cpe.psychopen.eu | ISSN 2625-3410 | June 2021 | Volume 3 | Issue 2 |

CLINICAL PSYCHOLOGY IN EUROPE

The Official Academic Journal of the European Association of Clinical Psychology and Psychological Treatment

PsychOpen GOLD

CLINICAL PSYCHOLOGY IN EUROPE

The Official Academic Journal of the
European Association of Clinical Psychology and Psychological Treatment

Editors-in-Chief

Winfried Rief
Division of Clinical Psychology and Psychological Treatment
Department of Psychology
Philipps-University of Marburg
Marburg, Germany
email: rief@uni-marburg.de

&

Cornelia Weise
Division of Clinical Psychology and Psychological Treatment
Department of Psychology
Philipps-University of Marburg
Marburg, Germany
email: weise@uni-marburg.de

Section Editors

Colette Hirsch
EACLIPT-Board | London, UK

Tania Lincoln
Hamburg, Germany

Omer Van den Bergh
Leuven, Belgium

Anton-Rupert Laireiter
Vienna, Austria

Jolanda Meeuwissen
Utrecht, Netherlands

Editorial Board

Gerhard Andersson
EACLIPT-Board | Linköping, Sweden

Claudi Bockting
EACLIPT-Board | Amsterdam, Netherlands

Cristina Botella
Castelló de la Plana, Spain

Per Carlbring
Stockholm, Sweden

Trudie Chalder
London, UK

Roman Cieślak
EACLIPT-Board | Warsaw, Poland

David Clark
Oxford, UK

Ioana Alina Cristea
Cluj-Napoca, Romania

Pim Cuijpers
Amsterdam, Netherlands

Daniel David
Cluj-Napoca, Romania

Céline Douilliez
EACLIPT-Board | Louvain-La-Neuve, Belgium

Anke Ehlers
Oxford, UK

Thomas Ehring
Munich, Germany

Giovanni Fava
Bologna, Italy

Jens Gaab
Basel, Switzerland

Martin Hautzinger
Tübingen, Germany

Dirk Hermans
Leuven, Belgium

Stefan Hofmann
Boston, USA

Emily Holmes
Stockholm, Sweden

Jutta Joormann
New Haven, USA

Maria Karekla
University of Cyprus, Cyprus

Andreas Maercker
EACLIPT-Board | Zurich, Switzerland

Robert Masten
Ljubljana, Slovenia

Lance McCracken
Uppsala, Sweden

Thomas Probst
Krems, Austria

Bernhard Strauß
Jena, Germany

Claus Vögele
Luxembourg, Luxembourg

PsychOpen GOLD

CLINICAL PSYCHOLOGY IN EUROPE

June 2021 | Volume 3 | Issue 2

Contents

PsychOpen GOLD is a publishing service by
Leibniz Institute for Psychology Information (ZPID), Germany.
www.leibniz-psychology.org

PsychOpen GOLD

Clinical Psychology in Europe

PsychOpen GOLD

Editorial

Check for updates

Laudatio for Distinguished Scholar Dr. Aaron T. Beck

Claudi L. H. Bockting[1]

[1] *Amsterdam UMC, University of Amsterdam, Amsterdam, The Netherlands.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e6871, https://doi.org/10.32872/cpe.6871

Published (VoR): 2021-06-18

Corresponding Author: Claudi L. H. Bockting, Department of Psychiatry, Amsterdam University Medical Center, University of Amsterdam, Meibergdreef 5, 1105 AZ Amsterdam, The Netherlands. E-mail: c.l.bockting@amsterdamumc.nl

On behalf of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT), I am honored to have the opportunity to award Dr. Aaron T. Beck (MD) with the European '*Diamond Distinguished Contributor to Psychological Interventions Award*'.

On July 18, 2021, Dr. Beck will celebrate his 100th birthday. As a psychiatrist and scientist, he spent almost his entire career on reducing human suffering. With a medical and academic career spanning more than 70 years, 600 published articles, 25 books, and numerous awards, it is without doubt that Dr. Beck has greatly influenced and shaped our current thinking on psychopathology and clinical practice beyond the measurable. Albeit, measurability was of utmost concern to him during his career. Originally starting out as a neurologist after his medical training at Yale, particularly liking the precision of this field, he soon found himself becoming absorbed in psychoanalysis. Carrying over his interest in empirical work, he later widely explored and rigorously tested the psychoanalytic model of depression as a psychiatrist at the University of Pennsylvania. Other than expected he did not find evidence for the psychoanalytic concept, but rather unraveled the core assumptions of cognitive therapy. Due to his unremitting work, psychological interventions became more evidence-based, client-focused, and accessible to a wide variety of people with different conditions across the globe. Today, Cognitive Behavior Therapy (CBT) is the most studied psychotherapy (>2000 studies on CBT) for most mental health problems globally. Even more so, his Cognitive Behavioral theoretical model has led to groundbreaking insights on the etiology, maintenance, and recurrence of psychopathology.

Dr. Beck is not only the founding father of CBT, he also played a crucial role in demonstrating time and time again that research and clinical practice go hand in hand. That is, already in the early years of Dr. Beck, the concept scientist practitioner was

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

'a given'. Most people who had the pleasure to see Dr. Beck on stage will recall his onstage role-plays. Without hesitation, until recent times he was always prepared to do a role-play in public at a conference or at events of the Beck Institute. In each role-play, Dr. Beck managed to give the audience the impression it was a piece of cake to conduct CBT. We all know better: It requires a lot of training. Nevertheless, it is indeed doable with the right amount of practice, which Dr. Beck was always aware of. One of the greatest achievements of Dr. Beck together with the Beck Institute, and probably one of the ingredients of the therapy's success, is that CBT is highly transferable by training. The worldwide dissemination of CBT demonstrates clearly that CBT is highly transferable, even across different cultures.

Dr. Aaron T. Beck Received the Diamond Distinguished Contributor Psychological Interventions Award by the EACLIPT

On a personal note, I vividly remember my first introduction to Dr. Beck when he received an honorary membership at the Dutch association for CBT. I was invited to join for dinner with Dr. Beck and a small group, and I was shocked to find out I was seated next to him. As a classical Dutch person (usually too direct), I had to actively inhibit my urge to immediately confront him with my slightly provocative questions that challenge

PsychOpen GOLD

the CBT model. Given all the research on inhibition, you will most likely know how hard it can be to inhibit these questions once they are on top of your mind. They can almost become intrusive, and even rebounce once you attempt to suppress them. So, well aware that pure suppression was not an option, I had to choose a more problem-focused approach. Therefore, I decided to discuss something completely different with Dr. Beck to distract my own mind. And what could be more impartial, universal and pleasing, than talking about music? Obviously, having my mental set of Beck associations activated, I couldn't think of any other artist than the famous American musician Beck. So, my opening line was: "Do you know the very popular song Loser, in which Beck sings '*I am a loser baby (so why don't you kill me)*'?". We discussed that the song might indeed be inspired by CBT. Could it be that this song could even lead to cognitive restructuring in listeners? Taken together, it includes the identification of rigid negative beliefs, evaluating the evidence, as well as the formulation of alternative beliefs! After this small talk, of course, my suppressed thoughts rebounced – how could they not? Fortunately, Dr. Beck was happy to discuss all my burning questions, as he has always been after. For instance, why not intervene immediately on beliefs/schema level, instead of starting working on thought level before going there? He gave the only right answer: 'That is an empirical question. You should study it'. This is, most certainly, another way in which Dr. Beck influenced science and clinicians: transfer curiosity to an empirical question and study it. I indeed did study this, later on in several trials. I can only imagine the large number of people he inspired throughout his life, and continues to do. Dr. Beck's lifework is living and still developing.

By the way, Dr. Beck asked me to send him a disk of the song, and I did. He later told me that he didn't know the song, but liked the idea of using music or other means to evaluate beliefs on a large scale. He was and is more than willing to provide feedback on articles and research. Hereby, he teaches us all an important lesson: curiosity should never stop. After all this time, he still serves as an inspiration to the scientific community, numerous scientist practitioners, clinicians all over the world. More importantly he contributed and still contributes significantly to reduce human suffering of many individuals all over the world that suffer from mental health problems and mental health conditions.

The EACLIPT is proud that Dr. Beck accepts our European '*Diamond Distinguished Contributor to Psychological Interventions Award*'.

Claudi Bockting
Professor of Clinical Psychology in Psychiatry
Amsterdam UMC/University of Amsterdam
President of EACLIPT

PsychOpen GOLD

Funding: The author has no funding to report.

Acknowledgments: The author has no additional (i.e., non-financial) support to report.

Competing Interests: The author has declared that no competing interests exist.

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

PsychOpen GOLD

Clinical Psychology in Europe

PsychOpen GOLD

Editorial

Check for updates

A Brief History of Aaron T. Beck, MD, and Cognitive Behavior Therapy

Judith S. Beck[1,2], Sarah Fleming[1]

[1] *Beck Institute for Cognitive Behavior Therapy, Philadelphia, PA, USA.* **[2]** *Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e6701, https://doi.org/10.32872/cpe.6701

Published (VoR): 2021-06-18

Corresponding Author: Sarah Fleming, Beck Institute for Cognitive Behavior Therapy, PO Box 2152, Bala Cynwyd, PA 19004-6152, USA. E-mail: sfleming@beckinstitute.org

On July 18th, 2021, the medical and mental health community around the world will celebrate the 100th birthday of Aaron T. Beck, MD. Dr. Beck is globally recognized as the father of Cognitive Behavior Therapy (CBT) and is one of the world's leading researchers in psychopathology. Since he developed CBT in the 1960s and 1970s, this revolutionary treatment has been found to be effective in over 2000 clinical trials for a wide range of mental disorders, psychological problems, and medical conditions with psychological components. A prolific and productive researcher with a career spanning more than 70 years, Dr. Beck has published over 600 articles and authored or co-authored 25 books. He is also the recipient of numerous awards, including the 2006 Albert Lasker Award for Clinical Medical Research and the Gustave O. Lienhard Award from the Institute of Medicine for "outstanding national achievement in improving personal health care services in the United States." He has dedicated his life to alleviating human suffering through the development of an evidence-based psychological therapy and continues his work to this day.

CBT is based on the psychological construct that individuals' interpretations of situations influence their reaction (emotional, behavioral, physiological), more so than the situation itself. Further, people's interpretations may be distorted, inaccurate or unhelpful, particularly when psychopathology is present. These interpretations, termed "automatic thoughts", are often linked to maladaptive underlying beliefs that individuals have about themselves, other people, the world, or the future. Dr. Beck found that when he helped his patients evaluate and change their distorted thinking, they felt better and were able to modify their behavior. When he helped them evaluate and change their underlying beliefs, their improvement was long-lasting.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Dr. Aaron T. Beck and Dr. Judith S. Beck Co-Founded Beck Institute in 1994

Photo © 2019 Beck Institute for Cognitive Behavior Therapy

The Development of Cognitive Therapy

As a young psychiatrist in the 1950s, Dr. Beck wholly subscribed to the dominant psychotherapeutic modality at the time: psychoanalysis. His earliest research sought to validate psychoanalytic constructs. He was surprised when his research appeared to refute the underlying tenets of psychoanalytic theory. Rather than confirm the psychoanalytic theory that depressed clients felt an innate need to suffer, Dr. Beck's initial studies with depressed patients seemed to point to underlying negative beliefs associated with loss and failure. He soon began to understand that these underlying beliefs were consistent with the patients' automatic thoughts, which could be accessed and collaboratively evaluated in session. Dr. Beck moved his patients from the couch to a chair, where he worked with them to examine their automatic thoughts and identify cognitive distortions. By helping patients correct negative information processing biases, he was able to help them feel better and engage in more adaptive behaviors. He called his new therapy "Cognitive Therapy".

In 1977, the results of the first major clinical trial comparing Cognitive Therapy to anti-depressant medication were published (Rush et al., 1977). Cognitive Therapy became the first talking therapy shown to be more efficacious than medication for the treatment of depression. When a second study, conducted in the UK and published in 1981, appeared to replicate the results (Blackburn et al., 1981), interest in the approach grew nationally and internationally.

PsychOpen GOLD

Dr. Aaron T. Beck and the Dalai Lama

Photo © 2019 Beck Institute for Cognitive Behavior Therapy

Dr. Beck (and colleagues) began to apply Cognitive Therapy to other disorders, such as anxiety, personality disorders, substance use, and suicidality. He developed a comprehensive theory of psychopathology that provided the basis for treatment and methods to evaluate the validity of his theories and the efficacy and effectiveness of the therapy. For each new condition, he would begin by making clinical observations, identifying typical maladaptive beliefs associated with the disorder. He often developed scales and instruments to assess these beliefs. He would then develop a treatment to target the dysfunctional beliefs and associated maladaptive behavioral strategies. The therapy would be validated using a randomized controlled trial, then disseminated in the literature so that others could study, practice, and refine the treatment (Beck, 2019). Other researchers followed suit. In the UK, for example, a group at Oxford used a similar method to devise and test Cognitive Therapy treatment protocols for panic disorder, social anxiety disorder, obsessive-compulsive disorder, and posttraumatic stress disorder (Clark, 1986; Clark & Wells, 1995; Salkovskis, 1999; Ehlers et al., 2005). Cognitive Therapy was also successfully applied to eating disorders, couples' problems, anger and hostility, psychosis, and other mental health problems. It was also successfully applied to children, adolescents, adults, and older adults in a variety of settings, including hospitals, outpatient clinics, residential placements, schools, and prisons.

PsychOpen GOLD

Dr. Aaron T. Beck at the Beck Excellence Summit

Photo © 2019 Beck Institute for Cognitive Behavior Therapy

Additionally, researchers found that patients with medical conditions can benefit from Cognitive Therapy, or Cognitive Behavior Therapy (CBT), as it is known today. In many cases, CBT can help reduce symptoms. In other cases, CBT can help patients cope better with their conditions. Research has shown that patients with scores of medical problems from dementia and insomnia to irritable bowel syndrome, migraine headaches, obesity, and chronic pain have benefited from CBT.

Achievements in Cognitive Therapy

CBT has become the most widely practiced (Knapp et al., 2015) and heavily researched (David et al., 2018) psychotherapy in the world. Much of its success can be attributed to the careful attention paid to its dissemination and implementation and to the training and credentialing of CBT therapists around the world. To this end, Dr. Aaron Beck and his daughter, Dr. Judith Beck, founded the nonprofit Beck Institute for Cognitive Behavior Therapy (BI) in 1994. The mission of BI is to improve lives worldwide through excellence and innovation in CBT training, practice, and research. The organization has trained more than 28,000 health and mental health professionals from 130 countries through a variety of in person and virtual programs and distance supervision, including some of the leading researchers in CBT today. All of the organization's programs operate in service of its mission.

One of the largest and most successful implementations of CBT has been the Improving Access to Psychological Therapies (IAPT) program. Dr. David M. Clark, a prominent CBT researcher, who had maintained a close working relationship with Dr. Aaron Beck

PsychOpen GOLD

since he was a doctoral student, partnered with economist Lord Richard Layard to radically expand access to evidence-based psychological therapies throughout England via a massive overhaul of England's National Health Service (NHS). Through IAPT, Dr. Clark and his colleagues have trained over 10,500 clinicians in CBT and other evidence-based therapies. As of 2019, one million people pass through the program each year, with over half a million receiving a course of treatment. The program has collected outcome data on 99% of those treated. Around seven in every ten treated individuals (67%) show substantial reductions in their anxiety or depression. For five in every ten (51%) the reductions are large enough for the person to be classified as recovered (Clark, 2019). By 2024, the IAPT program plans to increase its reach from one million to 1.9 million individuals annually. The IAPT program has shown that improving public mental health is not only possible but is also cost-effective. The program should serve as a blueprint for countries around the world who want to address the growing global mental health crisis.

Dr. Aaron T. Beck and Family at his 95th Birthday Celebration

Photo © 2019 Beck Institute for Cognitive Behavior Therapy

Dr. Aaron Beck has continued his research into the treatment of psychopathology even until today. He is most passionate about the work he and colleagues at the University of Pennsylvania and now at the Beck Institute undertook two decades ago. They developed Recovery-Oriented Cognitive Therapy (CT-R), which provides concrete, actionable steps to promote recovery and resilience among individuals with serious mental health conditions. CT-R is beginning to change the way severe mental illness is conceptualized and treated. Initial research has supported this approach (Grant et al., 2012; Grant et al., 2017). Originally developed to treat schizophrenia, the principles of CT-R can be incorporated into CBT (J. Beck, 2020) and may be especially useful for individuals experiencing

PsychOpen GOLD

extensive behavioral, social, and physical health challenges. CT-R is highly collaborative, person-centered, and strengths-based, focusing on developing and strengthening positive beliefs of purpose, hope, efficacy, empowerment and belonging (and deemphasizing a focus on symptoms and negative beliefs). This approach has been implemented in a variety of inpatient, residential, and community settings, resulting in the reduction or elimination of controlling interventions such as seclusion, restraint, and as-needed medication, as well as reducing the length of hospital stays for individuals (Beck et al., 2020).

The Future of Cognitive Therapy

Building on CBT's demonstrated efficacy, one important continuing challenge for researchers and clinicians is to develop ways to deliver quality CBT treatment to the individuals who need it most. This involves both adapting treatment for diverse cultures and populations and creating effective and efficient treatment delivery models, including the expansion of digital and online methods of delivery and integrating CBT into primary care settings and public health clinics. It also entails robust and effective training programs for health and mental health professionals, peer specialists, care givers, teachers, and other groups. Dr. Aaron Beck has devoted his life to alleviating human suffering through his study and application of psychological principles. The CBT community looks forward to honoring his 70-year legacy by continuing to study and disseminate evidence-based CBT around the world.

Funding: The authors have no funding to report.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

References

Beck, A. T. (2019). A 60-year evolution of cognitive theory and therapy. *Perspectives on Psychological Science, 14*(1), 16-20. https://doi.org/10.1177/1745691618804187

Beck, A. T., Grant, P., Inverso, E., Brinen, A., & Perivoliotis, D. (2020). *Recovery-oriented cognitive therapy for serious mental health conditions*. New York, NY, USA: Guilford Press.

Beck, J. S. (2020). *Cognitive Behavior Therapy, Third Edition: Basics and Beyond*. New York, NY, USA: Guilford Press.

Blackburn, I. M., Bishop, S., Glen, A. I. M., Whalley, L. J., & Christie, J. E. (1981). The efficacy of cognitive therapy in depression: A treatment trial using cognitive therapy and

PsychOpen GOLD

pharmacotherapy, each alone and in combination. *The British Journal of Psychiatry, 139*(3), 181-189. https://doi.org/10.1192/bjp.139.3.181

Clark, D. M. (1986). A cognitive approach to panic. *Behaviour Research and Therapy, 24*(4), 461-470. https://doi.org/10.1016/0005-7967(86)90011-2

Clark, D. M. (2019). IAPT at 10: Achievements and challenges. https://www.england.nhs.uk/blog/iapt-at-10-achievements-and-challenges

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. Liebowitz, D. Hope, & F. Scheier (Eds.), *Social phobia: Diagnosis, assessment and treatment* (pp. 69–93). New York, NY, USA: Guilford Press.

David, D., Cristea, I., & Hofmann, S. G. (2018). Why cognitive behavioral therapy is the current gold standard of psychotherapy. *Frontiers in Psychiatry, 9*, Article 4. https://doi.org/10.3389/fpsyt.2018.00004

Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., & Fennell, M. (2005). Cognitive therapy for post-traumatic stress disorder: Development and evaluation. *Behaviour Research and Therapy, 43*(4), 413-431. https://doi.org/10.1016/j.brat.2004.03.006

Grant, P. M., Bredemeier, K., & Beck, A. T. (2017). Six-month follow-up of recovery-oriented cognitive therapy for low-functioning individuals with schizophrenia. *Psychiatric Services, 68*, 997-1002. https://doi.org/10.1176/appi.ps.201600413

Grant, P. M., Huh, G. A., Perivoliotis, D., Stolar, N. M., & Beck, A. T. (2012). Randomized trial to evaluate the efficacy of cognitive therapy for low-functioning patients with schizophrenia. *Archives of General Psychiatry, 69*, 121-127. https://doi.org/10.1001/archgenpsychiatry.2011.129

Knapp, P., Kieling, C., & Beck, A. T. (2015). What do psychotherapists do? A systematic review and meta-regression of surveys. *Psychotherapy and Psychosomatics, 84*(6), 377-378. https://doi.org/10.1159/000433555

Rush, A. J., Beck, A. T., Kovacs, M., & Hollon, S. (1977). Comparative efficacy of cognitive therapy and pharmacotherapy in the treatment of depressed outpatients. *Cognitive Therapy and Research, 1*, 17-37. https://doi.org/10.1007/BF01173502

Salkovskis, P. M. (1999). Understanding and treating obsessive—compulsive disorder. *Behaviour Research and Therapy, 37*, S29-S52. https://doi.org/10.1016/S0005-7967(99)00049-2

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

Clinical Psychology in Europe

PsychOpen GOLD

Research Articles

Check for updates

Looking on the Bright Side Reduces Worry in Pregnancy: Training Interpretations in Pregnant Women

Colette R. Hirsch[1§], Frances Meeten[2§], Jill M. Newby[3,4], Sophie O'Halloran[1], Calum Gordon[1], Hannah Krzyzanowski[1], Michelle L. Moulds[3]

[1] *Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom.* **[2]** *School of Psychology, University of Sussex, Brighton, United Kingdom.* **[3]** *School of Psychology, University of New South Wales, Sydney, Australia.* **[4]** *Black Dog Institute, Hospital Road Randwick, New South Wales, Sydney, Australia.*

[§]*These authors contributed equally to this work.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e3781, https://doi.org/10.32872/cpe.3781

Received: 2020-05-28 • **Accepted:** 2021-03-22 • **Published (VoR):** 2021-06-18

Handling Editor: Cornelia Weise, Philipps-University of Marburg, Marburg, Germany

Corresponding Author: Colette R. Hirsch, Department of Psychology, Institute of Psychiatry, Psychology and Neuroscience, King's College London, De Crespigny Park, London SE5 8AF, UK. Phone: +44 207 848 0697. E-mail: colette.hirsch@kcl.ac.uk

Supplementary Materials: Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Background: Recent evidence suggests that anxiety is more common than depression in the perinatal period, however there are few interventions available to treat perinatal anxiety. Targeting specific processes that maintain anxiety, such as worry, may be one potentially promising way to reduce anxiety in this period. Given evidence that negative interpretation bias maintains worry, we tested whether interpretation bias could be modified, and whether this in turn would lead to less negative thought (i.e., worry) intrusions, in pregnant women with high levels of worry.

