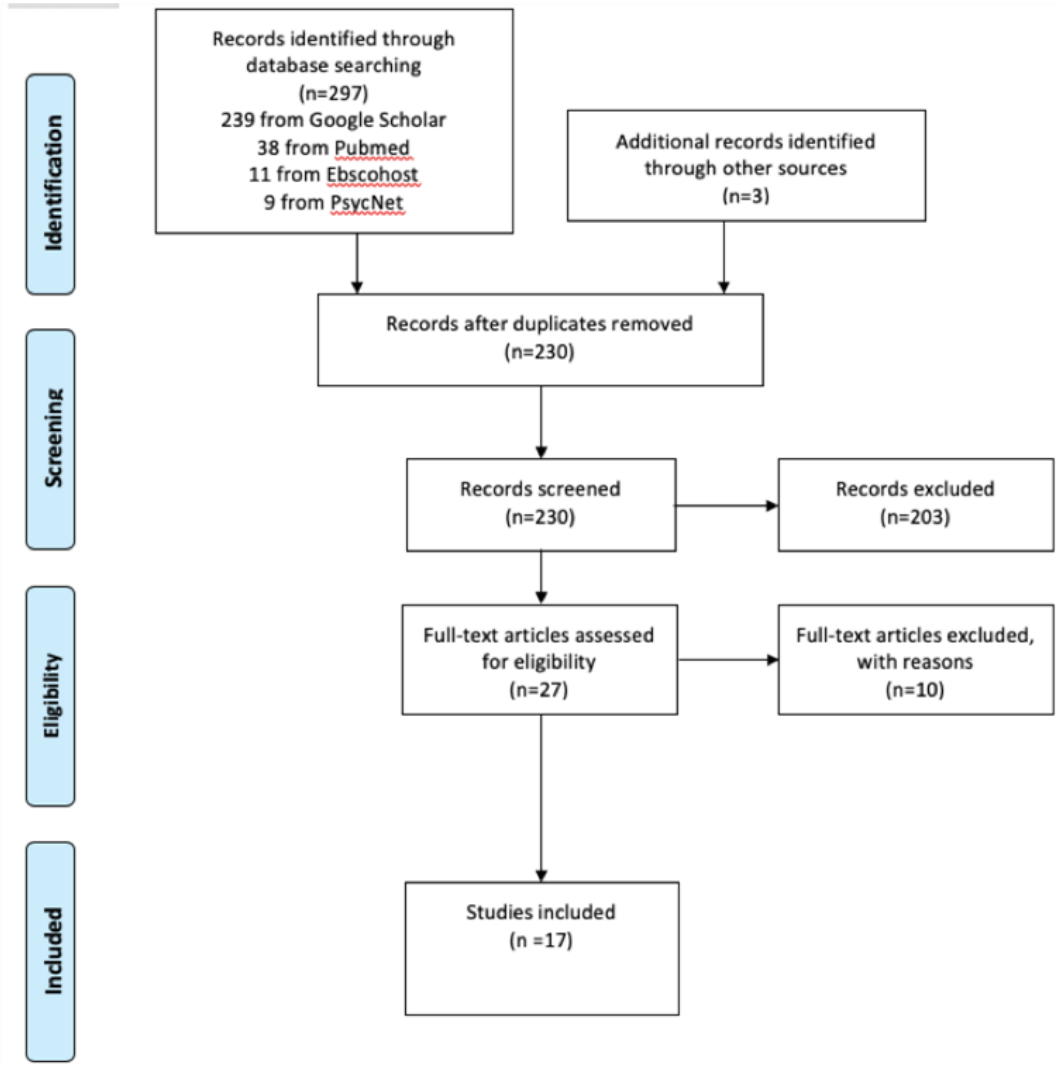
In an attempt to answer specific clinical questions about the publishing bias influence in the field of psychology and identify ways to control it, a systematic evidence based meta-analysis review tool, i.e. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses: Checklist, 2009), was employed. It entails approximately 30 criteria that facilitate clarity and accountability including a random selection of interventions, thus rendering reporting more transparent and coherent. In this light, it was deemed it may also facilitate critical appraisals of published systematic reviews (Moher et al., 2008).

Arguably, the impact of such bias is so prevalent in psychology abstracts that experts in the field have employed a wide range of strategies that are conducive to identifying, classifying, monitoring or preventing potentially inefficient and unsound health care interventions. Identification and categorization of prominent problematic intervention-related research issues took place in the first step which focused on studying the influence of publication bias and a way to control them.

Within seven years (January 2012-September 2018) the following databases were employed to conduct this research: PsycInfo, PsyARTICLES, PsycNET, PubMed and Google Scholar were used in order to conduct this research. This step entailed the utilization of a key author search replicating the protocol of the aforementioned step but this time with different keywords: psychological Intervention AND Efficacy AND Publication Bias, psychological Intervention AND Efficacy, psychological Intervention AND Publication Bias, psychological Intervention AND Evidence Based,

psychological Intervention AND Replication, psychological Intervention AND Risk Factors. This search was carried out on 13th February 2018.

Figure 1. PRISMA diagram of study identification and selection



3 Results

With the use of PRISMA search through PubMed and Ebscohost, 17 papers clearly suggest that publication bias is not uncommon in the field of psychology. In fact, following identification and review, recent findings indicate that the criteria used for analysis may determine the degree of successful replication of the original studies and they report it accounts for 36-47%.

3.1 The influence of publication bias

Seven published papers are meta-analysis, reviews and trials, showing that publication bias is problematic in the field of psychology research. Publication bias has been well researched by Berning et al. (2016), who analysed it in 3 high-index social science journals in Germany. With a use of a calliper test, they found that in one hundred and fifty-six articles published between 2001 and 2010, in each journal the publication bias evident in the literature stood at 10% significance level. Furthermore, potential causes ascribed to bias have been investigated and included multiple vs. single authorship. Interestingly, the relationship between author characteristics and publication bias was not supported by evidence.

Another interesting study that examined systematic review publication bias regarding psychotherapeutic interventions for depression was that of Niemeyer et al. (2013). Upon applying Begg and Mazumdar's adjusted rank correlation test, Egger's regression analysis, and the trim and fill procedure, they only found a marginal impact of publication bias; despite two exceptions, the assessment of the efficacy of therapeutic interventions remained stable and did not show any variation after the application of the trim and fill procedure that was used to amend possibly missing studies remained. This finding suggested only marginal impact of publication bias in psychotherapy research for depression.

Publication bias is also prevalent in the field of applied behaviour-analytic literature and needs to be further elucidated before any firm conclusions can be drawn. This is supported by the analysis of published single subject experimental design studies and unpublished dissertations by Sham et al. (2014) on a well-established intervention for children with autism subjected to pivotal response treatment (PRT). To do so, they compared effect sizes and the percentage of non-overlapping data (PND). In both published studies and unpublished studies with similar methodologies, the PND score was higher in published ones by 22 percent. In terms of unpublished studies, however, PRT still seemed to be effective. These results suggest publication bias in the applied behavior-analytic literature needs to be further assessed before sound and conclusive claims can be made.

Other findings suggest that it is not easy to make a clear delineation of risks and benefits of certain medication such as anti-depressants and as such findings can be exaggerated or misinterpreted . Vries et al. (2018) identified pooled-trial publications in a systematic literature review on the risk-benefit profile of antidepressants. They found 107 pooled-trial publications that reported 23 out of 32 trials that were not published in single publications. In the same vein, only 21 out of 51 negative trials were published exclusively in pooled-trials publications, with only two out of 54 positive trials being published. Interestingly, although the primary aim of 13 out of 107 publications was to present data on the trial's primary research question, only four of these publications focused on evidence for individual efficacy of the primary research question. Not surprisingly, only 5 percent of pooled-trials publications reached a negative conclusion. These findings may suggest, for example, that the apparent risk-benefit profile of antidepressants might have been distorted in the pooled-trial publications (Vries et al., 2018).

In another study by Kühberger et al.(2015) , a negative correlation of r = -.45 between sample size and effect size and an inordinately high number of p values suggested strong publication bias. As neither implicit nor explicit power analysis can justify these results, publication bias seems to be the case in the entire field of psychology.

Ferguson et al. (2012) examined 91 meta-analysis recently published in American Psychological Association and the Association for Psychological Science journals, and the methods they employed in order to identify and limit publication bias. The results of the analyses of a 48-meta-analyses subset with a novel tandem procedure showed that publication bias was a cause for concern in 25% of meta-analyses. If unpublished studies are also included there might be an even greater rise of publication bias possibly due to selection bias in such literature searches.

Finally, Coburn et al. (2015) used funnel plots, a trim and fill procedure, cumulative meta-analysis, Egger's linear regression, and the Vevea and Hedges weight-function model to explore the relationship between publication bias and two study characteristics. The results in this study indicated that publication bias can also differ over levels of study characteristics.