Method: Participants (N = 49, at least 16 weeks gestation) were randomly assigned to either an interpretation modification condition (CBM-I) which involved training in accessing positive meanings of emotionally ambiguous scenarios, or an active control condition in which the scenarios remained ambiguous and unresolved.

Results: Relative to the control condition, participants in the CBM-I condition generated significantly more positive interpretations and experienced significantly less negative thought intrusions.

Conclusions: Our findings indicate that worry is a modifiable risk factor during pregnancy, and that it is possible to induce a positive interpretation bias in pregnant women experiencing high

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

levels of worry. Although preliminary, our findings speak to exciting clinical possibilities for the treatment of worry and the prevention of perinatal anxiety.

Keywords

perinatal mental health, worry, interpretation bias, cognitive bias mediation (CBM), pregnancy, anxiety

Highlights

- Modification of interpretation bias in pregnant women with high levels of worry was examined.
- Participants received interpretation bias training or an active control condition.
- Training led to less negative interpretations and fewer negative thought intrusions.
- Modifying negative interpretation bias in pregnant women may have clinical utility.

The perinatal period, the time from conception to 12 months post birth (Austin, Highet, & Expert Working Group, 2017), is a time of significant change and adjustment. It often brings new stressors which, combined with hormonal fluctuations, can leave women vulnerable to mental health problems. Women are at a higher risk of developing a serious mental illness during the first month postpartum than at any other point in their lives (Stewart et al., 2003), and are also at risk for relapse or recurrence of a pre-existing mental health problem. Perinatal mental health problems are associated with negative outcomes for both mother and baby; for example, poor foetal development (DiPietro et al., 2002), low birth weight (Hedegaard et al., 1993), and greater risk of behavioural, psychological and developmental problems (O'Connor et al., 2002; Stein et al., 2014).

Until relatively recently, most research on perinatal mental health has focused on postnatal depression, with other conditions overlooked (Goodman, Watson, & Stubbs, 2016; Howard, Molyneaux, et al., 2014). In particular, perinatal anxiety has tended to be ignored in favour of depression, despite evidence that anxiety disorders are more prevalent than depression in pregnancy and postpartum (Fairbrother et al., 2016). This is particularly the case in the treatment outcome literature. In a systematic review, Loughnan et al. (2018) identified only one randomised controlled trial evaluating a treatment for perinatal anxiety. With prevalence rates of up to 8.5% (Goodman et al., 2016), and given that maternal prenatal anxiety is associated with a twofold increase in the risk of a child developing psychological disorders (O'Donnell et al., 2014), there is a clear need to develop effective, evidence-based approaches to treat perinatal anxiety.

One promising approach may be to target modifiable psychological processes that maintain anxiety symptoms and their consequences, such as repetitive negative thinking (RNT). RNT refers to types of thinking which are pathological, perseverative and difficult to control (Samtani & Moulds, 2017); for example, worry and rumination. Worry is a form of RNT that is predominantly verbal, difficult to control and involves entertaining potential negative outcomes of future situations (Borkovec, 1994). Rumination primarily

PsychOpen GOLD

involves focusing on events in the past, as well as one's perceived personal inadequacies, current mood/symptoms and their causes and consequences (Nolen-Hoeksema, 1991). Both these forms of RNT are experienced as unwanted negative intrusive thoughts that come to mind unbidden, and capture attention such that it is difficult to shift focus away from the thought. Moulds et al. (2018) proposed that RNT could be an important factor to target in interventions to improve perinatal distress. In keeping with this, a recent study of pregnant women (Hirsch, Meeten, et al., 2020) demonstrated that worry and RNT more generally was associated with increased levels of perinatal anxiety and depression. The predictive role of worry in the development and maintenance of anxiety is well-established, and recent research has indicated that this may similarly apply in the perinatal context. For example, Schmidt et al. (2016) reported that levels of worry in the first four months of pregnancy predicted anxiety and depression symptoms in the third trimester.

One key cognitive process proposed to contribute to pathological worry is negative interpretation bias: the transdiagnostic tendency to perceive ambiguous information or events as threatening or negative (Hirsch & Mathews, 2012; Hirsch et al., 2016). Krahé et al. (2019) found that greater levels of negative interpretation were associated with increased worry. Similarly, Hirsch, Meeten, et al. (2020) demonstrated that higher levels of both worry and anxiety in pregnant women are associated with more negative interpretation bias. These findings speak to the clinically related possibility that modifying interpretation bias may reduce worry. One experimental methodology showing promise in this regard is cognitive bias modification for interpretation (CBM-I).

The goal of CBM-I is to facilitate consistent generation of positive interpretations of ambiguous information (where the interpretation could be positive or threatening) via repeated computerised practice. Specifically, participants listen to ambiguous scenarios, with ambiguity being resolved by the final word in a benign manner (see Appendix A in the Supplementary Materials for an example scenario). Evidence indicates that a single session of CBM-I can modify interpretation bias and in turn reduce worry in high worriers (Feng et al., 2020; Hirsch et al., 2009), as well as those with generalised anxiety disorder (GAD) (Hayes, Hirsch, Krebs, & Mathews, 2010). In another GAD sample, Hirsch et al. (2018) demonstrated that multi-session positive CBM-I training resulted in a more positive interpretation bias and reduced worry and anxiety one month later compared to an active control condition. More recently, community participants with high levels of RNT (worry and/or rumination) completed an enhanced version of CBM-I where participants were instructed to generate positive resolutions to ambiguous scenarios (rather than be presented with a positive resolution) for half of the scenarios, in order to aid generalisation and engagement. Participants were also instructed to generate positive images of the outcome for each scenario. This led to more positive interpretation bias, fewer negative interpretations, and lower levels of RNT, anxiety and depression, relative to a control condition in which ambiguity was unresolved (Hirsch, Krahé, Whyte, Bridge,

PsychOpen GOLD

et al., 2020). These findings prompt the clinically interesting possibility that CBM-I can be used as a potential intervention for anxiety.

To determine whether CBM-I can help reduce worry and anxiety via a web-based platform with no face-to-face contact with researchers during assessment or training, we conducted a study with a sample of individuals with GAD with or without comorbid major depressive disorder (Hirsch, Krahé, Whyte, Krzyzanowski, et al., 2020). Training was highly effective at reducing negative interpretations compared to the control condition. Importantly, reductions in worry, rumination, anxiety and depression were evident at three-months follow-up. Furthermore, effects were mediated by changes in interpretation bias. These findings raise the possibility of CBM-I forming a low-intensity intervention for pregnant women at risk of escalating levels of anxiety or depression due to heightened RNT. As an online intervention, it could be completed at a location and time convenient for pregnant women, and thus has scope to be more readily integrated into daily life.

The possibility that CBM-I may have utility in facilitating a more positive interpretation bias in pregnant women who engage in high levels of worry remains untested. Given that pregnant women who worry have a more negative interpretation bias (Hirsch, Meeten, et al., 2020), and the proposal that targeting RNT, such as worry, in pregnancy may have the potential to prevent and treat postpartum anxiety (Moulds et al., 2018), testing whether CBM-I can shift interpretive bias in pregnant high worriers represents a logical first step. Accordingly, we recruited pregnant women with self-reported high levels of worry who were randomly allocated to either (i) CBM-I (i.e., interpretation training enhanced with positive imagery and self-generation) or (ii) control (no resolution of ambiguity nor positive imagery) conditions. We hypothesised that participants in the CBM-I condition would generate more positive interpretations and thus demonstrate a positive interpretation bias compared to those in the control condition. We also hypothesised that participants in the CBM-I condition would experience fewer negative thought intrusions (indicative of worry) during a behavioural worry task in which they were instructed to focus on their breathing, relative to participants in the control condition.

Method

Study Registration

The study was registered on Open Science Framework: https://osf.io/ye84g. See Appendix B in the Supplementary Materials for registered information.

Participants

49 women with high levels of self-reported worry (scoring ≥ 56[1] on the Penn State Worry Questionnaire cf. Hayes, Hirsch, & Mathews, 2010) completed the study and 47 women

PsychOpen GOLD

completed useable data (see Table 1 for demographic information). Participants were required to be 16 or more weeks pregnant, fluent in English, with normal or corrected vision and hearing, and have no history of either stillbirth or three or more miscarriages. Participation involved attending a session in the lab, and participants were reimbursed £25 for taking part.

Table 1

Mean Demographic and Statistics Characteristics and Questionnaires (Standard Deviation in Parenthesis)

Characteristic	CBM-I *N* = 23	Control *N* = 24	*t*(45)	*p*
Age	33.35 (4.78)	32.46 (4.65)	0.65	0.52
Weeks of gestation	26.96 (7.10)	28.29 (6.62)	0.67	0.51
PSWQ	64.30 (5.67)	66.13 (5.66)	1.10	0.28
RTQT	39.70 (10.63)	40.67 (7.01)	0.37	0.71
PASS	43.09 (15.83)	47.54 (17.87)	0.90	0.37
EDPS	11.87 (3.55)	14.21 (5.37)	1.76	0.09
PHQ-9	8.87 (3.88)	11.00 (6.09)	1.42	0.16
GAD-7	8.52 (4.12)	11.42 (5.36)	2.07	0.04
RRS	54.48 (13.30)	52.63 (13.54)	0.47	0.64

Note. CBM-I = cognitive bias modification for interpretation; Weeks of gestation = number of weeks pregnant at time of testing; PSWQ = Penn State Worry Questionnaire; RTQT = Trait Repetitive Thinking Questionnaire; PASS = Perinatal Anxiety Screening Scale; EPDS = Edinburgh Postnatal Depression Scale; GAD7 = Generalised Anxiety Disorder Questionnaire; PHQ9 = Patient Health Questionnaire; RRS = Ruminative Response Scale.

Individuals who expressed interest in the study were sent a screening questionnaire via Qualtrics, an online data acquisition platform. 163 women completed the screening questionnaire, of whom 64 did not meet the inclusion criteria. 99 respondents were eligible to take part in the study and were invited via email to take part in the study. 63 of these responded and were offered a testing date. Of these, 49 participants completed the study, while six were found to be ineligible on the day of testing due to their Penn State Worry Questionnaire score (Meyer et al., 1990) being below cut off, seven withdrew before attending and one session was cancelled due to the COVID-19 pandemic. Two participants' data was not included in the study as their responses to the Recognition Test Comprehension Questions indicated they had either not understood or not engaged with the task. The final sample of 47 participants were aged between 22 and 42 years (M = 32.89, SD = 4.69), and ranged between 16 and 39 weeks pregnant (M = 27.64, SD =

1) In a sample of individuals diagnosed with GAD, a PSWQ score of 56 was one standard deviation below the mean (Molina & Borkovec, 1994) and is commonly used as a cut-off in research (Feng et al., 2020; Hirsch, Perman, et al. 2015). Accordingly, we classified participants as high worriers if their PSWQ score was ≥ 56.

PsychOpen GOLD

6.82). 12 participants had one child and two participants had two children. The other 35 participants were pregnant with their first child.

Sample Size

An a-priori power calculation with an alpha of .05 and power of .80 was computed in GPower. The effect size was determined by a study examining the effects of interpretation bias manipulation on the Recognition Test (Feng et al., 2020). Projected sample size was 26 per condition. As we did not know whether pregnancy would influence the capacity to modify interpretation bias, we elected to increase the planned number of participants recruited per condition to 30. However, due to the COVID-19 pandemic in 2020, face-to-face testing was ultimately prohibited. Recruitment and testing ended prematurely after testing 49 participants (two participants were excluded due to performance on the Recognition Test) resulting in final samples of n = 23 and n = 24 in the CBM-I and control conditions, respectively.

Measures and Materials

Questionnaires

Penn State Worry Questionnaire (PSWQ) — The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) consists of 16 statements related to worry (e.g., *My worries overwhelm me*) which are rated from 1 (*not at all typical of me*) to 5 (*very typical of me*). The PSWQ has high internal consistency (present sample Cronbach's α = .70), convergent and discriminant validity (Brown, Antony, & Barlow, 1992), and good test-retest reliability (Meyer et al., 1990).

Other standardised questionnaires — Perinatal anxiety was assessed using the Perinatal Anxiety Screening Scale (PASS; Somerville et al., 2014; Cronbach's α = .94 in current sample). Perinatal depression was assessed with the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987: Cronbach's α = .84). General depressed mood was assessed using the Patient Health Questionnaire 9 (PHQ-9, Kroenke & Spitzer, 2002; Cronbach's α = .84) and anxiety symptoms using the Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer et al., 2006; Cronbach's α = .87). Trait RNT was assessed with the Repetitive Thinking Questionnaire (RTQ-T [trait]; McEvoy, Thibodeau, & Asmundson, 2014; Cronbach's α = .90). Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991; Cronbach's α = .93) was used to assess depressive rumination[2].

2) VAS mood ratings were also taken during the study, but were not available for analysis due to the university being closed because of COVID-19.

PsychOpen GOLD

Tasks

Worry induction — Participants identified a current worry topic (related to their pregnancy or other aspects of their life) and were asked a series of questions to prime salient features. They were instructed to silently worry about this topic as they normally would for five minutes.

Interpretation assessment task - Recognition Test — The first phase of this task (Hirsch et al., 2018; adapted from Mathews & Mackintosh, 2000) requires participants to read a series of ambiguous scenarios. The last word of each scenario (which leaves the ambiguity unresolved) is presented as a word fragment, and participants are instructed to fill in the first missing letter of that word. Next, participants complete a comprehension question (yes/no) about the scenario (see Appendix A in the Supplementary Materials for example). In the second phase, participants are presented with a scenario title and four statements in random order, then indicate how similar each statement is to the meaning of the original scenario. The statements include one positive target (in keeping with the positive interpretation of the original scenario), one negative target, one positive and one negative foil unrelated to the scenario meaning. Participants rate each statement on a scale from 1 (*very different in meaning*) to 4 (*very similar in meaning*). Interpretation bias is assessed by calculating a positivity index, which is calculated by subtracting the mean ratings for negative targets from the mean ratings for positive targets. Higher scores indicate a more positive interpretation bias.

Breathing Focus Task — In the version of the task (Feng et al., 2020; adapted from Ruscio & Borkovec, 2004) employed in this study, participants first practiced the breathing focus task. Next, they were instructed to engage in worry about a current worry topic for five minutes, then completed a five-minute breathing focus task. During this task, participants were instructed to focus on their breathing. They were given a series of prompts (12 computerised tones) throughout the task; at each prompt, participants were asked to indicate if they were focusing on their breathing as instructed, or if their mind had wandered to another topic (i.e., they were experiencing a thought intrusion). If the latter, participants were asked to indicate the valence of the intrusion (i.e., positive, negative or neutral). Negative thought intrusions are interpreted to be indicative of worry, as per previous CBM-I studies (e.g., Feng et al., 2020).

CBM-I Condition

Imagery Practise Task — Participants in the CBM-I condition completed an online imagery practice task (adapted from Holmes et al. (2006) and used in Hirsch, Krahé, Whyte, Bridge, et al., 2020; Feng et al., 2020) to help them generate vivid mental images, and to instruct them on how to hold them in mind (see Feng et al., 2020).

PsychOpen GOLD

Cognitive Bias Modification for Interpretation (CBM-I) — CBM-I is a scenario-based task that requires participants to listen (over headphones) to 40 scenarios which present common worry-related situations that are initially emotionally ambiguous. Participants in the active condition were provided with a positive resolution (i.e. ending) of the ambiguous scenario for 20 trials, and instructed to generate their own positive resolution for the 20 remaining trials. Participants are instructed to use mental imagery to vividly picture the resolution. After each scenario, participants are presented with a 'Yes/No' comprehension question, designed to emphasise the desired interpretation of the scenario. They then receive feedback ('correct/incorrect') on these answers. Participants then rate the positivity of the scenario, on a scale of 0 (*'not at all')* to 100 (*'extremely')* (see Appendix A, Supplementary Materials, for example).

Control condition

Filler Task — The Feng et al. (2019) filler task was used to match the time taken to complete the imagery training in the CBM-I condition.

Sham Training — Similar to CBM-I training, participants listened to 50 ambiguous worry-related scenarios over headphones. An increased number of trials was required to match the duration of CBM-I training. In this condition ambiguity remained unresolved, and participants were not instructed to generate particular outcomes. Participants completed comprehension questions without feedback, thus allowing for either positive or negative interpretations without correction.

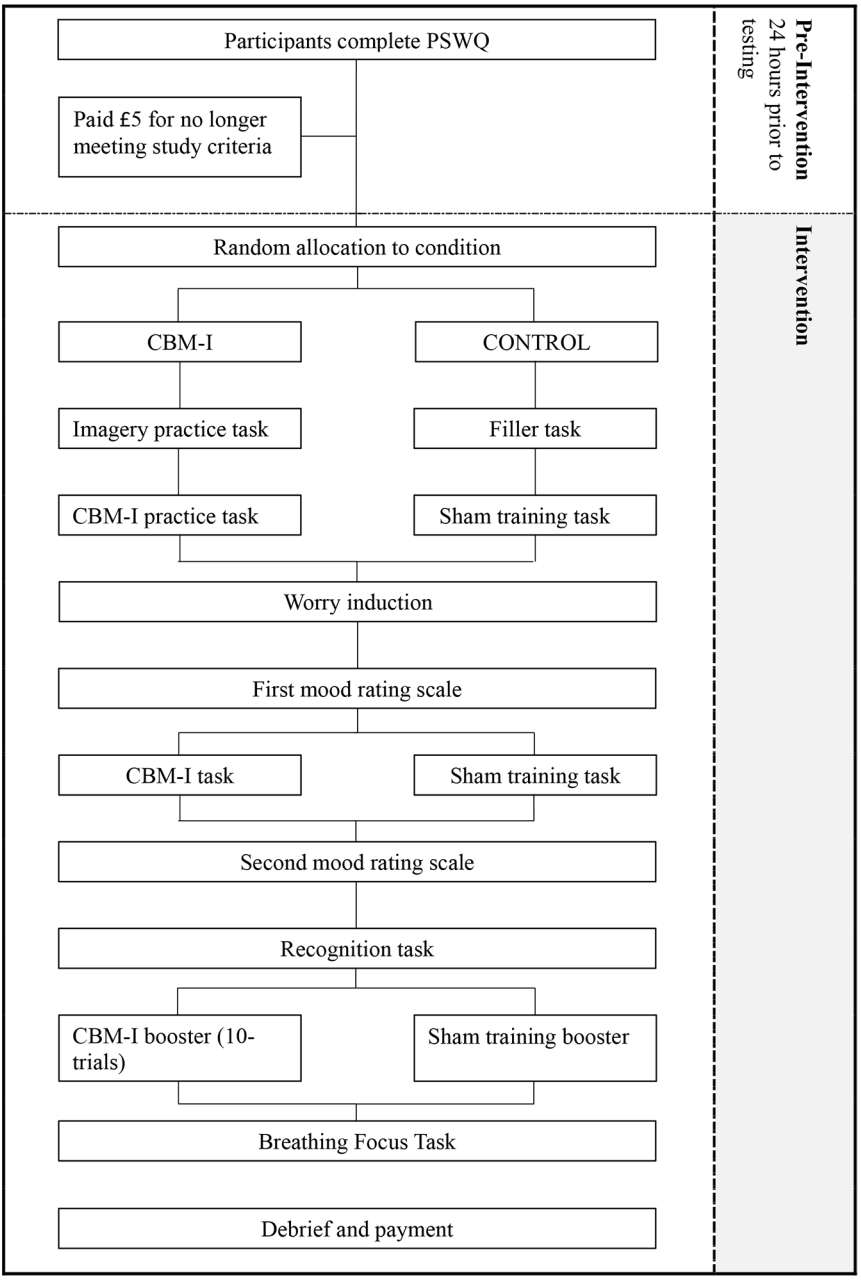
Procedure

Participants completed the PSWQ online within the 24 hours prior to the experimental testing session, to ensure that they met study eligibility criteria. Before coming into the lab, participants were randomly allocated to the CBM-I or control condition on the basis of an allocation by an independent researcher. They then completed the study tasks associated with their allocated condition. See Figure 1. for an overview of the study procedure.

PsychOpen GOLD

Figure 1

Overview of Study Procedure



PsychOpen GOLD

Results

Questionnaire Measures for CBM-I and Control Conditions

See Table 1 for means of questionnaire measures and statistics for participants included in the analysis. The only significant between-condition difference to emerge was for GAD-7; such that participants in the control condition reported higher anxiety. Importantly, however, we note that the conditions did not differ on the PASS, – i.e., a measure of perinatal anxiety specifically (rather than a measure of general anxiety developed for non-pregnant populations).