Table 1. The influence of publication bias

Study	Sample Size	Location / Publisher / Data Base	Methods / Question	Problem	Instruments and Procedures	Results
Berning et al., 2016	N = 91 meta-analysis	APA and APS	Examination of other meta-analysis for used methods to identify publication bias;	The selective publication of positive outcomes in clinical trials for the efficacy of antidepressants has led to a distorted perception of the scientific community and the public	Tandem Procedure;	64 (70%) made some effort to analyze publication bias; 26 (41%) reported finding evidence of bias; Approaches to controlling publication bias were heterogeneous among studies; 57 (63%) attempted to find unpublished studies to control for publication bias; Results indicated that publication bias was worrisome in about 25% of meta-analyses; Meta-analyses that included unpublished studies were more likely to show bias than those that did not, likely due to selection bias in unpublished literature searches;

Niemeyer et al., 2013	N = 1000 psychological articles from 2007;	All areas of psychological research drawn from PsychINFO;	Is effect size independent from sample size in psychological research;	While the p value is used to show statistical significance, it's often criticized due to dichotomous reject/not reject decisions, and the common misconception that significance means a large effect, while non-significance means no effect;	Power Survey;	A negative correlation of r = -.45 between effect size and sample size; an inordinately high number of p values just passing significance;
Sham et al., 2014	N = 32;	Published articles and unpublished doctoral dissertations on PRT through PsychINFO search;	Publication bias in studies with SSED on ABA interventions;	Intervention studies may be especially prone to publication bias because	-	Although published and unpublished studies had similar methodologies, the mean PND in published studies was 22% higher than in unpublished studies;
	Published SSED studies (n = 21);			results are often selectively reported, emphasizing the most exciting among them, and outsiders		Even when unpublished studies are included, PRT appeared to
	Unpublished dissertations (n = 10);			frequently do not have access to what they need to replicate studies		be effective;
	PRT (n = 1);					
Vries et al., 2018).	N = 19 meta-analysis including 31 datasets;	PsychINFO and PSYNDEX	Assess whether systematic reviews investigating psychotherapeutic interventions for depression are affected by publication bias;	This study aims to address publication bias in the evidence for the efficacy of psychotherapeutic and preventive interventions for depression;	Begg and Mazumdar's adjusted rank correlation test; Egger's regression analysis; trim and fill procedure;	Significant bias was detected in 5 (16.13%; rank correlation test) and 6 (19.35%; Egger's regression analysis) of the data sets; Applying the trim and fill procedure to amend presumably missing studies rarely changed the assessment of the efficacy of therapeutic interventions, with 2 exceptions;

Kühberger et al., 2015	N = 107 randomized controlled trials of 16 antidepressants of FDA reviews;	FDA-registered trials; PubMed; EMBASE; Cochrane Central Register of Controlled Trials;	Investigation whether pooled-trials publications constitute a specific form of reporting bias;	Pooled-trials publications might be particularly susceptible to bias, because it is often unclear how trials were selected for inclusion;	-	Only two (3.8%) of 54 positive trials were published exclusively in pooled-trials publications, compared with 21 (41.1%) of 51 negative trials (p < 0.001); Thirteen (12%) of 107 publications had as primary aim to present data on the trial's primary research question (drug efficacy compared with placebo). Only four of these publications, reporting on five (22%) trials, presented individual efficacy data for the primary research question. Additionally, only five (5%) of 107 pooled-trials publications had a negative conclusion;
Ferguson et al., 2012	N = 2 meta-analytic data sets;	Psychological Bulletin;	Examination of the relationship between publication bias and 2 study characteristics by breaking down 2 meta-analytic data sets into levels of the relevant study characteristic and assessing publication bias in each level;	Publication bias can be due to other factors, such as study characteristics, than significance;	Funnel plots; trim and fill; Egger's linear regression; cumulative meta-analysis; Vevea and Hedges weight function model;	Results show that publication bias can differ over levels of study characteristics;
Coburn, et al., 2015	N = 156 articles in a period between 2001 and 2010	KZfSS; ZfS; PVS;	This study investigates publication bias in three top-tier journals in the German social sciences	The tendency to publish statistically significant findings is called "publication bias", which has been shown to occur in many areas;	Caliper test;	In all three journals empirical evidence for the existence of publication bias was found; Possible causes linked to this bias: single versus multiple authorship; academic degree; only weak support for the relationships between individual author characteristics and publication bias was found;