Assessing the Impact of CBM-I on Interpretation Bias (Hypothesis 1)

To examine the effect of condition on interpretation bias, we conducted a regression analysis with mean positivity index score as the dependent variable. Condition[3] significantly predicted post-training positivity index score, b = 0.54, SE = .19, p = .007, 95% CIs [0.16, 0.92]. The mean positivity index was higher for the CBM-I (M = 0.35, SD = 0.64) than the control (M = 0.19, SD = 0.65) condition, confirming that CBM-I was effective in facilitating a positive interpretation bias.

Assessing the Impact of CBM-I on Negative Thought Intrusions (Hypothesis 2)

To examine the effect of condition on negative thought intrusions, we conducted a bootstrapped (due to non-normality of data) regression analysis with number of negative thought intrusions from the breathing focus task as the dependent variable. Condition significantly predicted post-training positivity index score, b = -1.11, SE = .45, p = .02, 95% CIs [-1.96, -0.28]. Consistent with the hypothesis, participants in the CBM-I condition reported significantly fewer intrusions (M = 1.50, SD = 1.01) than did those in the control condition (M = 2.61, SD = 1.85).

Discussion

In this first study of interpretation training in pregnant worriers, we successfully induced a positive interpretation bias using CBM-I. Consistent with Hirsch et al. (2009) and Feng et al. (2019), participants in the CBM-I condition reported fewer negative thought

3) As GAD7 scores were significantly different at baseline we re-ran the regression analysis with mean centred GAD7 scores and an interaction variable of (mean centred) GAD7 and condition. Neither GAD7 scores (p = .67) or the interaction term (p = .54) were significant predictors in the model. Condition remained a significant predictor (p = .02).

PsychOpen GOLD

intrusions relative to the control condition, supporting a causal role for interpretation bias in maintaining worry in pregnant women. As the first study to employ CBM-I to test questions about interpretation bias and worry in pregnant women, our results extend the CBM literature in important ways. First, on a methodological note, they demonstrate the applicability and effectiveness of CBM-I in the perinatal context. Second, they confirm that interpretation bias maintains worry in pregnant women. Whilst this relationship is well-established in the broader literature (Feng et al., 2019; Hirsch et al., 2009; Hirsch, Krahé, Whyte, Bridge, et al., 2020) given the unique and multi-faceted circumstances and changes (e.g., biological, cognitive) which characterise the perinatal period, our results are theoretically important in confirming this link in a perinatal sample.

Third, by indicating that worry is a modifiable psychological risk factor in pregnancy, our findings have clinical promise. As noted earlier, the treatment of perinatal anxiety has received limited research attention. Further, the treatments that have been developed are primarily generic such that they are comprised of standard CBT techniques, including challenging cognitions by generating alternative interpretations (e.g., Forsell et al., 2017; see Moulds et al., 2018). In contrast, CBM-I seeks to enhance access to positive interpretations in a more direct, automatic way. Our findings suggest that developing novel approaches which draw on experimental findings and directly target factors that have been identified to maintain anxiety (e.g., worry) to potentially supplement existing treatment approaches may be a promising future clinical direction.

Moreover, our findings speak to the issue of prevention. Given growing evidence that antenatal RNT predicts perinatal mental health problems (DeJong et al., 2016; Schmidt et al., 2016), the prospect of reducing worry in pregnant women by targeting interpretation bias represents an exciting possibility for preventing postpartum anxiety. Topper et al. (2017) found that that a preventive intervention which targeted RNT reduced the onset of depression and anxiety 12 months later. Our finding that antenatal worry is a modifiable risk factor similarly raises the possibility that an intervention targeting worry may also have utility in preventing subsequent mental health problems in the postnatal period.

We acknowledge some limitations and suggest future research directions. First, while single-session CBM experiments critically advance understanding of theoretical mechanisms, they do not provide sufficient evidence regarding the sustained consequences of targeting interpretation bias in this way (Hirsch et al., 2018). However, we note that recent studies using multiple CBM-I sessions (e.g., 10 internet-delivered sessions) have reported encouraging preliminary evidence of the longevity of effects (i.e., reductions in RNT at one-month follow-up; Hirsch et al., 2018; Hirsch, Krahé, Whyte, Bridge, et al., 2020). Future research employing multiple sessions with an extended follow-up period is needed before conclusions can be drawn about potential clinical benefit and preventive utility in the perinatal context. Second, we did not gather detailed information about previous numbers of miscarriages or complications in participants' current (or any

PsychOpen GOLD

previous) pregnancy, leaving it unknown whether our findings generalise to pregnant women who have experienced pregnancy loss or complications in participants' current (or any previous) pregnancy.

Third, we did not assess interpretation bias or the presence of negative intrusions pre-training, and thus do not know whether groups differed at the outset. However, participants were randomised to condition by a researcher outside of the study team, making these possible explanations for the results unlikely. Fourth, randomisation led to differences in anxiety (GAD-7) between groups. Finally, due to COVID-19 pandemic ruling out completion of data collection, the number of participants was slightly below that recommended in the original sample size calculation.

Our findings raise interesting possibilities for future research. In a recent fully web-based study, Hirsch, Krahé, Whyte, Krzyzanowski, et al. (2020) reported that CBM-I led to reductions in depression and anxiety, as well as worry and rumination, in participants with GAD with or without comorbid depression. The effects persisted to 3-month follow-up, and notably, were mediated by changes in interpretation bias. These results raise the exciting possibility that CBM-I could form a low intensity intervention to treat or prevent anxiety and worry, with potential for application in the perinatal context. Further, given evidence that CBM-I may be effective in modifying interpretation bias in the context of a range of mental health conditions (e.g., depression, Hirsch et al., 2018; eating disorders, Turton et al., 2018; social anxiety, Stevens et al., 2018), another potential research direction could be to investigate the effectiveness of CBM-I for other perinatal psychological symptoms, beyond anxiety.

In sum, this study is the first to evaluate the effectiveness of single session CBM-I for reducing worry in pregnant women. Our findings provide empirical support for interpretive bias as a mechanism underlying antenatal worry, and thus indicate that worry is a modifiable risk factor during pregnancy. Future research with a broader sample warrant investigation (where the current sample were from South London and had not experienced three or more miscarriages) to determine if findings generalise to a more heterogenous sample. Furthermore, future research with pregnant women diagnosed with GAD is needed to confirm that these results are generalisable to treatment-seeking, clinical samples. Nonetheless, given evidence that worry early in pregnancy predicts later anxiety, these data represent an important first step in investigating whether CBM-I holds promise as a therapeutic approach to address perinatal mental health problems.

Funding: CH receives salary support from the National Institute for Health Research (NIHR), Mental Health Biomedical Research Centre at South London and Maudsley NHS Foundation Trust and King's College London.

Acknowledgments: We are very grateful to the pregnant women who took part in the study.

Competing Interests: The authors have declared that no competing interests exist.

PsychOpen GOLD

Supplementary Materials

The following Supplementary Materials are available (for access see Index of Supplementary Materials below):

- Via the Open Science Framework (OSF) repository: The preregistration for the study
- Via the PsychArchives repository: Supplementary Materials (Appendices)
  - Appendix A includes: Further methodological details of cognitive bias modification for interpretation and the Recognition Task assessment of interpretation bias
  - Appendix B includes: Open Science Framework pre-registered study protocol

Index of Supplementary Materials

Hirsch, C. R., Meeten, F., Newby, J. M., O'Halloran, S., Gordon, C., Krzyzanowski, H., & Moulds, M. L. (2018). *Cognitive Bias Modification for Interpretation (CBM-I) to reduce worry in pregnant women* [Preregistration]. OSF. https://osf.io/ye84g

Hirsch, C. R., Meeten, F., Newby, J. M., O'Halloran, S., Gordon, C., Krzyzanowski, H., & Moulds, M. L. (2021). *Supplementary materials to "Looking on the bright side reduces worry in pregnancy: Training interpretations in pregnant women"* [Appendices]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.4856

References

Austin, M. P., Highet, N., & the Expert Working Group. (2017). *Mental health care in the perinatal period: Australian clinical practice guideline.* Melbourne, Australia: Centre of Perinatal Excellence.

Borkovec, T. D. (1994). The nature, functions, and origins of worry. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 5-33). Oxford, United Kingdom: John Wiley and Sons.

Brown, T. A., Antony, M. M., & Barlow, D. H. (1992). Psychometric properties of the Penn State Worry Questionnaire in a clinical anxiety disorders sample. *Behaviour Research and Therapy, 30*, 33-37. https://doi.org/10.1016/0005-7967(92)90093-V

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry, 150*, 782-786. https://doi.org/10.1192/bjp.150.6.782

DeJong, H., Fox, E., & Stein, A. (2016). Rumination and postnatal depression: A systematic review and a cognitive model. *Behaviour Research and Therapy, 82*, 38-49. https://doi.org/10.1016/j.brat.2016.05.003

DiPietro, J. A., Hilton, S. C., Hawkins, M., Costigan, K. A., & Pressman, E. K. (2002). Maternal stress and affect influence foetal neurobehavioral development. *Developmental Psychology, 38*, 659-668. https://doi.org/10.1037/0012-1649.38.5.659

PsychOpen GOLD

Fairbrother, N., Janssen, P., Antony, M. M., Tucker, E., & Young, A. H. (2016). Perinatal anxiety disorder prevalence and incidence. *Journal of Affective Disorders, 200*, 148-155. https://doi.org/10.1016/j.jad.2015.12.082

Feng, Y. C., Krahé, C., Meeten, F., Sumich, A., Mok, C. M., & Hirsch, C. R. (2020). Impact of imagery-enhanced interpretation training on offline and online interpretations in worry. *Behaviour Research and Therapy, 124*, Article 103497. https://doi.org/10.1016/j.brat.2019.103497

Feng, Y. C., Krahé, C., Sumich, A., Meeten, F., Lau, J. Y., & Hirsch, C. R. (2019). Using event-related potential and behavioural evidence to understand interpretation bias in relation to worry. *Biological Psychology, 148*, Article 107746. https://doi.org/10.1016/j.biopsycho.2019.107746

Forsell, E., Bendix, M., Hollandare, F., von Schultz, B. S., Nasiell, J., Blomdahl-Wetterholm, M., . . . Kaldo, V. (2017). Internet delivered cognitive behavior therapy for antenatal depression: A randomised controlled trial. *Journal of Affective Disorders, 221*, 56-64. https://doi.org/10.1016/j.jad.2017.06.013

Goodman, J. H., Watson, G. R., & Stubbs, B. (2016). Anxiety disorders in postpartum women: A systematic review and meta-analysis. *Journal of Affective Disorders, 203*, 292-331. https://doi.org/10.1016/j.jad.2016.05.033

Hayes, S., Hirsch, C. R., Krebs, G., & Mathews, A. (2010). The effects of modifying interpretation bias on worry in generalized anxiety disorder. *Behaviour Research and Therapy, 48*, 171-178. https://doi.org/10.1016/j.brat.2009.10.006

Hayes, S., Hirsch, C. R., & Mathews, A. (2010). Facilitating a benign attention bias reduces negative thought intrusions. *Journal of Abnormal Psychology, 119*, 235-240. https://doi.org/10.1037/a0018264

Hedegaard, M., Henriksen, T. B., Sabroe, S., & Secher, N. J. (1993). Psychological distress in pregnancy and preterm delivery. *British Medical Journal, 307*, 234-239. https://doi.org/10.1136/bmj.307.6898.234

Hirsch, C. R., Hayes, S., & Mathews, A. (2009). Looking on the bright side: Accessing benign meanings reduces worry. *Journal of Abnormal Psychology, 118*, 44-54. https://doi.org/10.1037/a0013473

Hirsch, C. R., Krahé, C., Whyte, J., Bridge, L., Loizou, S., Norton, S., & Mathews, A. (2020). Effects of modifying interpretation bias on transdiagnostic repetitive negative thinking. *Journal of Consulting and Clinical Psychology, 88*, 226-239. https://doi.org/10.1037/ccp0000455

Hirsch, C. R., Krahé, C., Whyte, J., Krzyzanowski, H., Meeten, F., Norton, S., & Mathews, A. (2020). *Internet-delivered interpretation training reduces worry and anxiety in individuals with generalized anxiety disorder: A randomized controlled experiment.* Manuscript submitted for publication.

Hirsch, C. R., Krahé, C., Whyte, J., Loizou, S., Bridge, L., Norton, S., & Mathews, A. (2018). Interpretation training to target repetitive negative thinking in generalized anxiety disorder and depression. *Journal of Consulting and Clinical Psychology, 86*, 1017-1030. https://doi.org/10.1037/ccp0000310

PsychOpen GOLD

Hirsch, C. R., & Mathews, A. (2012). A cognitive model of pathological worry. *Behaviour Research and Therapy, 50*, 636-646. https://doi.org/10.1016/j.brat.2012.06.007

Hirsch, C. R., Meeten, F., Gordon, C., Newby, J., Bick, D., & Moulds, M. (2020). *Repetitive negative thinking and interpretation bias in pregnancy.* (Manuscript submitted for publication).

Hirsch, C. R., Meeten, F., Krahé, C., & Reeder, C. (2016). Resolving ambiguity in emotional disorders: The nature and role of interpretation biases. *Annual Review of Clinical Psychology, 12*, 281-305. https://doi.org/10.1146/annurev-clinpsy-021815-093436

Hirsch, C. R., Perman, G., Hayes, S., Eagleson, C., & Mathews, A. (2015). Delineating the role of negative verbal thinking in promoting worry, perceived threat, and anxiety. *Clinical Psychological Science, 3*, 637-647. https://doi.org/10.1177/2167702615577349

Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive interpretation training: Effects of mental imagery versus verbal training on positive mood. *Behavior Therapy, 37*, 237-247. https://doi.org/10.1016/j.beth.2006.02.002

Howard, L. M., Molyneaux, E., Dennis, C., Rochat, T., Stein, A., & Milgrom, J. (2014). Non-psychotic mental disorders in the perinatal period. *Lancet, 384*, 1775-1788. https://doi.org/10.1016/S0140-6736(14)61276-9

Krahé, C., Whyte, J., Bridge, L., Loizou, S., & Hirsch, C. R. (2019). Are different forms of repetitive negative thinking associated with interpretation bias in generalized anxiety disorder and depression? *Clinical Psychological Science, 7*, 969-981. https://doi.org/10.1177/2167702619851808

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals, 32*, 509-515. https://doi.org/10.3928/0048-5713-20020901-06

Loughnan, S. A., Wallace, M., Joubert, A. E., Haskelberg, H., Andrews, G., & Newby, J. M. (2018). A systematic review of psychological treatments for clinical anxiety during the perinatal period. *Archives of Women's Mental Health, 21*, 481-490. https://doi.org/10.1007/s00737-018-0812-7

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109*, 602-615. https://doi.org/10.1037/0021-843X.109.4.602

McEvoy, P. M., Thibodeau, M. A., & Asmundson, G. J. G. (2014). Trait repetitive negative thinking: A brief transdiagnostic assessment. *Journal of Experimental Psychopathology, 5*, 1-17. https://doi.org/10.5127/jep.037813

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28*, 487-495. https://doi.org/10.1016/0005-7967(90)90135-6

Molina, S., & Borkovec, T. D. (1994). The Penn State Worry Questionnaire: Psychometric properties and associated characteristics. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 265-283). Chichester, United Kingdom: Wiley.

Moulds, M. L., Black, M. J., Newby, J. M., & Hirsch, C. R. (2018). Repetitive negative thinking and its role in perinatal mental health. *Psychopathology, 51*, 161-166. https://doi.org/10.1159/000488114

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100*, 569-582. https://doi.org/10.1037/0021-843X.100.4.569

PsychOpen GOLD

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology, 61*, 115-121. https://doi.org/10.1037/0022-3514.61.1.115

O'Connor, T. G., Heron, J., Glover, V., & Alspac Study Team. (2002). Antenatal anxiety predicts child behavioral/emotional problems independently of postnatal depression. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*, 1470-1477. https://doi.org/10.1097/00004583-200212000-00019

O'Donnell, K. J., Glover, V., Barker, E. D., & O'Connor, T. G. (2014). The persisting effect of maternal mood in pregnancy on childhood psychopathology. *Development and Psychopathology, 26*, 393-403. https://doi.org/10.1017/S0954579414000029

Ruscio, A. M., & Borkovec, T. D. (2004). Experience and appraisal of worry among high worriers with and without generalized anxiety disorder. *Behaviour Research and Therapy, 42*, 1469-1482. https://doi.org/10.1016/j.brat.2003.10.007

Samtani, S., & Moulds, M. L. (2017). Assessing maladaptive repetitive thought in clinical disorders: A critical review of existing measures. *Clinical Psychology Review, 53*, 14-28. https://doi.org/10.1016/j.cpr.2017.01.007

Schmidt, D., Seehagen, S., Vocks, S., Schneider, S., & Teismann, T. (2016). Predictive importance of antenatal depressive rumination and worrying for maternal–foetal attachment and maternal well-being. *Cognitive Therapy and Research, 40*, 565-576. https://doi.org/10.1007/s10608-016-9759-z

Somerville, S., Dedman, K., Hagan, R., Oxnam, E., Wettinger, M., Byrne, S., . . . Page, A. C. (2014). The perinatal anxiety screening scale: Development and preliminary validation. *Archives of Women's Mental Health, 17*, 443-454. https://doi.org/10.1007/s00737-014-0425-8

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*, 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Stein, A., Pearson, R. M., Goodman, S. H., Rapa, E., Rahman, A., McCallum, M., . . . Pariante, C. M. (2014). Effects of perinatal mental disorders on the foetus and child. *Lancet, 384*, 1800-1819. https://doi.org/10.1016/S0140-6736(14)61277-0

Stevens, E. S., Behar, E., & Jendrusina, A. A. (2018). Enhancing the efficacy of cognitive bias modification for social anxiety. *Behavior Therapy, 49*, 995-1007. https://doi.org/10.1016/j.beth.2018.02.004

Stewart, D. E., Robertson, E., Dennis, C., Grace, S. L., & Wallington, T. (2003). *Postpartum depression: Literature review of risk factors and interventions.* Toronto, Canada: University Health Network Women's Health Program for Toronto Public Health. Retrieved from https://www.who.int/mental_health/prevention/suicide/lit_review_postpartum_depression.pdf

Topper, M., Emmelkamp, P. M., Watkins, E., & Ehring, T. (2017). Prevention of anxiety disorders and depression by targeting excessive worry and rumination in adolescents and young adults: A randomized controlled trial. *Behaviour Research and Therapy, 90*, 123-136. https://doi.org/10.1016/j.brat.2016.12.015

PsychOpen GOLD

Turton, R., Cardi, V., Treasure, J., & Hirsch, C. R. (2018). Modifying a negative interpretation bias for ambiguous social scenarios that depict the risk of rejection in women with anorexia nervosa. *Journal of Affective Disorders, 227*, 705-712. https://doi.org/10.1016/j.jad.2017.11.089

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

PsychOpen GOLD

Clinical Psychology in Europe

PsychOpen GOLD

Research Articles

Check for updates

Increased Anxiety of Public Situations During the COVID-19 Pandemic: Evidence From a Community and a Patient Sample

Andre Pittig[1,2], Valentina M. Glück[1], Juliane M. Boschet[1], Alex H. K. Wong[1], Paula Engelke[1]

[1] *Department of Psychology (Biological Psychology, Clinical Psychology, and Psychotherapy), University of Würzburg, Würzburg, Germany.* **[2]** *Center of Mental Health, University of Würzburg, Würzburg, Germany.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e4221, https://doi.org/10.32872/cpe.4221

Received: 2020-09-05 • **Accepted:** 2021-03-22 • **Published (VoR):** 2021-06-18

Handling Editor: Cornelia Weise, Philipps-University of Marburg, Marburg, Germany

Corresponding Author: Andre Pittig, Department of Psychology I, University of Würzburg, Marcusstrasse 9-11, 97070 Würzburg, Germany. E-mail: andre.pittig@uni-wuerzburg.de

Abstract

Background: Increases in emotional distress in response to the global outbreak of the SARS-CoV-2 (COVID-19) pandemic have been reported. So far, little is known about how anxiety responses in specific everyday public life situations have been affected.

Method: Self-reported anxiety in selected public situations, which are relevant in the COVID-19 pandemic, was investigated in non-representative samples from the community (n = 352) and patients undergoing psychotherapy (n = 228). Situational anxiety in each situation was rated on a 5-point Likert scale (0 = no anxiety at all to 4 = very strong anxiety). Situational anxiety during the pandemic was compared with retrospectively reported situational anxiety before the pandemic (direct change) and with anxiety levels in a matched sample assessed before the pandemic (n = 100; indirect change).

Results: In the community and patient sample, indirect and direct change analyses demonstrated an increase in anxiety in relevant public situations but not in control situations. Average anxiety levels during the pandemic were moderate, but 5-28% of participants reported high to very high levels of anxiety in specific situations. Interestingly, the direct increase in anxiety levels was higher in the community sample: patients reported higher anxiety levels than the community sample before, but not during the pandemic. Finally, a higher increase in situational anxiety was associated with a higher perceived danger of COVID-19, a higher perceived likelihood of contracting COVID-19, and stronger symptoms of general anxiety and stress.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Conclusions: Preliminary findings demonstrate an increase in anxiety in public situations during the COVID-19 pandemic in a community and a patient sample. Moderate anxiety may facilitate compliance with public safety measures. However, high anxiety levels may result in persistent impairments and should be monitored during the pandemic.

Keywords

anxiety, COVID-19, emotional distress, public situations

Highlights

- Anxiety in public situations has increased in Germany in response to the COVID-19 pandemic.
- Average anxiety levels were moderate, but 5-28% of participants reported high to very high levels of anxiety.
- A stronger increase of anxiety was linked to a higher perceived likelihood and dangerousness of a COVID-19 infection.
- Large-scale representative studies monitoring the development of persistent anxiety are needed.

Emotional distress has increased in response to the global outbreak of the SARS-CoV-2 (COVID-19) pandemic. Moderate to severe increases in distress have been reported internationally, for example, in China, the USA, Canada, Iran, and Europe (e.g., Asmundson et al., 2020; Mazza et al., 2020; Moghanibashi-Mansourieh, 2020; Pierce et al., 2020; Salari et al., 2020; Torales et al., 2020; Wang et al., 2020). While early reports focused on the general increase in emotional distress, more recent studies specifically reported increases in symptoms of anxiety, depression, and stress (Asmundson et al., 2020; Taylor et al., 2020; Torales et al., 2020). To date, little is known about emotional responses in specific public situations that are characterized by an increased threat of COVID-19 infection. These specific emotional responses are, however, important to fully understand emotional responses to the COVID-19 pandemic and how they may influence our daily life.

Public policy measures (i.e., behavioral recommendations or restrictions) to reduce the spread of COVID-19 vary internationally. In Germany, public life was largely "shut down" for approximately four weeks at the beginning of the COVID-19 pandemic (i.e., from mid-March 2020 to mid-April 2020). After COVID-19 infection numbers declined, some restrictions were revoked, but others were continued as the pandemic was ongoing (for German policy measures, see Steinmetz et al., 2020). Especially physical distancing, the use of disinfectant, and wearing face masks were recommended in most public situations (see Robert Koch Institute, 2020). Relevant public situations for COVID-19 related restrictions concerned public transport, restaurants and supermarkets, and effectively every crowded public area. As had been communicated to the general public, these

PsychOpen GOLD

public situations are especially salient for COVID-19 related threats. The resulting threat salience may be linked to elevated situational anxiety in these public situations. In the ongoing pandemic, moderate situational anxiety levels may indeed be adaptive as they may support safety behaviors to prevent COVID-19-related harm (e.g., Arnaudova et al., 2017; Pittig et al., 2020). However, high anxiety levels may also lead to severe distress without additionally supporting safety behaviors and may even persist in the absence of threat (Pittig et al., 2020). Preliminary evidence showed that patients with anxiety-related and mood disorders exhibited stronger COVID-related stress responses than a healthy sample (Asmundson et al., 2020), suggesting that individuals with mental health conditions are prone to experiencing COVID-related anxiety. It is therefore important to explore the potential increase of situational anxiety in public situations during the COVID-19 pandemic, in both general community and clinical samples.

Methodologically, an increase in situational anxiety can be assessed by direct and indirect change measures (Stieglitz & Baumann, 2001). As a measure of direct change, current anxiety levels, which are assessed during the pandemic, can be compared with retrospectively assessed anxiety levels before the pandemic. Retrospective self-reports pose a risk of recall biases (Van den Bergh & Walentynowicz, 2016), whereby recall inaccuracies of affective states might differ between clinical and general community samples (Ben-Zeev, Young, & Madsen, 2009). Nevertheless, this direct approach reflects perceived individual increases in anxiety, i.e., whether individuals *feel* that their anxiety has increased in response to the pandemic. As an indirect change measure, current anxiety levels, which are assessed during the pandemic, can be compared with anxiety levels assessed before the pandemic, optimally within the same sample. The indirect approach is unbiased by retrospective recall but requires repeated measurements. The fast onset of the COVID-19 pandemic prohibited the arrangement of such controlled longitudinal designs. Alternatively, indirect change can be measured by comparing anxiety levels in a sample surveyed during the pandemic with anxiety levels in a different sample assessed before the pandemic. Potential biases caused by differences in certain characteristics between the two samples (e.g., differences in age or biological sex distribution) can be prevented by matching the samples based on these characteristics.

The current study examined both direct and indirect changes in situational anxiety in public situations, which are relevant to the COVID-19 pandemic, in a non-representative community sample and a patient sample. In an online survey, individuals reported their anxiety levels for ten relevant public situations (e.g., taking the bus, going to the supermarket, or being at a crowded public place) and three control situations (e.g., being outdoors alone). We assessed retrospective anxiety levels (i.e., before the pandemic) and current anxiety levels in the previous two weeks (i.e., during the pandemic). Besides comparing these ratings (direct change), situational anxiety during the pandemic was compared with a matched sample that was surveyed before the pandemic (indirect change). To highlight the clinical relevance (i.e., high levels of anxiety may result in

PsychOpen GOLD

impairments), we complemented these analyses by calculating the proportion of individuals who reported high or very high anxiety levels in these situations. We hypothesized that both the community and the patient sample show an increase in situational anxiety during the COVID-19 pandemic, with a stronger increase in the patient sample (Asmundson et al., 2020). Furthermore, we explored the association between increased situational anxiety and symptoms of anxiety, depression, stress, the perceived likelihood of contracting COVID-19, and the perceived dangerousness of a COVID-19 infection. We expected that these clinical symptoms and perceived threat of COVID-19 are positively associated with situational anxiety.

Method and Materials

Participants and Recruitment

The study was approved by the local ethics committee (GZEK 2020-31). Three samples of participants anonymously completed an online survey. Participants had to be ≥ 18 years of age. The pre-COVID sample was recruited from the general community before the pandemic (February to April 2019) as part of the validation of an online survey (n = 100, Age: M = 27.73, SD = 10.47, Females: 69.8%). The community sample (n = 352, Age: M = 35.90, SD = 14.09, Females: 69.9%) and the patient sample (n = 228, Age: M = 39.07, SD = 14.50, Females: 60.5%) were recruited during the COVID-19 pandemic (mid of May to mid of July 2020). As present restrictions may influence situational anxiety, we briefly report restrictions that were continuously active across the recruitment period (Steinmetz et al., 2020): Most public situations, e.g., going to supermarkets and shops, using public transport as well as attending religious meetings and demonstrations, were accessible on the condition that specific regulations were followed (e.g., physical distancing, face masks, a limited number of people). Restaurants and entertainment venues (e.g., theaters and cinemas) re-opened stepwise starting between mid of May and mid of June (regionally depending). Meetings of persons from more than two different households were permitted in Germany as from mid of June, but group size was mostly still limited, e.g., to a maximum of ten people. Major public events remained prohibited during the whole recruitment period.

Both the pre-COVID and the community sample were recruited from the general community in Germany via identical online recruitment pathways (e.g., via a German internet platform for online surveys, German local social media groups, and the participant management tool of the University of Würzburg). The patient sample was recruited via the outpatient clinic for psychotherapy at the University of Würzburg. 109 out of 689 participants completed opt-in informed consent but discontinued the survey before providing anxiety ratings for at least one situation and were thus excluded (15.8%). The remaining 580 participants in the community and patient sample completed all

PsychOpen GOLD

situational anxiety ratings, i.e., there were no missing data for the variables of interest, as the completion of sociodemographic data, trait anxiety, and symptom measures was required before answering the situational anxiety ratings. All patients had provided written informed consent to be contacted for research purposes prior to the study and were currently undergoing psychotherapeutic treatment. A total of 496 patients was invited to participate in the study (response rate = 46.0%). The distribution of main primary diagnoses within the invited patients was 33.4% affective disorders, 23.7% anxiety disorders, 15.3% adjustment disorder, 7.4% somatoform disorders, 5.0% obsessive-compulsive disorder, 3.9% posttraumatic stress disorder, 2.9% eating disorders.

Online Survey

The online survey measured self-reported anxiety in selected public situations, trait anxiety, symptoms of emotional distress, and basic demographic data (i.e., age, sex, employment status). Trait anxiety was assessed with the anxiety subscale of the NEO-PI-R (N1 subscale; Costa & McCrae, 1992). Symptoms of anxiety, depression, and stress over the previous week were assessed with the German short version of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995; Nilges & Essau, 2015). All participants, including the pre-COVID sample, completed these two questionnaires. The community and patient sample additionally rated the perceived dangerousness of COVID-19 (5-point Likert-scale from *very harmless* to *very dangerous*) and the subjective likelihood of contracting COVID-19 (5-point Likert-scale from *very unlikely* to *very likely*).

Self-reported anxiety was assessed for 13 selected public situations, mostly taken from a well-established questionnaire for agoraphobia (Mobility Inventory; Chambless et al., 1985). Ten of these situations were regarded as highly relevant in the COVID-19 pandemic: taking the bus, taking the train, going to the supermarket, going to the cinema/theater, shopping mall, restaurant, waiting in line, talking to others, and being at an outdoor or indoor public area with people. Three additional situations were used to control whether general changes in anxiety occurred in situations that are unrelated to COVID-19 but may still provoke some anxiety, i.e., being alone in an unknown area. All participants were instructed to rate their anxiety level for each situation during the previous two weeks (5-point Likert scale; 0 = *no anxiety at all* to 4 = *very strong anxiety*). The community and patient samples retrospectively rated each situation regarding how anxious they were before the COVID-19 outbreak. If participants had not approached a particular situation in the previous two weeks, they were asked to imagine being in the situation and rate the anxiety level accordingly.

PsychOpen GOLD

Statistical Analysis

The main research aim was to examine changes in self-reported anxiety in public situations during the COVID-19 pandemic. To this end, we calculated the direct and indirect change in self-reported anxiety. Direct change was analyzed by comparing anxiety ratings for the 13 selected public situations during the previous two weeks with retrospectively reported anxiety for these situations before the pandemic (within-subjects comparison). Therefore, we conducted repeated measures ANOVAs for each situation with Group (community vs. patient sample) as between-subjects factor and Time (previous two weeks vs. before COVID-19) as within-subjects factor, including all participants from both samples recruited during the COVID-19 pandemic. Indirect change was analyzed by comparing anxiety ratings in the previous two weeks in the community and patient sample separately with anxiety ratings for the same situations in the matched pre-COVID sample (between-subjects comparison). As these indirect change analyses may be biased due to different sample characteristics, we aimed to reduce sample bias by matching participants. Precisely, we matched the three samples on age, sex, and employment status using nearest neighbor matching (Ho et al., 2011). As the smallest sample (i.e., the pre-COVID sample) included 100 participants, we selected the closest neighbors in the other samples, respectively. As a result, the indirect change analyses were conducted with 100 participants per sample. Analyses with the complete, but unmatched samples yielded the same pattern of results. Indirect change was analyzed using a MANOVA with anxiety ratings in the previous two weeks in the 13 situations as dependent variables, followed by one-way ANOVAs for each situation with the between-subjects factor Group (pre-COVID, community, patient). Bonferroni-Holm correction was applied in all analyses. Cohen's *d* and eta-squared are reported as effect sizes.

To highlight the clinical relevance of these analyses, we aimed to provide descriptive data on the frequency of high anxiety levels in public situations in response to the COVID-19 pandemic. For each situation, we calculated the relative number of participants from the complete sample who indicated "strong" or "very strong" anxiety. Finally, we exploratorily examined the associations between the increase in self-reported anxiety (difference score: anxiety during COVID-19 – anxiety before COVID-19) and clinical variables (trait anxiety, symptoms of depression, stress, and anxiety) as well as COVID-19 related variables (perceived dangerousness and likelihood of contracting COVID-19) in the unmatched community and patient samples. To this end, robust winsorized correlations (trim = 0.2) were calculated using the WRS2 package (Mair & Wilcox, 2020) in R (R Core Team, 2020).

PsychOpen GOLD

Results

Increased Anxiety of Public Situations

Direct Change

For all situations, there was an increase in self-reported anxiety during the COVID-19 pandemic (see Figure 1A and Table 1). For the control situations, this increase was relatively small and there were no significant effects involving Group. For most COVID-relevant situations, repeated measures ANOVAs yielded a significant interaction of Group and Time. Post-hoc Wilcoxon tests indicated that anxiety increased in all situations in the patient sample, ps < .001, rs = .86 to 1.00, and in the community sample, ps < .001, rs = .81 to 1.00. The patient compared to the community sample reported higher retrospective anxiety before the COVID-19 pandemic in most situations, Us > 42606.0, ps < .020, rs = .06 to .25, except for "being alone in an unknown area", U = 39955.0, p = .924, r = .04. Interestingly, the groups did not differ in anxiety during the COVID-19 pandemic, Us < 42858.0, ps > .077, rs = -.05 to .07.

This overall pattern differed only for the situations "waiting in line" and "talking to others". For both, anxiety was higher during than before the pandemic (Table 1), and the patient sample reported higher anxiety. However, there was no significant interaction between Group and Time.

In sum, direct change analyses indicated a slight increase in self-reported anxiety in the control situations and a larger increase in all COVID-relevant public situations. Interestingly, the latter increase was higher in the community sample compared with the patient sample, as indicated by patients' higher anxiety levels before but not during the pandemic in most public situations.

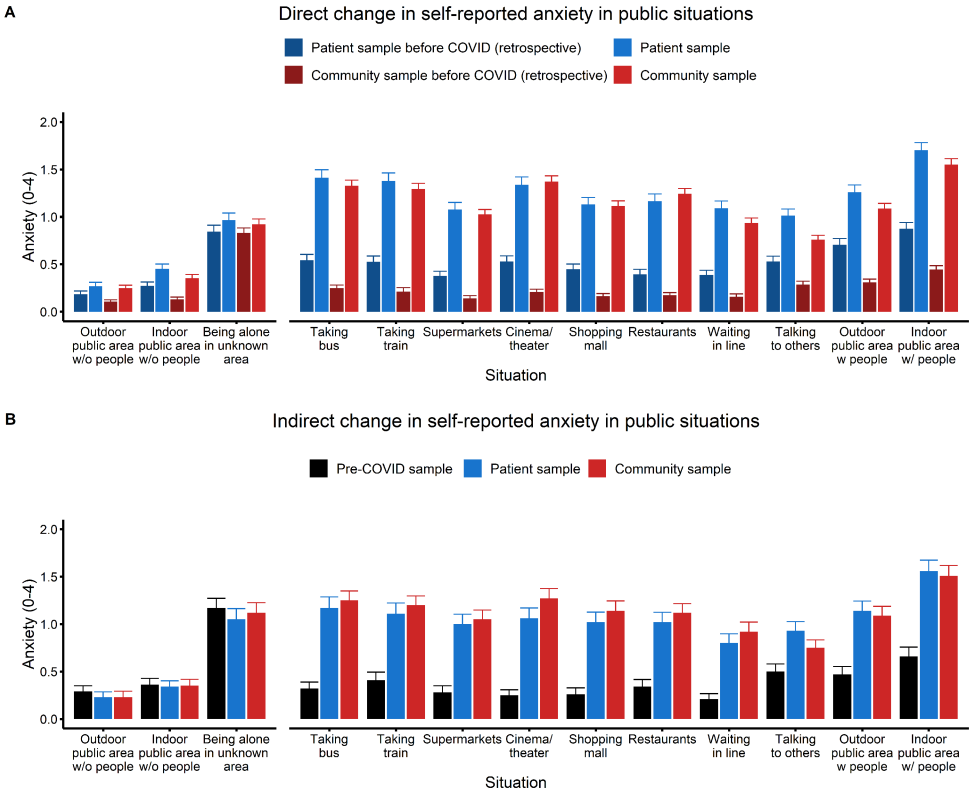
Indirect Change

For the matched samples, the significant MANOVA, Pillais' Trace = .33, F(26, 572) = 4.27, p < .001, was followed up by one-way ANOVAs for each situation, comparing self-reported anxiety levels during the previous two weeks between the three samples. As expected, no significant differences were found for the three control situations (see Figure 1B and Table 1). In all COVID-relevant public situations, self-reported anxiety during the previous two weeks differed between groups. For almost all situations, anxiety ratings did not differ between the community and the patient sample, ts < 1.58, ps > .116, ds = -0.19 to 0.05, but were higher than in the pre-COVID sample, respectively, ts > 4.61, ps < .001, ds = 0.68 to 1.20. This pattern only differed for the situation "talking to others": While the patient sample again reported higher anxiety than the pre-COVID sample, t = 3.48, p = .002, d = 0.48, the community sample did not differ from the other two samples, ts < 2.03, ps > .087, ds < 0.30. In sum, indirect change analyses of the matched samples indicated higher self-reported anxiety levels during the previous two weeks than before the COVID-19 pandemic in all relevant public situations.

PsychOpen GOLD

Figure 1

Average Self-Reported Anxiety in Selected Public Situations Before and During the COVID-19 Pandemic (With Standard Error of the Mean)



Note. Situational anxiety was rated for each situation on a 5-point Likert scale (0 = no anxiety at all to 4 = very strong anxiety). A: Direct change as indicated by comparing anxiety ratings during the previous two weeks (during the pandemic) with retrospectively reported anxiety before the pandemic (within-subject comparison; community sample: n = 352, patient sample: n = 228). B: Indirect change as analyzed by comparing anxiety ratings for the previous two weeks in a matched community and patient sample with anxiety ratings in the matched pre-COVID sample (between-subject comparison, n = 100 for each subsample).

PsychOpen GOLD

Table 1

Overview of Statistical Results for Direct and Indirect Change

	Direct change			Indirect change			
Situation / Effect	***F***	***p***	**η^2**	**Effect**	***F***	***p***	**η^2**
Outdoor public area w/o people							
Time	41.32	< .001	.011				
Group	1.43	.232	.002	Group	0.34	.710	.002
Time*Group	2.80	.095	< .001				
Indoor public area w/o people							
Time	72.25	< .001	.024				
Group	6.12	.014	.008	Group	0.02	.997	< .001
Time*Group	0.88	.349	< .001				
Being alone in unknown area							
Time	37.33	< .001	.003				
Group	0.10	.755	< .001	Group	0.32	.729	.002
Time*Group	0.67	.413	< .001				
Taking bus							
Time	408.01	< .001	.188				
Group	7.80	.005	.007	Group	28.32	< .001	.160
Time*Group	4.79	.029	.002				
Taking train							
Time	342.30	< .001	.174				
Group	8.17	.004	.007	Group	19.30	< .001	.115
Time*Group	4.80	.029	.002				
Supermarkets							
Time	352.66	< .001	.173				
Group	6.20	.013	.006	Group	22.33	< .001	.131
Time*Group	4.64	.032	.002				
Cinema/theater							
Time	390.67	< .001	.194				
Group	4.71	.030	.004	Group	32.62	< .001	.180
Time*Group	12.86	< .001	.006				
Shopping mall							
Time	357.68	< .001	.170				
Group	6.10	.014	.006	Group	25.31	< .001	.146
Time*Group	9.39	.002	.004				
Restaurant							
Time	364.73	< .001	.197				
Group	1.49	.223	.001	Group	20.82	< .001	.123
Time*Group	9.45	.002	.005				

PsychOpen GOLD

Direct change				Indirect change			
Situation / Effect	***F***	***p***	**η^2**	**Effect**	***F***	***p***	**η^2**
Waiting in line							
Time	311.01	< .001	.149				
Group	10.23	.001	.010	Group	18.66	< .001	.112
Time*Group	0.68	.409	< .001				
Talking to others							
Time	222.51	< .001	.071				
Group	15.43	< .001	.019	Group	6.12	.002	.040
Time*Group	0.03	.865	< .001				
Outdoor public area w/o people							
Time	283.91	< .001	.106				
Group	16.99	< .001	.019	Group	15.37	< .001	.094
Time*Group	8.17	.004	.003				
Indoor public area w/o people							
Time	398.88	< .001	.167				
Group	15.08	< .001	.015	Group	22.48	< .001	.131
Time*Group	8.28	.004	.003				

Note. The factor *Time* refers to the within-subject factor for ratings before (retrospective) vs. during pandemic. The factor *Group* refers to community vs. patient sample (direct change) or pre-COVID vs. community vs. patient sample (indirect change).

Frequency of High and Very High Anxiety in Public Situations

The proportion of individuals indicating high or very high anxiety levels is displayed in Table 2. Overall, the frequency of high or very high anxiety increased by approximately 10%. In the community sample, the average increase was 8% (indirect) to 10% (direct). In the patient sample, the average increase was 11% (direct) to 12% (indirect).

Associations Between Anxiety Increase, Symptoms, and COVID-19 Related Variables

Robust winsorized correlations within the patient and the community samples are shown in Table 3. Most correlations were similar in both samples. A stronger increase in self-reported anxiety (i.e., a higher direct change score) was associated with a higher perceived dangerousness and a higher perceived likelihood of contracting COVID-19 (the latter two correlated positively in the patient sample, $r = .41$, $p < .001$, and in the community sample, $r = .33$, $p = .003$). Moreover, a stronger increase in self-reported anxiety was associated with stronger symptoms of anxiety and stress, but not with symptoms of depression, or with trait anxiety.

PsychOpen GOLD

Table 2

Relative Frequency of High or Very High Anxiety to Distinct Public Situations

	Community sample (n = 352)		Patient sample (n = 228)		Pre-COVID sample (n = 100)
Public situation	**During[a]**	**(Before)[b]**	**During[a]**	**(Before)[b]**	**Before[a]**
Outdoor public place w/o people	0.9%	(0.3%)	1.8%	(0.9%)	0.0%
Indoor public place w/o people	2.3%	(0.6%)	1.8%	(1.3%)	2.0%
Being alone in unknown area	8.5%	(7.1%)	10.5%	(7.5%)	18.0%
Taking bus	15.1%	(1.4%)	19.3%	(4.8%)	4.0%
Taking train	15.1%	(1.1%)	18.9%	(5.3%)	2.0%
Supermarkets	7.7%	(0.6%)	11.0%	(2.6%)	4.0%
Cinema/theater	15.6%	(1.4%)	20.6%	(6.1%)	0.0%
Shopping mall	10.5%	(0.9%)	11.0%	(3.9%)	4.0%
Restaurants	13.1%	(0.9%)	12.7%	(3.5%)	6.0%
Waiting in line	5.7%	(1.1%)	11.8%	(3.1%)	2.0%
Talking to others	5.1%	(1.1%)	9.2%	(3.9%)	2.0%
Outdoor public area w/ people	8.8%	(1.1%)	15.8%	(6.6%)	8.0%
Indoor public area w/ people	20.5%	(3.1%)	27.6%	(7.9%)	6.0%

Note. Proportion of participants responding with "strong anxiety" or "very strong anxiety" in the different public situations.
[a]Anxiety during the previous two weeks.
[b]Retrospective anxiety before the COVID-19 pandemic.