Note: Study: Sample Size: FDA: Food and Drug Administration; PRT: Pivotal Response Treatment; SSED: Single-Subject Experimental Design; Location/Publisher/Data Base: APA: American Psychological Association; APS: Association for Psychological Science; KZfSS: Kölner Zeitschrift für Soziologie und Sozialpsychologie; PVS: Politische Vierteljahresschrift; ZfS: Zeitschrift für Soziologie; Methods/Question: ABA: Applied Behavior-Analytic; Problem: Solution: Instruments and Procedures: Results: PND: Percentage of Non-overlapping Data;

3.2 The way to deal with publication bias

In an attempt to control or eliminate publication bias, researchers have put forward many promising changes regarding the peer-review system, statistical significance of data and data contamination and underlying effect size. Button et al. (2016) stress the weaknesses of the peer-review system, suggesting that publication bias often stems from the reviewers' tendency to be unimpressed by small samples and impressed by large-scale or large data banks. They launched a pilot within the peer-review system, in which authors, reviewers and editors are heavily influenced by impressive results. To address this, they are launching a pilot trial where reviewers are blinded to the study's results, leaving them to assess only the methods. Their aim is to improve the reliability and quality of published research, by focusing on the methods, rather than on results.

Simonsohn et al. (2014) addressed publication bias issues with a validation technique that re-analysed data from Many-Labs Replication Project, which showed that only sample sizes and sufficient test results can adequately correct publication bias. That way, they tackle the problem occurring when journals tend to publish statistically.

Winship et al. (2018) present a set of rough rules of thumb to interpret t-values in published results under publication bias when there is only a single study. "We first re-interpret t-statistics in a one-tailed hypothesis test in terms of their associated p-values when there is extreme publication bias, that is, when no null findings are published. We then consider the consequences of different degrees of publication bias. We show that under even moderate levels of publication bias adjusting one's p-values to insure Type I error rates of either 0.05 or 0.01 result in far higher t-values than those in a conventional t-statistics table. Under a conservative assumption that publication bias occurs 20 percent of the time, with a one-tailed test at a significance level of 0.05, a t-value equal or greater than 2.311 is needed. For a two-tailed test the appropriate standard would be equal or above 2.766. Both cutoffs are far higher than the traditional ones of 1.645 and 1.96. To achieve a p-value less than 0.01, the adjusted t-values would be 2.865 (one-tail) and 3.254 (two-tail), as opposed to the traditional values 2.326 (one-tail) and 2.576 (two-tail). We illustrate our approach by applying it to evaluate the hypothesis tests in recent issues of *Criminology* and *Journal of Quantitative Criminology (JQC)*."

Data contamination is another recurring issue in the publication bias literature. Francis et al. (2012) demonstrated that effect sizes in experiments can serve as a viable publication bias testing tool. They applied their test on several studies of prominent phenomena to show how publication bias contaminates some findings in experimental psychology. Additionally, they've shown that by using

the Bayesian methods of data analysis the occurrence of publication bias can be reduced, and recommend that such methods should be part of any systematic process to remove publication bias.

Guan et al. (2016) demonstrate a Bayesian model averaging approach, which takes into account a possibility of publication bias, therefor allowing a better estimate of the underlying effect size. This will lead to a more conservative interpretation of published studies though.

Another way of estimating population effect size for publication bias is proposed by Du et al. (2007) following a Bayesian fill-in meta-analysis (BALM) method. To check the performance of BALM, they compared it with other recently published or commonly used correction methods and they conducted many simulation studies that confirmed small biases. In fact, they stated:

> The simulation results suggested BALM yielded small biases, small RMSE values, and close-to-nominal-level coverage rates in inferring the population effect size and the between-study variance, and outperformed the other examined publication bias correction methods across a wide range of simulation scenarios when the publication bias mechanism is correctly specified. The performance of BALM was relatively sensitive to the assumed publication bias mechanism.

Ulrich et al. (2018) provide a mathematical approach, that allows to examine the properties of p-curves without simulations. While the skewness of p-curves can be used as a diagnostic tool to reveal the presence of p-hacking within a certain domain of research, it will still need many computer simulations. Ulrich et al.'s method allows the computation of a p-curve for any statistic whose sampling distribution is known and thereby allow a thorough evaluation of its properties. Furthermore, they've used weighted distribution functions to analyze two different types of publication bias, and how those have an influence on the shapes of p-curves. Their results show the existence of a cliff effect at p = .05 and also suggest that researchers tend to be more likely to recommend submission of an article as the level of statistical significance increases beyond this p level, which leads to right-skewed p-curves.