Table 3

Associations Between Direct Increase of Anxiety in Public Situations and COVID-19 Variables, Clinical, and Demographic Data

	COVID-19 variable		Clinical variable			
Sample	**Danger**	**Likelihood contraction**	**Trait Anxiety**	**Anxiety**	**Stress**	**Depression**
Community sample	.25*	.19	.16	.21*	.23*	.03
Patient sample	.26*	.26*	.12	.21*	.28*	.14

Note. Zero-order robust winsorized correlations (trim = 0.2) with direct change score (anxiety during COVID-19 minus before COVID-19).
*$p < .05$.

PsychOpen GOLD

Discussion

The current study investigated changes in anxiety in public situations in response to the COVID-19 pandemic. In all relevant public situations, anxiety increased strongly, both in a community sample and in a clinical sample of patients affected by mental disorders. In both samples, evidence for increased anxiety was supported by direct and indirect change analyses. For direct change, levels of situational anxiety during the pandemic were higher than retrospective anxiety levels of the same individuals before the pandemic. For indirect change, situational anxiety during the pandemic was higher than anxiety in the same situations assessed before the pandemic in a matched community sample. Thus, the present findings expand previous reports concerning an increase in general emotional distress during the COVID-19 pandemic (e.g., Asmundson et al., 2020; Taylor et al., 2020), as the current results highlight a distinct increase in self-reported anxiety in COVID-relevant public situations.

The increase in situational anxiety in response to the pandemic was not driven by outdoor situations per se. No strong increase in anxiety was found in situations that do not involve potential physical contact with others (e.g., being alone in a public area). In these control situations, self-reported anxiety during the pandemic was only slightly higher than retrospectively reported anxiety. Also, anxiety levels in these control situations before the pandemic and during the pandemic did not differ. Thus, increased situational anxiety was linked to physical closeness to other individuals, presumably due to the associated risk of contracting COVID-19. In support, a higher perceived likelihood of contracting COVID-19 and a higher perceived danger of COVID-19 infections were associated with a stronger increase in situational anxiety. In sum, increased anxiety of public situations likely resulted from a higher perceived threat of contracting COVID-19.

Average situational anxiety levels during the pandemic were moderate. As the ongoing pandemic represents a realistic threat to the individual and the society, moderate levels of anxiety in situations that pose a higher risk of contraction can be seen as adaptive responses. Anxiety activates the defensive network and facilitates defensive behaviors such as avoidance or safety behavior (Pittig et al., 2018, 2020). In this regard, moderate anxiety levels could promote compliance with safety measures. However, extremely high anxiety levels may not entail additional benefits for preventing infections but may lead to severe distress and impairments. On average, there was an increase of 8-12% in individuals who reported high to very high anxiety in public situations. Up to 20-28% of participants indicated high or very high anxiety when being in an indoor public area with others during the pandemic. Importantly, high anxiety levels may result in avoidance of relevant situations, which may persist even in the absence of threat (Pittig et al., 2020). It therefore seems important to identify individuals with high anxiety and to monitor the development of persistent maladaptive anxiety and potential avoidance. Notably, individuals who perceived COVID-19 as being more dangerous and perceived the likelihood of contracting COVID-19 as being higher showed a stronger increase in

PsychOpen GOLD

situational anxiety. Moreover, a stronger increase in situational anxiety has been linked to stronger general symptoms of stress and anxiety. These findings suggest that caution should be placed on these individuals, given that they are more likely to experience a higher level of psychological distress and detrimental effects on their overall well-being (Kang et al., 2020; Torales et al., 2020).

Interestingly, there were some expected, but also unexpected, differences between the community and the patient sample. As expected, patients reported higher levels of retrospective anxiety than participants of the community sample. These heightened anxiety levels before the COVID-19 outbreak may reflect higher perceived threat in these situations due to relevant psychopathologies (e.g., agoraphobia, social anxiety). However, no group differences in situational anxiety during the pandemic were observed. In other words, both samples showed similar anxiety levels in public situations during the COVID-19 pandemic. Importantly, the lack of group differences was not due to a ceiling effect, considering that the average self-reported anxiety was moderate in both samples. These results are not in line with previous findings of higher levels of COVID-19-related distress in clinical samples than in the general population (Asmundson et al., 2020). There may be multiple explanations. First, whereas previous studies assessed general emotional distress, the present study examined anxiety in specific public situations. The higher levels of general distress found in previous studies may be caused by factors different from anxious responding in COVID-relevant situations (e.g., troubles coping with self-isolation, general worries about the future, or the socio-economic impact of COVID-19; see Asmundson et al., 2020). Second, the patient sample consisted of patients with mental disorders undergoing cognitive-behavioral treatment. The ongoing treatment may have buffered negative effects of the pandemic and facilitated adaptive coping strategies. Third, patients and non-patients may have applied diverging scaling in COVID-related anxiety ratings (e.g., patients who have frequently experienced highly anxious states may classify levels of anxiety as “moderate” when non-patients may classify similar levels as “high”). Finally, the lack of differences between the patient and community sample under realistic threat is in line with findings from experimental fear learning research. Specifically, a meta-analysis found no differences in learning novel fear responses to a stimulus signaling threat between healthy individuals and patients with anxiety disorders (Duits et al., 2015). However, patients showed elevated responses to a safety signal and ongoing fear responses in the absence of threat. Thus, patients seemingly do not show elevated responses to stimuli and situations signaling realistic threat but rather show a bias to stimuli and situations signaling safety or the absence of previous threat. Therefore, it is important to monitor increased anxiety responses in patients when the risk for contraction of COVID-19 decreases. Moreover, the present study did neither assess the effects of psychotherapy on the negative psychological effects of the COVID-19 pandemic, nor did it assess potential increases in anxiety in currently untreated clinical samples. Thus, additional research is warranted.

PsychOpen GOLD

The present results are limited by the non-representative samples, which were recruited from a German-speaking population. The generalizability to other populations requires further research. The current findings may only represent a subset of the population but provide the insight that at least in this portion of the German population, an increase in COVID-19-related situational anxiety occurred. As no data about the current place of the participants' residence were collected, the potential influence of regional variances in COVID-19 incidence values and, relatedly, official regulations at the time of the survey on situational anxiety cannot be ruled out. However, incidences were generally low in Germany and did not exceed 25 per 100,000 population in any German state at the period of the survey (Robert Koch Institute, 2021) and official restrictions did not differ substantially between German regions (see Steinmetz et al., 2020). The study's results may also be used to generate more elaborate hypotheses on the associations between COVID-19-related and clinical variables on the one side and an increase in situational anxiety on the other side. As outlined above, monitoring general and situation-specific anxiety levels and identifying individuals at risk for developing persistent anxiety and impairments is important for understanding and potentially preventing pandemic-related psychological distress. Public policymakers should facilitate appropriate large-scale, long-term studies. Another limitation is the missing assessment whether participants experienced the public situations during the previous two weeks or whether they imagined being in the situations. Future research may disentangle these potentially diverging responses. Finally, the patient sample was diagnosed with heterogeneous mental disorders, which could not be matched to situational anxiety changes. Thus, we could not evaluate whether there were any differences between different mental disorders or whether a specific disorder may be linked to a higher recall bias.

In conclusion, the current study provides preliminary evidence for an increase in situational anxiety in public situations in a community and a patient sample during the COVID-19 pandemic. Both groups showed similar levels of moderate situational anxiety, which may facilitate compliance with public safety recommendations and restrictions for preventing COVID-19 contractions. However, some individuals display high levels of anxiety, which should be monitored during and after the pandemic.

Funding: The authors have no funding to report.

Acknowledgments: The authors thank Kristina Schneider, Julian Koch and Naja Kärcher for their help with data collection.

Competing Interests: The authors have declared that no competing interests exist.

Twitter Accounts: @AndrePittig, @GluckValentina, @JulianeBoschet, @PsycAlexWong, @EngelkePaula

PsychOpen GOLD

References

Arnaudova, I., Kindt, M., Fanselow, M., & Beckers, T. (2017). Pathways towards the proliferation of avoidance in anxiety and implications for treatment. *Behaviour Research and Therapy, 96*, 3-13. https://doi.org/10.1016/j.brat.2017.04.004

Asmundson, G. J. G., Paluszek, M. M., Landry, C. A., Rachor, G. S., McKay, D., & Taylor, S. (2020). Do pre-existing anxiety-related and mood disorders differentially impact COVID-19 stress responses and coping? *Journal of Anxiety Disorders, 74*, Article 102271. https://doi.org/10.1016/j.janxdis.2020.102271

Ben-Zeev, D., Young, M. A., & Madsen, J. W. (2009). Retrospective recall of affect in clinically depressed individuals and controls. *Cognition and Emotion, 23*(5), 1021-1040. https://doi.org/10.1080/02699930802607937

Chambless, D. L., Caputo, G. C., Jasin, S. E., Gracely, E. J., & Williams, C. (1985). The Mobility Inventory for Agoraphobia. *Behaviour Research and Therapy, 23*(1), 35-44. https://doi.org/10.1016/0005-7967(85)90140-8

Costa, P. T., & McCrae, R. R. (1992). *NEO PI-R Professional Manual: Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI).* Psychological Assessment Resources.

Duits, P., Cath, D. C., Lissek, S., Hox, J. J., Hamm, A. O., Engelhard, I. M., van den Hout, M. A., & Baas, J. M. P. (2015). Updated meta-analysis of classical fear conditioning in the anxiety disorders. *Depression and Anxiety, 32*(4), 239-253. https://doi.org/10.1002/da.22353

Ho, D. E., Imai, K., King, G., & Stuart, E. A. (2011). MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software, 42*(8). https://doi.org/10.18637/jss.v042.i08

Kang, L., Ma, S., Chen, M., Yang, J., Wang, Y., Li, R., Yao, L., Bai, H., Cai, Z., Xiang Yang, B., Hu, S., Zhang, K., Wang, G., Ma, C., & Liu, Z. (2020). Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: A cross-sectional study. *Brain, Behavior, and Immunity, 87*, 11-17. https://doi.org/10.1016/j.bbi.2020.03.028

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. https://doi.org/10.1016/0005-7967(94)00075-U

Mair, P., & Wilcox, R. (2020). Robust statistical methods in R using the WRS2 package. *Behavior Research Methods, 52*(2), 464-488. https://doi.org/10.3758/s13428-019-01246-w

Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., & Roma, P. (2020). A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: Immediate psychological responses and associated factors. *International Journal of Environmental Research and Public Health, 17*(9), Article 3165. https://doi.org/10.3390/ijerph17093165

PsychOpen GOLD

Moghanibashi-Mansourieh, A. (2020). Assessing the anxiety level of Iranian general population during COVID-19 outbreak. *Asian Journal of Psychiatry, 51*, Article 102076. https://doi.org/10.1016/j.ajp.2020.102076

Nilges, P., & Essau, C. (2015). Die Depressions-Angst-Stress-Skalen. *Schmerz, 29*(6), 649-657. https://doi.org/10.1007/s00482-015-0019-z

Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., Kontopantelis, E., Webb, R., Wessely, S., McManus, S., & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: A longitudinal probability sample survey of the UK population. *The Lancet: Psychiatry, 7*(10), 883-892. https://doi.org/10.1016/S2215-0366(20)30308-4

Pittig, A., Treanor, M., LeBeau, R. T., & Craske, M. G. (2018). The role of associative fear and avoidance learning in anxiety disorders: Gaps and directions for future research. *Neuroscience and Biobehavioral Reviews, 88*(February), 117-140. https://doi.org/10.1016/j.neubiorev.2018.03.015

Pittig, A., Wong, A. H. K., Glück, V. M., & Boschet, J. M. (2020). Avoidance and its bi-directional relationship with conditioned fear: Mechanisms, moderators, and clinical implications. *Behaviour Research and Therapy, 126*, Article 103550. https://doi.org/10.1016/j.brat.2020.103550

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.r-project.org/

Robert Koch Institute. (2020). Mund-Nasen-Bedeckung im öffentlichen Raum als weitere Komponente zur Reduktion der Übertragungen von COVID-19. *Epidemiologisches Bulletin, 19*, 3-5. https://doi.org/10.25646/6731

Robert Koch Institute. (2021). Gesamtübersicht der pro Tag ans RKI übermittelten Fälle, Todesfälle und 7-Tage-Inzidenzen nach Bundesland und Landkreis (28.1.2021) [Comrehensive overview of the cases, deaths and 7-day incidences transmitted to the RKI per day by federal state and district (1/28/2021). https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Daten/Fallzahlen_Kum_Tab.html;jsessionid=96A314A6010A8C27B84B4FA5B1E042DE.internet061

Salari, N., Hosseinian-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., Rasoulpoor, S., & Khaledi-Paveh, B. (2020). Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: A systematic review and meta-analysis. *Globalization and Health, 16*(1), Article 57. https://doi.org/10.1186/s12992-020-00589-w

Steinmetz, H., Batzdorfer, V., & Bosnjak, M. (2020, June). *The ZPID lockdown measures dataset for Germany*. ZPID (Leibniz Institute for Psychology Information). https://doi.org/10.23668/PSYCHARCHIVES.3019

Stieglitz, R.-D., & Baumann, U. (2001). Veränderungsmessung. In *Psychodiagnostik in Klinischer Psychologie, Psychiatrie, Psychotherapie* (S. 21–38). Thieme.

Taylor, S., Landry, C. A., Paluszek, M. M., Fergus, T. A., McKay, D., & Asmundson, G. J. G. (2020). COVID stress syndrome: Concept, structure, and correlates. *Depression and Anxiety, 37*(8), 706-714. https://doi.org/10.1002/da.23071

PsychOpen GOLD

Torales, J., O'Higgins, M., Castaldelli-Maia, J. M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *The International Journal of Social Psychiatry, 66*(4), 317-320. https://doi.org/10.1177/0020764020915212

Van den Bergh, O., & Walentynowicz, M. (2016). Accuracy and bias in retrospective symptom reporting. *Current Opinion in Psychiatry, 29*(5), 302-308. https://doi.org/10.1097/YCO.0000000000000267

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 Coronavirus Disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health, 17*(5), Article 1729. https://doi.org/10.3390/ijerph17051729

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

PsychOpen GOLD

Clinical Psychology in Europe

PsychOpen GOLD

Research Articles

Check for updates

Evaluation of the Factor Structure and Psychometric Properties of the German Version of the Clinical Perfectionism Questionnaire: The CPQ-D

Isabel Roth[1], Barbara Cludius[1], Sarah J. Egan[2], Karina Limburg[1]

[1] *Department of Psychology, LMU Munich, Munich, Germany.* **[2]** *School of Psychology and Speech Pathology, Curtin University, Perth, Australia.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e3623, https://doi.org/10.32872/cpe.3623

Received: 2020-04-27 • **Accepted:** 2021-03-30 • **Published (VoR):** 2021-06-18

Handling Editor: Winfried Rief, Philipps-University of Marburg, Marburg, Germany

Corresponding Author: Barbara Cludius, Department of Clinical Psychology and Psychotherapy, LMU Munich, Leopoldstr. 13, 80802, Munich, Germany. +49 (0)89 2180 5590. E-mail: barbara.cludius@psy.lmu.de

Abstract

Background: The aim was to create a German version of the Clinical Perfectionism Questionnaire (CPQ-D) and to test its factor structure, reliability, and validity in a non-clinical population.

Method: We recruited N = 432 participants via an online panel. The factor structure of CPQ-D was examined. The convergent, discriminative, and incremental validity was assessed in relation to the Frost Multidimensional Perfectionism Scale (FMPS) and the Positive and Negative Affect Schedule (PANAS).

Results: Exploratory factor analysis resulted in two factors. Factor 1 represented the over evaluation of striving and Factor 2 was associated to concern over mistakes. Internal consistency was acceptable with ω = .81 for the total score, ω = .77 for Factor 1, and ω = .73 for Factor 2. Convergent, discriminative, and incremental validity was demonstrated. Important to note, Item 12 should be used with caution since it showed low communality and a low item-total correlation and should therefore be further evaluated in future research.

Conclusion: The results indicate that the German translated version of the CPQ has acceptable internal consistency, convergent, discriminative and incremental validity. Future research should test the CPQ-D scale further in clinical and non-clinical populations and assess a broader variety of scales to determine validity of the scale.

Keywords

perfectionism, Clinical Perfectionism Questionnaire, German version, validity, factor analysis

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Highlights

- A German translation of the CPQ was tested and validated in a large community sample.
- The factor structure equals the English version, revealing two factors of clinical perfectionism.
- The CPQ-D proved to be a reliable and valid measure in a non-clinical sample.

Perfectionism is the tendency to set very high standards and to critically evaluate one's own behaviour (Frost, Marten, Lahart, & Rosenblate, 1990). The construct of perfectionism is usually defined as multidimensional and mostly assessed with two Multidimensional Perfectionism Scales (FMPS; Frost et al., 1990; HMPS; Hewitt & Flett, 1991). Factor analyses of the two scales have consistently resulted in two factors: perfectionistic strivings and perfectionistic concerns (Stöber & Otto, 2006). Perfectionistic strivings refer to striving for high standards and perfectionistic concerns refer to concerns over mistakes and the belief others hold high standards of the individual. Recent meta-analytic evidence has demonstrated that both dimensions of perfectionism are linked to psychopathology, particularly eating disorders, but also depression, anxiety and obsessive-compulsive disorder (Limburg, Watson, Hagger, & Egan, 2017). In order to focus on the clinically relevant aspects of perfectionism, Shafran, Cooper, and Fairburn (2002) proposed a model of clinical perfectionism, defined as an overdependence of self-evaluation on meeting personally demanding, self-imposed standards, despite adverse consequences (Shafran et al., 2002). Thus, the multidimensional construct of perfectionism (including perfectionistic strivings and concerns) differs from clinical perfectionism as the definition of clinical perfectionism puts a central emphasis on self-worth being dependent on meeting high standards. This emphasis is not present in the definition of perfectionistic strivings and concerns. Shafran and colleagues (2002) developed a model which outlines a range of cognitive and behavioural processes which maintain clinical perfectionism. Based on the clinical perfectionism model (Shafran et al., 2002) cognitive behaviour therapy (CBT) interventions were developed to target clinical perfectionism as a transdiagnostic process which is a predisposing and maintaining process in a range of psychological disorders (Egan, Wade, & Shafran, 2011). CBT for perfectionism has been demonstrated to result in transdiagnostic reductions in anxiety, depression and eating disorders (Suh, Sohn, Kim, & Lee, 2019). This approach to treat clinical perfectionism across disorders is in line with the current approach of process-based treatment (Hofmann & Hayes, 2019). In order to evaluate treatment efficacy, it is crucial to have a psychometrically sound scale assessing clinical perfectionism.

Therefore, Fairburn, Cooper, and Shafran (2003) developed the Clinical Perfectionism Questionnaire (CPQ), consisting of 12 items that assess clinical perfectionism in the previous month. Several studies have examined the validity and reliability of the CPQ.

PsychOpen GOLD

Chang and Sanna (2012) found the CPQ was positively correlated with depression and anxiety, indicating convergent validity. The CPQ further accounted for additional variance in depression and anxiety beyond the HMPS (Hewitt & Flett, 1991), which demonstrated incremental validity (Chang & Sanna, 2012). Dickie, Surgenor, Wilson, and McDowall (2012) tested the CPQ in a non-clinical sample. They excluded Items 7 ("Have you judged yourself on the basis of your ability to achieve high standards?") and 8 ("Have you done just enough to get by?") due to low or negative correlations with all other items and low item-total correlations. A factor analysis of the remaining ten items resulted in two factors representing personal standards and concerns about failure with acceptable reliability (α = .71 for both factors; Dickie et al., 2012). Similar conclusions were drawn by Stöber and Damian (2014) who also excluded Items 7 and 8 because of low correlations and crossloadings on the two factors they found. Convergent validity was demonstrated by positive correlations with other perfectionism measures (Stöber & Damian, 2014). Egan and colleagues (2016) tested the psychometric properties of the CPQ including all 12 items in both a clinical eating disorder and community sample. Their factor analysis also resulted in two factors representing similar constructs as previous studies. Factor 1 comprised the overevaluation of striving, and convergent validity was indicated by a significant positive correlation (r = .64) with the FMPS subscale *personal standards*. Factor 2 was related to reacting to perceived failure, and convergent validity was demonstrated with self-criticism indicated by substantial and significant positive correlations with the FMPS subscales *concern over mistakes* (r = .61) and *doubts about actions* (r = .56). Further indicating convergent validity, the second factor of the CPQ was correlated with the negative affect subscale of the *Positive and Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen, 1988). Discriminant validity of the CPQ was shown because it could reliably discriminate between both participants with high and low negative affect as well as between the eating disorder sample and healthy controls. In terms of incremental validity, the FMPS accounted for 23% of variance while the CPQ accounted for an additional 11% of variance in the PANAS-NA scores (Egan et al., 2016). Prior and colleagues (2018) also found in a clinical eating disorder sample a two factor structure using a bifactor approach, comprising of overevaluation of striving and concern over mistakes, in a 10 item version of the CPQ excluding the two items found in previous research to be problematic. Due to the focus of the CPQ on clinical aspects of perfectionism relevant to treatment, the aim of this study was to develop a German version of the scale in order to extend access to and distribution of the CPQ. This is important in further evaluating the efficacy of CBT for perfectionism in German speaking areas in clinical practice and research. In the present study a German translation of the CPQ was developed and tested within a community sample in order to explore the factor structure and psychometric properties of the scale. Since this is the first study on a German version, we used all 12 items instead of the reduced set of 10 items. We hypothesized that the German version (CPQ-D) would consist of two factors

PsychOpen GOLD

with a similar structure to the English version found in previous research (Egan et al., 2016; Prior et al., 2018) and that convergent, discriminant, and incremental validity would be demonstrated.

Materials and Methods

Sample

We used a community sample and recruited participants via the online panel PsyWeb (https://psyweb.uni-muenster.de). Inclusion criteria were age above 18 years and self-reported good German language abilities. Since sample sizes of N = 200-300 are regarded suitable for a factor analysis even with lower communalities of the items, we aimed to recruit a minimum sample of N = 250 (Bühner, 2011).

Measures

To create the German version of the CPQ (CPQ-D), the original version of the CPQ was first translated into German by the first author, then translated back to English and compared to the original version by the senior author. Finally, a few linguistic changes were made by the first and the senior author. The original CPQ (Fairburn et al., 2003) is a self-report measure that assesses the core elements of clinical perfectionism (see Table 2). The 12 items, of which Items 2 and 8 are reverse-scored, are rated based on participants' past 28 days on a 4-point Likert scale from 1 (*not at all*) to 4 (*all the time*). Total scores therefore range from 12 to 48 and a higher score indicates a higher level of clinical perfectionism.

The German version of the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990; Stöber, 1995) was used to assess multidimensional perfectionism with six subscales: personal standards (PS), concern over mistakes (CM), doubts about actions (DA), parental expectations (PE), parental criticism (PC), and organisation (O) and a sum score. The FMPS-D was chosen because its subscales personal standards and concern over mistakes are close to the definition of clinical perfectionism (Egan et al., 2016; Shafran et al., 2002). It consists of 35 items rated on 5-point Likert scales from 1 (*strongly disagree*) to 5 (*strongly agree*). Following recommendations of Dunn, Baguley, and Brunsden (2014), McDonald's ω (McDonald, 1999) was used instead of Cronbach's α to examine internal consistency. For the FMPS it was acceptable with ω = .92 for concern over mistakes, ω = .84 for personal standards and ω = .76 for doubts about actions. The FMPS score in our study comprised the subscales personal standards, doubts about actions, and concern over mistakes, following previous research examining the validity of the CPQ (Egan et al., 2016).

We used the German version of the Positive and Negative Affect Schedule (PANAS; Krohne, Egloff, Kohlmann, & Tausch, 1996; Watson et al., 1988) to measure positive and

PsychOpen GOLD

negative affect over the past 28 days. The scale contains ten words describing pleasant and ten words describing unpleasant emotions, representing the subscales positive affect (PA) and negative affect (NA), respectively. Participants rate to what extent they had experienced each of the 20 emotions during the past weeks on a 5-point scale. The PANAS is valid (Krohne et al., 1996) and in the present sample the internal consistency for the positive affect scale (PANAS-PA) was ω = .90 and for the negative affect scale (PANAS-NA) was ω = .89.

Procedure

The study was approved by the ethics committee of the faculty for psychology and educational science at the Ludwig-Maximilians University Munich. Participants provided informed consent and there was no identifying data. The online survey started with a short introduction after which participants were asked to complete the CPQ-D, the FMPS-D and the PANAS. Finally, personal feedback regarding individual results on the FMPS-D was provided.

Statistical Analyses

The free software R, version 3.5.1 (R Core Team, 2019), was used for all statistical analyses. The following additional packages were necessary for the analyses: GPArotation (Bernaards & Jennrich, 2005), boot (Canty & Ripley, 2017), semPlot (Epskamp, 2019), QuantPsych (Fletcher, 2012), Polycor (Fox, 2016), Car (Fox & Weisberg, 2019), Hmisc (Harrell, 2019), MBESS (Kelley, 2019), ggm (Marchetti et al., 2015), Foreign (R Core Team, 2018), Psych (Revelle, 2018), Corpcor (Schafer et al., 2017), effsize (Torchiano, 2018), ggplot2 (Wickham, 2016). Significance level for all tests was α=.05. After calculating descriptive statistics, Bartlett's test was used to test for sphericity and Kaiser-Meyer-Olkin test was applied to examine sampling adequacy. Further, inter-item-correlations were calculated to investigate whether all 12 items could be included in the exploratory factor analysis (EFA). Afterwards and based on the results of the preceding tests, an EFA was conducted for the CPQ-D. The number of factors was determined with a scree plot and a parallel analysis. In the parallel analysis the eigenvalues of the empirical data were compared against the 95th percentile of eigenvalues generated from 1000 simulated analyses, corresponding in size and number of items. To not risk keeping too many or irrelevant factors, the conservative approach of using only the 95th percentile of the simulated eigenvalues was applied. Factors with actual eigenvalues greater than those simulated eigenvalues were maintained (Hayton, Allen, & Scarpello, 2004).

Again, McDonald's ω was used instead of Cronbach's α to examine internal consistency of the factors (Dunn et al., 2014; McDonald, 1999). To test convergent and discriminative validity, correlations between the measures were calculated. Substantial and significant positive correlations between the CPQ-D, the FMPS-D, and PANAS-NA

PsychOpen GOLD

were considered evidence for convergent validity. In terms of discriminant validity, small positive and/or negative correlations were expected between the CPQ-D and PANAS-PA. Correlation coefficients were interpreted according to the rule of thumb by Cohen (1988), with $0.1 \leq |r| < 0.3$ indicating small, $0.3 \leq |r| < 0.5$ indicating moderate, and $|r| > 0.5$ indicating high correlations. To further test discriminant validity, we conducted *t*-tests to examine if participants with low negative affect differed from those with high negative affect in their CPQ-D scores. Effect sizes were assessed with Cohen's *d* and interpreted as small if $0.2 \leq |d| < 0.5$, medium if $0.5 \leq |d| < 0.8$, and high if $|d| > 0.8$ (Cohen, 1988). Finally, a hierarchical linear regression analysis predicting the PANAS-NA score with the FMPS-D and CPQ-D scores as independent variables was conducted to check for incremental validity.

Results

Participants

We collected data from 439 participants. Data screening resulted in the exclusion of three datasets due to missing consent, two were excluded due to invalid age information, one due to voluntary withdrawal, and one due to insufficient knowledge of the German language. The final sample consisted of $N = 432$ participants. Descriptive data of the sample along with means and standard deviations for the CPQ-D, FMPS-D, and PANAS are presented in Table 1. The mean CPQ-D total was $M = 26.50$ ($SD = 5.70$).

Factor Structure and Internal Consistency

Inter-item correlations were mostly moderate, only Items 8 and 12 had small correlations to other items ($r < .30$). The same items had small item-total correlations of $r = .19$ for Item 8 and $r = .20$ for Item 12. Due to results of Bartlett's test, $\chi^2(66) = 1253.53$, $p < .001$, and KMO test (MSA = .85) and since inter-item correlations were significant for all items, we decided to run the factor analysis for the complete set of items instead of excluding Items 8 and 12. An exploratory factor analysis using maximum likelihood estimation with promax rotation resulted in two factors with simple structure. Two factors were assumed based on the scree plot and parallel analysis. Of note, the eigenvalue rule was not fulfilled with only one factor having an eigenvalue greater than one, but the eigenvalue criterion has been marked as too strict (Jolliffe, 1972). Eight items loaded on Factor 1 and four items on Factor 2. Factor 1 explained 20% and Factor 2 accounted for 15% of variance, factors were moderately correlated with $r = .49$. The factor structure along with communalities of the items is depicted in Table 2. Internal consistency was $\omega = .81$ for the total score, $\omega = .77$ for Factor 1, and $\omega = .73$ for Factor 2.

PsychOpen GOLD

Table 1

Sample Characteristics, N = 432

Variable	*M* (*SD*) or *n* (%)
Age (years), *M* (*SD*)	49.53 (15.00)
Female, *n* (%)	251 (58.10)
Education, *n* (%)	
9th grade or less	19 (4.40)
10th grade	62 (14.35)
High school graduate	102 (23.61)
University graduate	243 (56.25)
Other degree	6 (1.39)
Psychological diagnosis, *n* (%)	137 (31.71)
Psychotherapeutic and/or psychiatric treatment, *n* (%)	
Yes, currently, *n* (%)	61 (14.12)
Yes, formerly, *n* (%)	162 (37.50)
Never, *n* (%)	233 (53.94)
CPQ-D total, *M* (*SD*)	26.50 (5.70)
Factor 1, *M* (*SD*)	18.21 (4.17)
Factor 2, *M* (*SD*)	8.29 (2.41)
FMPS-D total, *M* (*SD*)	98.84 (21.24)
Personal Standards, *M* (*SD*)	21.64 (5.50)
Doubts about Actions, *M* (*SD*)	9.99 (3.82)
Concern over Mistakes, *M* (*SD*)	22.11 (8.43)
Parental Expectations, *M* (*SD*)	11.98 (5.11)
Parental Criticism, *M* (*SD*)	10.11 (4.61)
Organisation, *M* (*SD*)	23.02 (4.48)
PANAS-NA, *M* (*SD*)	20.61 (7.74)
PANAS-PA, *M* (*SD*)	31.91 (7.39)

Note. CPQ-D = Clinical Perfectionism Questionnaire, German version; FMPS-D = Frost Multidimensional Perfectionism Scale; PANAS-NA = Positive and Negative Affect Schedule, Negative Affect subscale; PANAS-PA = Positive and Negative Affect Schedule, Positive Affect subscale.

PsychOpen GOLD

Clinical Psychology in Europe
2021, Vol. 3(2), Article e3623
https://doi.org/10.32872/cpe.3623

Table 2

Promax-Rotated Factor Structure of the CPQ-D

Item No.	Item CPQ	Item CPQ-D	F1	F2	h^2
1	Have you pushed yourself really hard to meet your goals?	Haben Sie sich sehr angestrengt, um Ihre Ziele zu erreichen?	**.48**	.08	.27
3	Have you been told that your standards are too high?	Wurde Ihnen gesagt, dass Ihre Ansprüche zu hoch sind?	**.53**	.12	.36
6	Have you raised your standards because you thought they were too easy?	Haben Sie Ihre Ansprüche erhöht, weil Sie dachten sie seien zu leicht zu erreichen?	**.46**	.00	.21
7	Have you judged yourself on the basis of your ability to achieve high standards?	Haben Sie sich selbst anhand dessen beurteilt, ob Sie hohe Ansprüche erreichen können?	**.58**	.23	.51
8	Have you done just enough to get by? (R)	Haben Sie geradeso genug getan, um über die Runden zu kommen? (R)	**.42**	-.23	.14
9	Have you repeatedly checked how well you are doing at meeting your standards (for example, by comparing your performance with that of others)?	Haben Sie wiederholt überprüft, wie gut Sie sich darin schlagen, hohe Ansprüche zu erreichen (zum Beispiel, indem Sie Ihre Leistung mit der anderer verglichen)?	**.51**	.20	.39
10	Do you think that other people would have thought of you as a "perfectionist"?	Glauben Sie, dass andere Leute Sie als „Perfektionist/in" bezeichnen würden?	**.62**	-.14	.32
11	Have you kept trying to meet your standards, even if this has meant that you have missed out on things?	Haben Sie auch dann versucht, Ihre Ansprüche zu erreichen, wenn Sie dadurch andere Dinge versäumt haben?	**.56**	.05	.34
2	Have you tended to focus on what you have achieved, rather than on what you have not achieved? (R)	Haben Sie sich eher darauf fokussiert was Sie erreicht haben, als darauf, was Sie nicht erreicht haben? (R)	-.03	**.45**	.19
4	Have you felt a failure as a person because you have not succeeded at meeting your goals?	Haben Sie sich wie ein/e Versager/in gefühlt, wenn es Ihnen nicht gelang, Ihre Ziele zu erreichen?	.14	**.76**	.70
3	Have you been afraid that you might not reach your standards?	Hatten Sie Angst, dass Sie Ihre Ziele möglicherweise nicht erreichen könnten?	.14	**.71**	.61
12	Have you avoided any tests of your performance (at meeting your goals) in case you failed?	Haben Sie jede Art der Überprüfung Ihrer Leistung vermieden, weil Sie bei der Erreichung Ihrer Ziele versagt haben könnten?	-.03	**.35**	.11

Note. F1 = loadings on Factor 1; F2 = loadings on Factor 2; h^2 = communality; (R) = reverse-coded, loadings > 0.3 are printed in bold.

Reprint of original items with courtesy of Roz Shafran.

Construct Validity

Pearson's correlations between the measures are seen in Table 3.

Table 3

Pearson Correlations and Partial Correlations of the Scales

Scale	CPQ-D total	Factor 1	F1.F2	Factor 2	F2.F1
FMPS-D total	.68*** [.63, .73]				
Personal Standards	.60*** [.54, .66]	.66*** [.60, .71]	.62***	.29*** [.20, .38]	-.02
Concern over Mistakes	.67*** [.62, .72]	.55*** [.48, .61]	.37***	.61*** [.59, .70]	.53***
Doubts about Actions	.51*** [.44, .58]	.35*** [.27, .43]	.09	.65*** [.55, .67]	.54***
PANAS-NA	.55*** [.48, .61]	.40*** [.32, .48]	.17***	.61*** [.55, .66]	.52***
PANAS-PA	-.11* [-.21, -.02]	.07 [-.03, .16]		-.39*** [-.46, -.30]	

Note. CPQ-D = Clinical Perfectionism Questionnaire, German version; FMPS = Frost Multidimensional Perfectionism Scale; PANAS-NA = Positive and Negative Affect Schedule, Negative Affect subscale; PANAS-PA = Positive and Negative Affect Schedule, Positive Affect subscale. Values in brackets depict the 95% CI for the respective Pearson correlation coefficient. F1.F2 = partial correlation of Factor 1 controlled for Factor 2, F2.F1 = partial correlation of Factor 2 controlled for Factor 1.
*$p < .05$. **$p < .01$. ***$p < .001$.

Convergent Validity

The CPQ-D total was highly correlated with the FMPS-D total and the relevant subscales personal standards, concern over mistakes, and doubts about actions, and with PANAS-NA. Factor 1 correlated with personal standards, but also concern over mistakes. When controlling for overlap with Factor 2, the relationship was only moderate. Factor 2 correlated highly with concern over mistakes, doubts about actions, and PANAS-NA and the relationship remained when controlling for Factor 1. Hence, the CPQ-D demonstrated convergent validity.

PsychOpen GOLD

Discriminative Validity

As expected, correlations between CPQ-D and both factors and PANAS-PA were small to negative. Following Egan and colleagues (2016), we classified participants with PANAS-NA scores of > 25 (75th percentile) as "high" (n = 114) and those with scores < 15 (25th percentile) as "low" (n = 133). An independent samples t-test revealed that those with higher PANAS-NA scores had significantly higher scores on CPQ-D total than those with low PANAS-NA scores ("high" PANAS-NA group: M = 31.18, SD = 5.42; "low" PANAS-NA group: M = 23.14, SD = 4.44; t(218.51) = 12.61, p < .001). Cohen's d was large with d = 1.63 (95% CI [1.34, 1.92]). Similar findings were evident for Factor 1 and Factor 2 (Factor 1: "high" PANAS-NA group: M = 20.75, SD = 4.01; "low" PANAS-NA group: M = 16.38, SD = 3.60; t(226.94) = 8.84, p < .001, d = 1.14, 95% CI for d [.87, 1.41]; Factor 2: "high" group: M = 10.43, SD = 2.26; "low" group: M = 6.77, SD = 1.62; t(201.23) = 14.40, p < .001, d = 1.88, 95% CI for d [1.58, 2.19]).

Incremental Validity

A multiple hierarchical linear regression model showed that the FMPS-D accounted for 23.6% of variance in PANAS-NA (p < .001) and that the CPQ-D accounted for an additional 11% of variance (p < .001). Upon inclusion of the CPQ-D total in the regression model, the predictive value of the FMPS-D reduced from β = .49 to β = .21, which could be due to the strong correlation of both variables (r = .68). The variance inflation factor of 1.86 confirmed that there was no multicollinearity between the predictors. Hence, in the final model including FMPS-D and CPQ-D, the latter was a stronger predictor for negative affect than the FMPS-D.

Discussion

Consistent with previous studies on the original version of the CPQ, the CPQ-D consists of two factors, with the same eight items loading on Factor 1 as the respective items in the English version and the same four items loading on Factor 2 (Dickie et al., 2012; Egan et al., 2016; Stöber & Damian, 2014). The values of the loadings of the single items differ slightly between all sighted analyses, but never by more than 0.15 between the German and the English version (Egan et al., 2016). Similar to previous studies Factor 1 represents primarily the over evaluation of striving whereas Factor 2 assesses concern over mistakes (Egan et al., 2016; Prior et al., 2018). Unlike the English version, the German version contains no cross loadings greater than 0.3 on both factors, which suggests that the German translation might discriminate more precisely between the two factors. Internal consistency of the factors and the total score were acceptable. The amount of variance explained by both factors was 35%, a very low proportion considering recommendations that at least 60% of variance should be explained (Hair et al., 2013). Previous studies found diverging amounts of variance explained, with 47.9% (Dickie et al., 2012), 45.9%

PsychOpen GOLD

(Stöber & Damian, 2014), and 79% (Egan et al., 2016). The low proportion we found could indicate that there is a third latent variable behind the construct of clinical perfectionism that could not be covered by the items. Alternatively, formulation of the translated items may not be adequate so that they cannot sufficiently assess the two latent variables. Prior and colleagues (2018) argued that a single, latent construct of clinical perfectionism could also explain the structure of the CPQ in a clinical eating disorder sample, and it is possible that a unidimensional structure may be worth further investigating in future research.

A noteworthy finding was that Items 8 and 12 had both low communalities, indicating small associations with both factors, and low item-total correlations, indicating that these items insufficiently represent the total scale. Findings for Item 8 ("Have you done just enough to get by?") can be interpreted in accordance with previous research finding this reverse scored item problematic (Dickie et al., 2012; Prior et al., 2018). This is supported by Item 8 having relatively high loadings with opposite items on both factors, which means that participants with a high score on Factor 1 (over evaluation of striving) seem to interpret Item 8 in an opposite way to participants with high scores on Factor 2 (concern over mistakes). This is likely due to the item being reverse scored and participants were reading the item incorrectly assuming it was similar to other items. Future research on the German CPQ should examine the 12-item version and a 10-item version of the scale with the reverse scored items removed. Item 12 ("Have you avoided any test of your performance (at meeting your goals) in case you failed?") was not problematic in studies on the English version. They found that Item 12 loaded on Factor 2 between .37 and .71 and had corrected item total correlations (CITC) of .24 or higher. In the German version the loading on Factor 2 was slightly smaller, but more problematic were the low CITC of .20 and the low communality of .11. This indicates that Item 12 does not represent Factor 2 well and does not contribute much to assessing the construct of clinical perfectionism. One reason could be that the German translation of Item 12 may have been too complicated to be easily understood by participants. Furthermore, avoidance of performance tests could be associated with other factors than perfectionism, for example test anxiety, a lack of motivation to be tested, or simply having no test situations available in everyday life. Future research on the CPQ-D should address this issue because the original content of Item 12 (testing and evaluating one's performance) is an important part of the definition of clinical perfectionism.

In terms of validity, our results provided evidence for convergent validity, discriminative validity, and incremental validity. Convergent validity was demonstrated by high correlations with the FMPS-D and the negative affect subscale of the PANAS. Factor 1 correlated highly with FMPS-D subscales assessing the setting and evaluation of strivings while Factor 2 correlated with scales measuring concerns about mistakes, concerns regarding meeting personal standards, and negative emotions. This supports the interpretation of Factor 1 representing perfectionistic strivings and Factor 2 assessing emotional

PsychOpen GOLD

consequences of failure. Discriminative validity was shown by low correlations with the positive affect subscale of the PANAS and by the finding that the CPQ-D could discriminate well between participants with high vs. low negative affect. Finally, the CPQ-D explained variance in negative affect beyond the proportion explained by the FMPS-D, demonstrating incremental validity.

Strengths and Limitations

Considering that we had similar findings compared to previous studies on the English version of the CPQ in terms of factor structure and construct validity, it seems like translation of the measure was successful. Also, it shows a simple structure which ensures interpretability. Another strength is that we tested the CPQ-D not only in a student sample, but in a community sample, of which nearly a third of the participants had a self-reported diagnosed psychological disorder and 14% reported to be in psychotherapeutic and/or psychiatric treatment, indicating some generalisability towards clinical samples.

However, there were some limitations. First, the community sample was recruited using an online panel. This method only reaches certain target groups. Participants in our sample were on average 49.53 years old and highly educated, which decreases generalisability of our results (e.g., our results may not apply to younger or people with lower education). Future research should consider using test theory to explore item-person fit.

Second, we did not assess the number of specific psychological disorders, although it would be interesting to know whether there are diverging results for different disorders. Third, we used a limited number of measures to assess construct and incremental validity. Other measures assessing perfectionism and further constructs (e.g., depression, anxiety, eating disorder symptoms, general well-being, personality traits) would have been valuable to examine validity more comprehensively. Fourth, regarding translation of the measure, it would have been worthwhile to have the German version translated back to English by several people and to have the German scale evaluated by several clinicians. Moreover, it should be considered in future research to use a cognitive interview to validate the German translation. Finally, there are no "clinical" cut-offs or severity ranges for the CPQ. Instead, clinicians and researchers currently interpret the score on the basis of higher scores indicating greater clinical perfectionism. It would be useful for future research to determine severity ranges (e.g., mild, moderate, severe) to further enhance the clinical and research application of the scale.