McShane et al. (2016) review and evaluate selection methods that assess and adjust for publication bias in meta-analysis, with simulations that cover both restrictive, and more realistic settings. They've found that the p-curve and the p-uniform approaches both perform reasonably well in restrictive settings, but poorly in more realistic settings, while the original Hedges approach performs even better in restrictive settings and variants of the Hedges approach perform well in realistic settings. They urge caution in the application of selection methods.

An interesting method is also proposed by Citkowicz et al. (2017) who identified continuous moderators that allow for a considerable amount of heterogeneous data in a model which included an adjusted mean effect size and a formal testing and correction tool for a small number of effects. Their model uses the beta density as a weight function that represents the selection process and provides adjusted parameter estimates that account for publication bias. This use of the beta density allows to use fewer parameters than similar models to represent selection, and is therefore suitable for meta-analyses that include relatively few studies.

Anderson et al. (2017) show in their study that the common approach to sample-size planning using the sample effect size from a prior study as an estimate of the population value often results in underpowered studies. To counter this, they present an alternative approach that adjusts sample effect sizes for bias and uncertainty. Furthermore, they've made an open-source R package, BUCSS, and a Web application available to researchers to easily implement their suggested method.

Table 2. A way to deal with publication bias

Study	**Brief-Description**
Button et al., 2016	A pilot trial where reviewers are blinded to the study's results, leaving them to assess only the methods ; focusing on the methods, rather than on results
Simonsohn et al., 2014	It is possible to correct for publication bias with only sample sizes and test results of the published findings
Winship et al., 2018	They show that under even moderate levels of publication bias adjusting one's p-values to insure Type I error rates of either 0.05 or 0.01 result in far higher t-values than those in a conventional t-statistics table
Francis et al., 2012	By using Bayesian methods of data analysis the occurrence of publication bias can be reduced
Guan et al., 2016	Bayesian model averaging approach, which takes into account a possibility of publication bias, therefor allowing a better estimate of the underlying effect size.
Du et al., 2017	Bayesian fill-in meta-analysis (BALM) method for adjusting publication bias and estimating population effect size for publication bias
Ulrich et al., 2018	Mathematical approach, that allows to examine the properties of p-curves without simulation & allows the computation of a p-curve for any statistic whose sampling distribution is known and thereby allows a thorough evaluation of its properties . Researchers tend to be more likely to recommend submission of an article as the level of statistical significance increases beyond this p level, which leads to right-skewed p-curves.
McShane et al., 2016	The original Hedges approach performs even better in restrictive settings and variants of the Hedges approach perform well in realistic settings. They urge caution in the application of selection methods.
Citkowicz et al., 2017	Represent a method that can (a) account for continuous moderators by including them within the model, (b) allow for substantial data heterogeneity, (c) produce an adjusted mean effect size, (d) include a formal test for publication bias, and (e) allow for correction when only a small number of effects is included
Anderson et al., 2017	They've made an open-source R package, BUCSS, and a Web application available to researchers to easily implement their suggested method.

4 Discussion and Conclusion

This systematic review examined the findings in a variety of relevant studies and highlighted specific clinical publishing bias issues in an attempt to suggest possible ways of control and monitoring. Expectedly, this systematic review and meta-analysis summarised key evidence published so far in order to gauze health care interventions efficacy. As such the PRISMA Statement was developed

after many adaptations as an approach for developing reporting guidelines. Publication bias has been much- discussed in the last decade. Publishing papers with significant results leads to the false assumptions about the efficacy of certain treatments or methods, challenging if the unpublished results are unavailable.

However, systematic reviews in the field of psychology are not only limited to determining the efficacy of certain interventions. They also identify methodological limitations due to publication bias. Although most reviews reach unfounded conclusions regarding how unclear CBT efficacy can be and often question its adaptation potential in order to meet specific clients' needs, there are numerous considerations in the evaluation of empirically supported treatments, and several authors question the relevance of empirically supported treatments. Results can be radically skewed in these cases, causing them to be misleading, critical if systematic review and meta-analyses form the basis of policy and practice decisions. Despite the weight of evidence, a significant gap exists between the availability of effective psychological treatments and the delivery of such interventions.