Conclusion

Overall, we found evidence for the reliability and validity of the CPQ-D, the factor structure is the same as in the English version (Dickie et al., 2012; Egan et al., 2016; Prior et al., 2018; Stöber & Damian, 2014). Therefore, the CPQ-D can be used in a similar way to the English version. It would be useful for future research to examine if there

PsychOpen GOLD

are differences between clinical perfectionism across countries, for example, between the United Kingdom (UK) where the CPQ was developed, and Germany. To date, cultural differences in the definition and perception of perfectionism have been found when comparing individualistic and collectivistic cultures, for example, Caucasian and Asian samples (Nilsson, Paul, Lupini, & Tatem, 1999; Pietrabissa et al., 2020). As both Germany and the UK are individualistic cultures which share common values (Juslin, Barradas, Ovsiannikow, Limmo, & Thompson, 2016) we do not assume great cultural differences. However, future research should test this possible effect on the results. Future studies should also examine the CPQ-D in non-clinical and clinical populations in order to evaluate whether the factor structure can be replicated and whether it is possible to explain more variance of the underlying construct than in the current study. Additionally, they should use a wider variety of additional measures to test its validity. Further, future research may wish to compare the CPQ-D in its current version with a version that excludes Items 8 and 12 due to their difficult properties. In summary, the CPQ-D appears to be a valid and reliable measure to assess clinical perfectionism in a German speaking population. Hence, it has the potential to be used as an efficient measure to assess the process of clinical perfectionism within the framework of process-based CBT (Hofmann & Hayes, 2019).

Funding: The authors have no funding to report.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

References

Bernaards, C. A., & Jennrich, R. I. (2005). Gradient projection algorithms and software for arbitrary rotation criteria in factor analysis. *Educational and Psychological Measurement, 65*, 676-696. https://doi.org/10.1177/0013164404272507

Bühner, M. (2011). *Einführung in die Test-und Fragebogenkonstruktion.* Munich, Germany: Pearson Deutschland.

Canty, A., & Ripley, B. (2017). boot: Bootstrap R (S-Plus) Functions (R package version 1.3-20) [Computer software].

Chang, E. C., & Sanna, L. J. (2012). Evidence for the validity of the Clinical Perfectionism Questionnaire in a nonclinical population: More than just negative affectivity. *Journal of Personality Assessment, 94*(1), 102-108. https://doi.org/10.1080/00223891.2011.627962

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ, USA: Erlbaum.

PsychOpen GOLD

Dickie, L., Surgenor, L. J., Wilson, M., & McDowall, J. (2012). The structure and reliability of the Clinical Perfectionism Questionnaire. *Personality and Individual Differences, 52*(8), 865-869. https://doi.org/10.1016/j.paid.2012.02.003

Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*(3), 399-412. https://doi.org/10.1111/bjop.12046

Egan, S. J., Shafran, R., Lee, M., Fairburn, C. G., Cooper, Z., Doll, H. A., . . . Watson, H. J. (2016). The reliability and validity of the clinical perfectionism questionnaire in eating disorder and community samples. *Behavioural and Cognitive Psychotherapy, 44*(1), 79-91. https://doi.org/10.1017/S1352465814000629

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic process: A clinical review. *Clinical Psychology Review, 31*(2), 203-212. https://doi.org/10.1016/j.cpr.2010.04.009

Epskamp, S. (2019). semPlot: Path Diagrams and Visual Analysis of Various SEM Packages' Output (R package version 1.1.1) [Computer software]. Retrieved from https://CRAN.R-project.org/package=semPlot

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). *The Clinical Perfectionism Questionnaire* (Unpublished scale). Oxford, United Kingdom.

Fletcher, T. D. (2012). QuantPsyc: Quantitative Psychology Tools (R package version 1.5) [Computer software]. Retrieved from https://CRAN.R-project.org/package=QuantPsych

Fox, J. (2016). polycor: Polychoric and Polyserial Correlations (R package version 0.7-9) [Computer software]. Retrieved from https://CRAN.R-project.org/package=polycor

Fox, J., & Weisberg, S. (2019). *An {R} companion to applied regression* (3rd ed.). Thousand Oaks, CA, USA: SAGE.

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research, 14*(5), 449-468. https://doi.org/10.1007/BF01172967

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis*. Upper Saddle River, NJ, USA: Pearson Education.

Harrell, F. E., Jr. with contributions from C. Dupont and many others. (2019). Hmisc: Harrell Miscellaneous (R package version 4.2-0) [Computer software]. Retrieved from https://CRAN.R-project.org/package=Hmisc

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational Research Methods, 7*(2), 191-205. https://doi.org/10.1177/1094428104263675

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology, 60*(3), 456-470. https://doi.org/10.1037/0022-3514.60.3.456

Hofmann, S. G., & Hayes, S. C. (2019). The future of intervention science: Process-based therapy. *Clinical Psychological Science, 7*(1), 37-50. https://doi.org/10.1177/2167702618772296

PsychOpen GOLD

Jolliffe, I. T. (1972). Discarding variables in a principal component analysis. I: Artificial data. *Journal of the Royal Statistical Society: Series C, Applied Statistics, 21*(2), 160-173. https://doi.org/10.2307/2346488

Juslin, P. N., Barradas, G. T., Ovsiannikow, M., Limmo, J., & Thompson, W. F. (2016). Prevalence of emotions, mechanisms, and motives in music listening: A comparison of individualist and collectivist cultures. *Psychomusicology: Music, Mind, and Brain, 26*(4), 293-326. https://doi.org/10.1037/pmu0000161

Kelley, K. (2019). MBESS: The MBESS R Package (R package version 4.5.1) [Computer software]. Retrieved from https://CRAN.R-project.org/package=MBESS

Krohne, H. W., Egloff, B., Kohlmann, C.-W., & Tausch, A. (1996). Investigations with a German version of the positive and negative affect schedule (PANAS). *Diagnostica, 42*, 139-156. https://doi.org/10.1037/t49650-000

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2017). The relationship between perfectionism and psychopathology: A meta-analysis. *Journal of Clinical Psychology, 73*(10), 1301-1326. https://doi.org/10.1002/jclp.22435

Marchetti, G. M., Drton, M., & Sadeghi, K. (2015). ggm: Functions for graphical Markov models (R package version 2.3) [Computer software]. Retrieved from https://CRAN.R-project.org/package=ggm

McDonald, R. P. (1999). *Test theory: A unified treatment*. Mahwah, NJ, USA: Lawrence Erlbaum Associates.

Nilsson, J. E., Paul, B. D., Lupini, L. N., & Tatem, B. (1999). Cultural differences in perfectionism: A comparison of African American and White college students. *Journal of College Student Development, 40*, 141-150.

Pietrabissa, G., Gullo, S., Aimé, A., McCabe, M., Alcaraz-Ibánez, M., Begin, C., . . . Fuller-Tyszkiewicz, M. (2020). Measuring perfectionism, impulsivity, self-esteem and social anxiety: Cross-national study in emerging adults from eight countries. *Body Image, 35*, 265-278. https://doi.org/10.1016/j.bodyim.2020.09.012

Prior, K. L., Erceg-Hurn, D. M., Raykos, B. C., Egan, S. J., Byrne, S., & McEvoy, P. M. (2018). Validation of the clinical perfectionism questionnaire in an eating disorder sample: A bifactor approach. *International Journal of Eating Disorders, 51*(10), 1176-1184. https://doi.org/10.1002/eat.22892

R Core Team. (2018). foreign: Read Data Stored by 'Minitab', 'S', 'SAS', 'SPSS', 'Stata', 'Systat', 'Weka', 'dBase'.... (R package version 0.8-71) Retrieved from https://CRAN.R-project.org/package=foreign

R Core Team. (2019). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Retrieved from https://www.R-project.org

Revelle, W. (2018). psych: Procedures for Personality and Psychological Research, Northwestern University, Evanston, IL, USA (Version = 1.8.12) [Computer software]. Retrieved from https://CRAN.R-project.org/package=psych

PsychOpen GOLD

Schafer, J., Opgen-Rhein, R., Zuber, V., Ahdesmaki, M., Duarte Silva, A. P., & Strimmer, K. (2017). corpcor: Efficient Estimation of Covariance and (Partial) Correlation (R package version 1.6.9) [Computer software]. Retrieved from https://CRAN.R-project.org/package=corpcor

Shafran, R., Cooper, Z., & Fairburn, C. G. (2002). Clinical perfectionism: A cognitive–behavioural analysis. *Behaviour Research and Therapy, 40*(7), 773-791. https://doi.org/10.1016/S0005-7967(01)00059-6

Suh, H., Sohn, H., Kim, T., & Lee, D. (2019). A review and meta-analysis of perfectionism interventions: Comparing face-to-face with online modalities. *Journal of Counseling Psychology, 66*(4), 473-486. https://doi.org/10.1037/cou0000355

Stöber, J. (1995). *Frost Multidimensional Perfectionism Scale-Deutsch (FMPS-D)* (Unpublished scale). Freie Universität Berlin, Institut für Psychologie, Berlin, Germany.

Stöber, J., & Damian, L. E. (2014). The Clinical Perfectionism Questionnaire: Further evidence for two factors capturing perfectionistic strivings and concerns. *Personality and Individual Differences, 61-62*, 38-42. https://doi.org/10.1016/j.paid.2014.01.003

Stöber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review, 10*(4), 295-319. https://doi.org/10.1207/s15327957pspr1004_2

Torchiano, M. (2018). effsize: Efficient effect size computation (R package version 0.7.4) [Computer software]. https://doi.org/10.5281/zenodo.1480624

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wickham, H. (2016). *ggplot2: Elegant Graphics for Data Analysis*. New York, NY, USA: Springer.

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

Clinical Psychology in Europe

PsychOpen GOLD

Scientific Update and Overview

Qualitative Approximations to Causality: Non-Randomizable Factors in Clinical Psychology

Michael Höfler[1], Sebastian Trautmann[2], Philipp Kanske[1,3]

[1] *Clinical Psychology and Behavioural Neuroscience, Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden, Dresden, Germany.* **[2]** *Department of Psychology, Medical School, Hamburg, Germany.* **[3]** *Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e3873, https://doi.org/10.32872/cpe.3873

Received: 2020-06-14 • **Accepted:** 2021-01-14 • **Published (VoR):** 2021-06-18

Handling Editor: Winfried Rief, Philipps-University of Marburg, Marburg, Germany

Corresponding Author: Michael Höfler, Clinical Psychology and Behavioural Neuroscience, Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden, Chemnitzer Straße 46, 01187 Dresden, Germany. Tel: +49 351 463 36921. E-mail: michael.hoefler@tu-dresden.de

Supplementary Materials: Materials [see Index of Supplementary Materials]

Abstract

Background: Causal quests in non-randomized studies are unavoidable just because research questions are beyond doubt causal (e.g., aetiology). Large progress during the last decades has enriched the methodical toolbox.

Aims: Summary papers mainly focus on quantitative and highly formal methods. With examples from clinical psychology, we show how qualitative approaches can inform on the necessity and feasibility of quantitative analysis and may yet sometimes approximate causal answers.

Results: Qualitative use is hidden in some quantitative methods. For instance, it may yet suffice to know the direction of bias for a tentative causal conclusion. Counterfactuals clarify what causal effects of changeable factors are, unravel what is required for a causal answer, but do not cover immutable causes like gender. Directed acyclic graphs (DAGs) address causal effects in a broader sense, may give rise to quantitative estimation or indicate that this is premature.

Conclusion: No method is generally sufficient or necessary. Any causal analysis must ground on qualification and should balance the harms of a false positive and a false negative conclusion in a specific context.

Keywords

causality, causal considerations, counterfactuals, directed acyclic graphs

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Highlights

- Causal inference outside randomized, controlled experiments and trials is rare in clinical psychology, regardless of the rich methodology that has evolved in the last decades.
- The attractiveness of these new formal tools distracts from their limits and expenditure, but considerable benefit is hidden in their qualitative use.
- Qualitative considerations may suffice to approximate causal answers.

Causal questions drive most scientific reasoning. This should entail plenty of causal analyses, but clinical psychology often avoids causality because the established gold standard, a randomized controlled experiment or trial (RCT), is in many cases infeasible. Although we cannot or should not manipulate variables such as gender, traumatic events, personality traits and other constructs, their effects on clinical outcomes must be investigated to inform prevention, intervention, policies, theories and further research.

The Specific Problem of Causality in Observational Studies

The methodological toolbox has been greatly expanded. It now offers approaches to causal answers in non-randomized studies (Greenland, 2017). These new tools mainly address the *specific* problem of causality: Without randomization, a binary factor **X** (group comparison, e.g., with and without a bipolar disorder diagnosis) and outcome **Y** (e.g., amount of substance use) often have *shared causes*, **Z** (e.g., parental mental health), that are out of experimental control and cause bias in an estimate of the average effect of **X** on **Y.** In linear models and for just a single **Z**, this bias is the product of the effect of **Z** on **X** and **Y**, meaning that it equals $\alpha_1 * \alpha_2$, where α_1 denotes the effect of **Z** on **X**, and α_2 the effect of **Z** on **Y** (e.g., Gelman & Hill, 2007, Chapter 9). This simple formula implies that

a. bias occurs only if $\alpha_1 \neq 0$ *and* $\alpha_2 \neq 0$
b. the direction of bias just depends on the *signs* of α_1 and α_2. If they are equal, bias is upward, otherwise downward.
c. bias is small if *either* is small

These properties generalize to non-linear relations and any distributions of **Y** and **Z** and to multiple **Z** that are independent or positively inter-related (Groenwold, Shofty, Miočević, van Smeden, & Klugkist, 2018; Pearl's "adjustment formula" is the most general expression; Pearl, 2009). We refer to the above as the *basic confounding relation.*

Experimental control and randomization together disconnect all *confounders* **Z** from **X** and thus eliminate *confounding bias.* Otherwise, **X** is just *observed*, and in life-sciences

PsychOpen GOLD

like clinical psychology the number of natural causes of an **X** might be vast. The new methodical tools try to unravel the **X-Y** relation in an imaginary world in which **X** (or **Y**) was independent of **Z** and thus simulate what *changing* (rather than observing) **X** would do with **Y** ("do(**X**)," Pearl, 2009). The new methods mimic what might be observed if **X** were changed, but unlike real-world change experiments where **X** is isolated, their use requires an explicit understanding of the relationships between variables **Z** and **X**. Likewise, during their elaboration it has been stressed that one must consider *how* an **X** is to be changed because this may make a large difference (Greenland, 2005a). For example, just stopping drug use might even worsen an outcome if an intervention does not address factors like stress coping, a putative cause of drug use. In this sense, the new methods complement randomized experiments and RCTs through the more explicit need to go beyond a single **X**, thus to move from "causal description" to "causal explanation" (Johnson, Russo, & Schoonenboom, 2019). For other (non-specific) sources of bias like selection and measurement error that also effect the results of randomized studies, see the Supplementary Materials.

Instead of making use of the new methodological toolbox to approach causal answers in observational studies, clinical psychology was dominated by the "mantra" that "correlation is not causation" (Pearl & MacKenzie, 2018, back of the book). For a historical account on how this stance has emerged through the statistical pioneer Karl Pearson, who had considered causality to equal perfect (deterministic) correlation, see Pearl and MacKenzie (2018).

Aim of This Paper

Some papers have already introduced tools from the new methodical box in (clinical) psychology and summarized the meanwhile vast literature on them (Dablander, 2020; Marinescu, Lawlor, & Kording, 2018). However, these have mainly focussed on quantitative approaches in a discipline where methodical causal thinking is new and, thus, requires qualitative guidance beforehand. One such instance is that psychology needs not only to overcome "retreating into the associational haven" (Hernán, 2005), but also immunization against overconfidence (Greenland, 2012) in novel methods. Overconfidence mainly concerns the quantitative and highly formal methods, because the mathematical sophistication in these easily obstructs the sight for hidden assumptions and over-simplification through translation into mathematics (Greenland, 2012, 2017; VanderWeele, 2016). Costs of using these methods also include learning and conducting them (which is error-prone) and the further degrees of freedom in analysis through their use which promotes p-hacking. We argue that qualitative approaches as exemplified in this article are easier to access and invite more debate and refinement on them and should at least inform the decision of using a particular quantitative method. We focus on a few causal conceptions that we believe are most illustrative for causal quests: the above basic

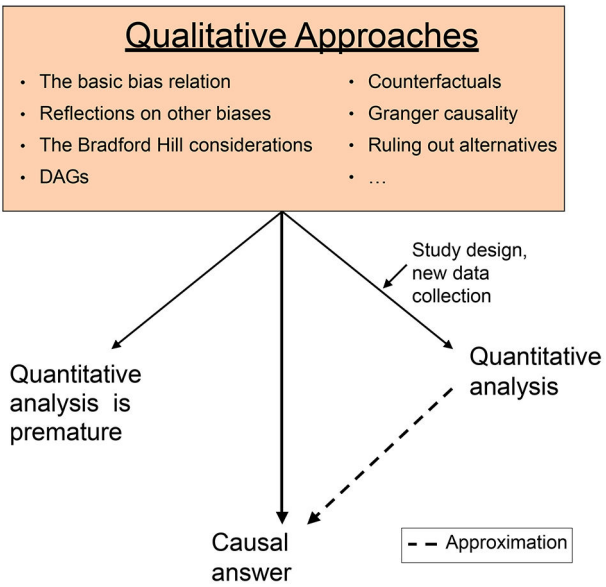
PsychOpen GOLD

confounding relation (1), counterfactuals (2), popular qualitative considerations (3) and directed acyclic graphs (DAGs) (4).

The following figure illustrates the scheme by which we describe how qualitative approaches may guide a causal quest.

Figure 1

Scheme of Qualitative Approaches Guiding Causal Quests



Note. These might be sufficient for overall causal answers, give rise to designing a new study and/or quantitative analysis, or suggest that such analysis is premature. The basic bias relation, counterfactuals and DAGs belong to the new toolbox of causal methods.

Qualitative Approaches

Gender Effects and the Basic Bias Relation

The effects of gender (biological sex) may play an important role for the development and maintenance of mental disorders. If they exist to considerable extent, they contribute to explaining the different aetiology of disorders that are more prevalent in females (e.g., internalizing disorders such as depression) and males (e.g., externalizing disorders such as substance use disorders). This is because gender may also affect many putative aetiological factors (e.g., response styles such as rumination; Johnson & Whisman, 2013; which, in turn, may influence the onset of disorders; Emsley & Dunn, 2012).

PsychOpen GOLD

But is the causal wording "effect" warranted here? With the basic bias relation, we are equipped to ask: Are there shared causes of gender and a disorder **Y**? If it holds true that gender is largely random in the sense that it depends only on factors that do not also affect the disorder (Scarpa, 2016, and references therein), then no confounding bias is expected. If such factors exist (e.g., environmental pollution; Astolfi & Zonta, 1999) but affect **Y** only weakly, they may be neglected since the bias through them should be small. If bias from other sources is also negligible like selection and measurement, a causal conclusion seems informed.

Upward Bias Through Confounders That Affect X and Y With the Same Sign

In the presence of reliable associational results, the basic bias relation can be applied well beyond gender effects. If there is at most a *weak* association between an **X** and a **Y**, and assuming that the common causes of **X** and **Y** affect both positively or both negatively (and are unrelated or positively inter-related), bias should be *upward*. Hence, the effect of **X** on **Y** should be smaller than the association and, thus, be absolutely small (and probably negligible). For example, the relatively weak and often inconsistently reported association between anxiety and alcohol use might be explained by genetic and personality factors increasing the risk for both (Schmidt, Buckner, & Keough, 2007). Such risk increasing may frequently apply: psychopathology in parents, genetic factors, stable personality traits, stressful life events and prior mental disorders are factors that might all affect disorders positively and be positively inter-related (Uher & Zwicker, 2017). However, with a larger number of shared factors, the probability rises that some have negative relations, but if these are few and unlikely to dominate bias (because their effects on **X** *and* **Y** are not very large as compared to those of the other factors), a researcher may still use the consideration.

Counterfactuals and a Defendable Assumption on Them

The above gender example brings up an important limitation yet in the standard "counterfactual" definition of a causal effect. Biological sex cannot be entirely changed (beyond transsexual transformation) or imagined to be changed, but social aspects of gender can (Glymour & Glymour, 2014).

Imagining a person under an alternative **X** condition is called *counterfactual* and defines an effect as the amount of change in **Y** if **X** is changed from one value to another (if this equals zero, there is no effect). Consider the putative effect of childhood trauma (CT) on depression (DE). Yet the idea of counterfactuals points out that "the effect" is imprecise since there are actually two counterfactuals and associated effects: a) trauma *experience* in individuals who actually do *not* experience trauma and b) trauma *recovery* in those who actually had experienced a trauma (but do not recover). Just referring to

PsychOpen GOLD

"the effect" denotes the *total* effect, which means that we imagine *both* changes at once (Pearl, 2009). Such a summary appears pointless in clinical psychology, at least if one aims to keep aetiology and persistence/maintenance apart which seems important since in many cases, different factors seem to be involved in the onset versus the persistence of mental disorders (McLaughlin et al., 2011).

The effect of *experiencing* a CT is, in principle, subject to a prevention RCT, but such studies would be highly ineffective. This is because CT prevention will never succeed among all individuals and is unethical if the control group is deliberately exposed to CT although exposure (and associated harm) could have been prevented. The effect of *recovery* from a trauma on the other hand; i.e., of successful intervention, can in principle be investigated in an RCT, but only with regard to specific *consequences* of CT. This not only heavily depends on what is meant with "consequences" (e.g., distress, symptom onset, incidence of a diagnosis) and the mode of intervention, it is confounded with the aim of investigating the recovery effect (Greenland, 2005a).