In conclusion, the results of our review show that publication bias is an endemic problem that requires an optimal solution. Publication bias is common in psychology research current research reveals low rates of successful replication of original studies (36-47%) in accordance with the criteria used. Using PRISMA to search through PubMed and Ebscohost, we isolated 17 papers reveal that publication bias is not new to the psychology field, and seven published meta-analysis, reviews and trials that highlight publication bias in the research. These reviews consistently found that empirical evidence for the existence of publication bias stands at a 10% significance level; the application of the trim and fill procedure to amend presumably missing studies did not change the assessment of therapeutic interventions' efficacy, and that published studies, as well as unpublished ones, had similar methodologies. Also, some authors identified pooled-trial publications in a systematic literature review with neither implicit nor explicit power analysis able to account for this pattern of findings. Results indicate that publication bias can differ over levels of study characteristics, and that many authors of meta-analyses are overrepresented in unpublished studies, suggesting that searches for unpublished studies may inadvertently increase publication bias.

These results underscore the necessity of understanding and controlling publishing bias. Publication bias in clinical trials directly impacts health, and steps must be taken to identify and reduce its risk factors. The results of ten studies provide possible solutions, including the Bayesian method, beta-weight density models, reading of p-curves, individual mathematical approaches to diminish publication bias in studies with problematic sample sizes, and an experimental approach necessitating blinding peer-reviewers to a study's results. Button et al. (2016) describes an excess of positive results drawn from studies with methodological limitations or small sample sizes, while null findings from studies of similar quality are absent, leading to evidence distortion and false conclusions. Their aim is to increase the reliability and quality of published research by focusing on the methods rather than on results. Simonsohn et al. (2014) focus on the tendency of some journals publishing statistically significant evidence, thus creating an overinflated record of effect size and limiting access to non-significant results. Using sample sizes and test results of the published findings, it is possible to correct for publication bias by re-analyzing data from the Many-Labs Replication project. Winship et al. (2018) suggest interpreting t-values in published results under publication bias

in single study cases. When even moderate levels of publication bias exist, adjusting p-values to ensure Type I error rates of either 0.05 or 0.01 result in far higher t-values than those in a conventional t-statistics table. Francis et al. (2012) have shown that the use of Bayesian methods of data analysis can reduce the occurrence of publication bias, and recommend that such methods be part of systematic processes to reduce publication bias. Guan et al. (2016) demonstrate a Bayesian model averaging approach, which estimates the possibility of publication bias by examining the underlying effect size, suggestive of a more conservative interpretation of published studies. Du et al. (2017) propose a Bayesian fill-in meta-analysis (BALM) method for adjusting publication bias and estimating population effect size for publication bias. Their simulation studies examine the performance of BALM and have compared it with commonly used and recently proposed publication bias correction methods. The mathematical approach of Ulrich et al. (2018) examines the properties of p-curves without simulations. While skewed p-curves can be diagnostically used to reveal the presence of p-hacking within a certain research domain, many computer simulations may still be required. McShane et al. (2016) reported that while the p-curve and the p-uniform approaches both perform reasonably well in restrictive settings, they perform poorly in more realistic settings. Hedges original approach, on the other hand, performs even better in restrictive settings, and variants of the Hedges approach perform well in realistic settings. Ultimately, they urge caution when applying selection methods. Citkowicz et al. (2017) propose a more vigorous method that can (a) account for continuous moderators by including them within the model, (b) allow for substantial data heterogeneity, (c) produce an adjusted mean effect size, (d) include a formal test for publication bias, and (e) allow for correction independent of effect size in the analysis. Lastly, Anderson et al. (2017) present an alternative approach that adjusts sample effect sizes for bias and uncertainty. An open-source R package, BUCSS and a Web application of their suggested method are readily available online.

This review acknowledges some limitations pertaining to the potential bias entailed during data analysis and coding performed by the researcher and author alone. Also, we understand that we did not imply a consensus reaching procedure and we did not use systematic review and meta-analysis protocols required (Tetzlaff et al., 2007), which may challenge the validity of our work. The flow diagram also needs adjustments when reporting individual patient data meta-analysis (Stewart &Clarke, 1995). Further research is also recommended regarding data contamination and published and unpublished bias. In conclusion, just as grey and white literature may largely affect the efficacy of cognitive psychological treatment and reproducibility, publishing bias may be a determining factor regarding the clarity, the validity and the transparency of data in the field and thus needs to be further explored.

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