At least for onset, "target trials" (here prevention trials) may be an effective further tool to clarify what a counterfactual specifically means (VanderWeele, 2016). A *target trial* is an ideal trial (or experiment) the data of which would provide the desired causal answer. It clarifies qualitatively what we *would* require, what we cannot do, but what we can anyway *imagine* (Lewis, 1973; Pearl, 2013), including the target population to infer on.

For a conclusion on the *existence* of either effect, crude estimates of counterfactual depression rates (generally mean outcomes) among those with and without CT, respectively, are necessary. If we know empirically that, say, 5% of those without CT develop depression later in life, and we assume that the experience of CT in all the observed individuals would have increased this rate (i.e., the counterfactual rate is >5%; probably few clinical psychologists would doubt this), the conclusion that *CT experience increases the risk for depression* is valid. Likewise if, say, 10% of those with CT have depression later on, we may conclude that an intervention *decreases* the rate provided that we are willing to assume that the intervention would achieve a rate below 10%.

This line of qualitative argument determines the "target quantity" (Petersen & Van der Laan, 2014) one wishes to estimate. It may also trigger other considerations like *substituting* unknown counterfactual depression rates from other, "analogous" (Hill, 1965) studies. For trauma experience, a sample of children traumatized by war may be used and for recovery, a sample of traumatized, untreated but resilient children.

Granger Causality

Imagining counterfactual states of brains in Neuroscience and Neuroimaging research seems meaningful, but in associated longitudinal studies there is a shortcut to the specific causal problem of common causes hidden in the term "Granger causality" (Friston, Moran, & Seth, 2013). Originally, the term states that, given "all the information in the

PsychOpen GOLD

universe up to time t" (Eichler & Didelez, 2010), and provided that the prediction of **Y** at time t + 1 is worse if an **X** at any time up to t is disregarded, then this prior **X** is a cause of **Y** (Granger, 1969). Although equivalent with the counterfactual definition, Granger causality has been frequently mistaken as only referring to *observed* **X** variables (Eichler, 2012; Eichler & Didelez, 2010) or even just a time-series of a single **X** (Marinescu et al., 2018). This downgrades the conception into a heuristic for practical use with the easily wrong qualitative suggestion that adjustment for common causes has been sufficient. Researchers who use it must be aware of the basic bias relation indicating that they play into their own hands if they ignore unobserved common causes that effect **X** and **Y** with the same sign. These may include variables that have occurred before study onset. Generally, collecting *big data* like thousands of voxels in a brain scan is no substitute for thoughtful reflections on the processes beyond the data that any defendable causal analysis relies on (Pearl & MacKenzie, 2018).

In the Supplementary Materials we briefly discuss other popular and, mostly long-used approaches: multimethod evidence, mixed methods research and ruling out alternatives.

Directed Acyclic Graphs

So far, we have only addressed direction of bias but not when and how bias can be removed. In the Supplementary Materials, we revisit the example of the effect of CT on DE to outline the qualitative answers that the qualitative method of DAGs provides, including the subsequent study design and analysis that a particular DAG model may give rise to. The example uses a model with four common causes and causal relations among them. It reveals that adjustment for them is possible in subsequent quantitative analysis (whereby one shared cause does not require adjustment).

Importantly, DAGs may include effects of unchangeable factors like "socio-economical family status" in the example where the counterfactual conception of an effect does not apply. The conception, however, may be extended to include other actors than humans who could change an **X** (Bollen & Pearl, 2013). Sometimes such an actor is difficult to name let alone to translate into a mathematical model, wherefore instances like "socio-economical family status" are more suited "to describe something as a cause" than to "reasonably define a quantitative causal effect estimand" (VanderWeele, 2016).

Qualitative Assumptions May Make Quantitative Approaches Seem Premature

In contrary to the above instance, a DAG might reveal that bias can *not* be fully eliminated, or leave open whether an adjustment decreases or increases bias (Morgan & Winship, 2014, Chapter 3). The practical utility of DAGs for quantitative analysis rises with fewer variables in them and the number of causal relations that can be assumed

PsychOpen GOLD

not to exist (Greenland, 2017). However, setting up a DAG model should reveal this. Per se, a DAG renders all associated assumptions transparent and invites for debate and refinement on them (the reader might ask herself if this happens with the figure in the Supplementary Materials).

Anyway, controversy on a model might be so large that grounding a study and quantitative analysis on it appears unwarranted (Petersen & Van der Laan, 2014). Also, if the number of potential common causes is large and there is no way to prioritize them for reducing bias, quantitative analysis seems premature. Instead, more research is required beforehand to set up a defendable DAG. An example is the effect of internalizing symptoms on substance use where common causes may include a variety of genetic, parental, childhood, personality and environmental factors, as well as all sorts of individual variables related to neurobiological, cognitive and emotional processes (Pasche, 2012).

Conclusions

No method can fully cover all aspects of causality across research fields and specific applications, especially in a life science as complex as clinical psychology (Greenland, 2017), and "there is no universal method of scientific inference" (Gigerenzer & Marewski, 2014). Likewise, a causal query can never be fully objective, because it always involves assumptions beyond the data (Greenland, 2005b). In sharp contrast, researchers tend to "mechanizing scientists' inferences" (Gigerenzer & Marewski, 2014) and downgrade methods from tools for thoughtful cooperation between methodologists and substantive experts (Höfler, Venz, Trautmann, & Miller, 2018) into empty rituals (Gigerenzer, 2018).

In this article, we have outlined some qualitative approaches through which one may approach a crude causal answer on an average effect, plan a quantitative analysis or unravel that any analysis is currently infeasible. In fact, any causal quest must start with qualification because otherwise it would be just a mechanical exercise. The qualitative conceptions outlined here are meant as provisory heuristics that must not be ritualized but should be taken as invitations for refinement and adjustment to any particular application.

Above all, the two possible errors in causal conclusions should guide causal quests and the decision on whether the use of a highly formal method pays off (Greenland, 2012): false positive and false negative. Statistical decision theory provides the framework to formalize the balance between false positive and false negative causal conclusions. It states that the better decision is the one with the lower expected costs (Dawid, 2012).

Thoughtful causal quests are essential for explaining why phenomena occur the way they do and in providing levers through which things could be changed, for instance, in preventing disorders and improving life. Assessing causality is complex, demanding and

PsychOpen GOLD

ambivalent, but so is science. However, it makes use of the natural capacity of causal modelling which is deeply grounded in us human beings and structures how we view the world (Pearl & MacKenzie, 2018).

Funding: The authors have no funding to report.

Acknowledgments: We wish to thank Konrad Lehmann for the layout of the figure.

Competing Interests: The authors have declared that no competing interests exist.

Supplementary Materials

The supplement provides additions to the paper, namely other sources of bias than confounding, and futher popular approaches to causality besides those from the new toolbox and Granger causality. Besides, it addresses the example of the effect of childhood trauma (factor X = CT) on depression (outcome Y = DE) using a DAG (directed acyclic graph) model on common causes and subsequent study design and data analysis the model gives rise to (for access see Index of Supplementary Materials below).

Index of Supplementary Materials

Höfler, M., Trautmann, S., & Kanske, P. (2021). *Supplementary materials to "Qualitative approximations to causality: Non-randomizable factors in clinical psychology"* [Additional information]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.4838

References

Astolfi, P., & Zonta, L. A. (1999). Reduced male births in major Italian cities. *Human Reproduction, 14*(12), 3116-3119. https://doi.org/10.1093/humrep/14.12.3116

Bollen, K. A., & Pearl, J. (2013). Eight myths about causality and structural equation models. In S. L. Morgan (Ed.), *Handbook of causal analysis for social research* (pp. 301–328). New York, NY, USA: Springer.

Dablander, F. (2020). *An introduction to causal inference.* PsyArXiv. https://doi.org/10.31234/osf.io/b3fkw

Dawid, P. (2012). The decision theoretic approach to causal inference. In C. Berzuini, P. Dawid, & L. Bernardinelli (Eds.), *Causality: Statistical perspectives and applications* (pp. 25–42). New York, NY, USA: Wiley.

Eichler, M. (2012). Causal inference in time series analysis. In C. Berzuini, P. Dawid, & L. Bernardinelli (Eds.), *Causality: Statistical perspectives and applications* (pp. 327–354). New York, NY, USA: Wiley.

PsychOpen GOLD

Eichler, M., & Didelez, V. (2010). On Granger causality and the effect of interventions in time series. *Lifetime Data Analysis, 16*(1), 3-32. https://doi.org/10.1007/s10985-009-9143-3

Emsley, R., & Dunn, G. (2012). Evaluation of potential mediators in randomized trials of complex interventions (psychotherapies). In C. Berzuini, P. Dawid, & L. Bernardinelli (Eds.), *Causality: Statistical perspectives and applications* (pp. 290–309). New York, NY, USA: Wiley.

Friston, K., Moran, R., & Seth, A. K. (2013). Analysing connectivity with Granger causality and dynamic causal modelling. *Current Opinion in Neurobiology, 23*(2), 172-178. https://doi.org/10.1016/j.conb.2012.11.010

Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models*. Cambridge, United Kingdom: Cambridge University Press.

Glymour, C., & Glymour, M. (2014). Commentary: Race and sex are causes. *Epidemiology, 25*(4), 488-490. https://doi.org/10.1177/1077559506289524

Gigerenzer, G. (2018). Statistical rituals: The replication delusion and how we got there. *Advances in Methods and Practices in Psychological Science, 1*(2), 198-218. https://doi.org/10.1177/2515245918771329

Gigerenzer, G., & Marewski, J. N. (2014). Surrogate science: The idol of a universal method for scientific inference. *Journal of Management, 41*(2), 421-440. https://doi.org/10.1177/0149206314547522

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*(3), 424-438. https://doi.org/10.2307/1912791

Greenland, S. (2005a). Epidemiologic measures and policy formulation: Lessons from potential outcomes. *Emerging Themes in Epidemiology, 2*, Article 5. https://doi.org/10.1186/1742-7622-2-5

Greenland, S. (2005b). Multiple-bias modelling for analysis of observational data. *Journal of the Royal Statistical Society A, 168*(2), 267-291. https://doi.org/10.1111/j.1467-985X.2004.00349.x

Greenland, S. (2012). Causal inference as a prediction problem: Assumptions, identification and evidence synthesis. In C. Berzuini, P. Dawid, & L. Bernardinelli (Eds.), *Causality: Statistical perspectives and applications* (pp. 43–58). New York, NY, USA: Wiley.

Greenland, S. (2017). For and against methodologies: Some perspectives on recent causal and statistical inference debates. *European Journal of Epidemiology, 32*(1), 3-20. https://doi.org/10.1007/s10654-017-0230-6

Groenwold, R. H. H., Shofty, I., Miočević, M., van Smeden, M., & Klugkist, I. (2018). Adjustment for unmeasured confounding through informative priors for the confounder-outcome relation. *BMC Medical Research Methodology, 8*(1), Article 174. https://doi.org/10.1186/s12874-018-0634-3

Hernán, M. A. (2005). Invited commentary: Hypothetical interventions to define causal effects—Afterthought or prerequisite? *American Journal of Epidemiology, 162*(7), 618-620. https://doi.org/10.1093/aje/kwi255

Hill, A. B. (1965). The environment and disease: Association or causation? *Proceedings of the Royal Society of Medicine, 58*(5), 295-300. https://doi.org/10.1177/0141076814562718

PsychOpen GOLD

Höfler, M., Venz, J., Trautmann, S., & Miller, R. (2018). Writing a discussion section: How to integrate substantive and statistical expertise. *BMC Medical Research Methodology, 18*, Article 34. https://doi.org/10.1186/s12874-018-0490-1

Johnson, D. P., & Whisman, M. A. (2013). Gender differences in rumination: A meta-analysis. *Personality and Individual Differences, 55*(4), 367-374. https://doi.org/10.1016/j.paid.2013.03.019

Johnson, R. B., Russo, F., & Schoonenboom, J. (2019). Causation in mixed methods research: The meeting of philosophy, science, and practice. *Journal of Mixed Methods Research, 13*(2), 143-162. https://doi.org/10.1177/1558689817719610

Lewis, D. (1973). Counterfactuals and comparative probability. *Journal of Philosophical Logic, 2*(4), 418–446. [Reprinted (1981) in W. L. Harper, R. Stalnaker, & G. Pearce (Eds.), Ifs (pp. 57–85). Dordrecht, The Netherlands: D. Reidel].

Marinescu, I. E., Lawlor, P. N., & Kording, K. P. (2018). Quasi-experimental causality in neuroscience and behavioural research. *Nature Human Behavior, 2*(12), 891-898. https://doi.org/10.1038/s41562-018-0466-5

McLaughlin, K. A., Breslau, J., Green, J. G., Lakoma, M. D., Sampson, N. A., Zaslavsky, A. M., & Kessleret, R. C. (2011). Childhood socio-economic status and the onset, persistence, and severity of DSM-IV mental disorders in a US national sample. *Social Science & Medicine, 73*(7), 1088-1096. https://doi.org/10.1016/j.socscimed.2011.06.011

Morgan, S. L., & Winship, C. H. (2014). *Counterfactuals and causal inference. Methods and principles for social research* (2nd ed.). Cambridge, United Kingdom: Cambridge University Press.

Pasche, S. (2012). Exploring the comorbidity of anxiety and substance use disorders. *Current Psychiatry Report, 14*(3), 176-181. https://doi.org/10.1007/s11920-012-0264-0

Pearl, J. (2009). *Causality, models, reasoning and infere*nce (2nd ed.). Cambridge, United Kingdom: Cambridge University Press.

Pearl, J. (2013). Structural counterfactuals: A brief introduction. *Cognitive Science, 37*(6), 977-985. https://doi.org/10.1111/cogs.12065

Pearl, J., & MacKenzie, D. (2018). *The book of why: The new science of cause and effect*. New York, NY, USA: Basic Books.

Petersen, M. L., & Van der Laan, M. J. (2014). Causal models and learning from data: Integrating causal modeling and statistical estimation. *Epidemiology, 25*(3), 418-426. https://doi.org/10.1097/EDE.0000000000000078

Scarpa, B. (2016). Bayesian inference on predictors of sex of the baby. *Frontiers in Public Health, 4*, Article 102. https://doi.org/10.3389/fpubh.2016.00102

Schmidt, N. B., Buckner, J. D., & Keough, M. E. (2007). Anxiety sensitivity as a prospective predictor of alcohol use disorders. *Behavior Modification, 31*(2), 202-219. https://doi.org/10.1177/0145445506297019

Uher, R., & Zwicker, A. (2017). Etiology in psychiatry: Embracing the reality of poly-gene-environmental causation of mental illness. *World Psychiatry, 16*(2), 121-129. https://doi.org/10.1002/wps.20436

PsychOpen GOLD

VanderWeele, T. J. (2016). Commentary: On causes, causal inference, and potential outcomes. *International Journal of Epidemiology, 45*(6), 1809-1816. https://doi.org/10.1093/ije/dyw230

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

PsychOpen GOLD

Clinical Psychology in Europe

PsychOpen GOLD

Scientific Update and Overview

Check for updates

Prospective Mental Imagery in Depression: Impact on Reward Processing and Reward-Motivated Behaviour

Fritz Renner[1], Jessica Werthmann[1], Andreas Paetsch[1], Hannah E. Bär[1], Max Heise[1], Sanne J. E. Bruijniks[1]

[1] *Clinical Psychology and Psychotherapy Unit, Institute of Psychology, University of Freiburg, Freiburg, Germany.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e3013, https://doi.org/10.32872/cpe.3013

Received: 2020-03-30 • **Accepted:** 2021-02-08 • **Published (VoR):** 2021-06-18

Handling Editor: Winfried Rief, Philipps-University of Marburg, Marburg, Germany

Corresponding Author: Fritz Renner, Clinical Psychology and Psychotherapy Unit, Institute of Psychology, University of Freiburg, Engelbergerstr. 41, 79106 Freiburg, Germany. E-mail: fritz.renner@psychologie.uni-freiburg.de

Abstract

Background: Mental imagery has long been part of cognitive behavioural therapies. More recently, a resurgence of interest has emerged for prospective mental imagery, i.e. future-directed imagery-based thought, and its relation to reward processing, motivation and behaviour in the context of depression.

Method: We conducted a selective review on the role of prospective mental imagery and its impact on reward processing and reward-motivated behaviour in depression.

Results: Based on the current literature, we propose a conceptual mechanistic model of prospective mental imagery. Prospective mental imagery of engaging in positive activities can increase reward anticipation and reward motivation, which can transfer to increased engagement in reward-motivated behaviour and more experiences of reward, thereby decreasing depressive symptoms. We suggest directions for future research using multimodal assessments to measure the impact of prospective mental imagery from its basic functioning in the lab to real-world and clinical implementation.

Conclusion: Prospective mental imagery has the potential to improve treatment for depression where the aim is to increase reward-motivated behaviours. Future research should investigate how exactly and for whom prospective mental imagery works.

Keywords

prospective mental imagery, depression, reward processing, motivation, behavioural activation

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

Highlights

- This review provides a selected update of the literature on prospective mental imagery.
- Prospective mental imagery might decrease depression via reward processing and reward-motivated behaviours.
- Suggestions for future research to investigate these hypotheses are provided.

According to Beck's cognitive model, individuals with depression hold negative views about the self, others and the future (Beck, Rush, Shaw, & Emery, 1979). In addition to the negatively biased content of future thinking in depression, the importance of thought modality, particularly mental representations, has increasingly been recognized as a key target in psychotherapy (Arntz, 2020). Thinking about events or activities in the future might draw on imagery-based thought, involving a rich perceptual experience in the absence of external sensory input (Pearson, Naselaris, Holmes, & Kosslyn, 2015). Prospective mental imagery, i.e. future-directed imagery-based thought, has recently gained interest in the context of depression. In this review, we provide a selected update of the recent scientific literature on prospective mental imagery and its impact on reward processing (i.e., anticipation or experience of reward) and reward-motivated behaviour (i.e., behaviour driven by the motivation to attain rewards) in depression. Drawing from the wider research in this area, we present a conceptual model linking prospective mental imagery to reward processing and reward-motivated behaviour and discuss future directions for research. For a broader discussion of the nature, function and clinical applications of mental imagery in depression and other mental disorders see e.g. Blackwell, 2019; Holmes, Blackwell, Burnett Heyes, Renner, and Raes, 2016; Ji, Kavanagh, Holmes, MacLeod, and Di Simplicio, 2019; Renner and Holmes, 2018.

Identifying Core Clinical Features in Depression: Reward Processing

Major Depressive Disorder (MDD) is characterized by low mood and/or the loss of interest in previously rewarding or enjoyable activities as well as a number of other emotional, cognitive and physical symptoms (American Psychiatric Association, 2013). MDD is a heterogeneous disorder, meaning that two individuals with a diagnosis of MDD may have little or no symptoms in common (Strunk & Sasso, 2017). This presents a major challenge for research and treatment development in depression (Fried, 2015, 2017; Olbert, Gala, & Tupler, 2014). Accordingly, recent initiatives have called to focus research on core clinical features rather than psychiatric syndromes in depression and other mental disorders (Insel et al., 2010). Alterations in reward processing are common in psychopathology (Zald & Treadway, 2017) and therefore one potential treatment target in this context. In depression, alterations in reward processing might manifest in a reduced

PsychOpen GOLD

sensitivity to reward, resulting in decreased approach motivation (Alloy et al., 2016). Deficits in reward processing represent a central aspect of anhedonia, defined as "diminished interest or pleasure in almost all activities" (American Psychiatric Association, 2013). Diminished interest and diminished experienced pleasure correspond to two distinct components of reward processing: Reward anticipation and reward consummation (Gard, Germans Gard, Kring, & John, 2006; Treadway & Zald, 2011). Reward anticipation can be further divided into anticipated reward, i.e. the expectation of how rewarding/pleasant a future activity will be, and anticipatory reward, i.e. the subjective experience of how rewarding/pleasant it is to think about a future activity (Baumgartner, Pieters, & Bagozzi, 2008). Reward consummation, on the other hand, refers to rewarding/pleasant feelings experienced while engaging in enjoyable activities (Gard, Germans Gard, Kring, & John, 2006). While both components are important, research has suggested that deficits in reward-motivated behaviour are primarily driven by reduced or dysfunctional reward anticipation (Bakker et al., 2017; Gorka et al., 2014). Given that these deficits in reward processing are not adequately addressed by current treatments of depression (Treadway & Zald, 2011), one way forward in treatment innovation is to develop procedures directly targeting reward anticipation and reward-motivated behaviours.

Targeting Reward Anticipation, Reward Motivation and Reward-Motivated Behaviours Using Prospective Mental Imagery

By drawing on shared brain structures and functions (Dijkstra, Bosch, & van Gerven, 2019; Kosslyn, Ganis, & Thompson, 2001; Pearson et al., 2015), vivid mental imagery can give rise to an "as real" experience and evoke emotional responses at subjective, physiological and neural levels (Ji, Burnett Heyes, MacLeod, & Holmes, 2016). These properties of prospective mental imagery allow us to simulate engagement in behavioural activities and to "pre-experience" future activities, thereby providing "a taste" of different courses of action and their potential (emotional) consequences (Moulton & Kosslyn, 2009). This makes prospective mental imagery an excellent candidate procedure to target reward anticipation and reward-motivated behaviours.

Recently, a number of studies have emerged that tested the impact of prospective mental imagery of positive events or activities on reward anticipation and reward-motivated behaviour. These studies have the common aim of investigating new ways of promoting positive experiences, in line with recent calls for treatment innovation in depression to focus on positive affect systems (Dunn, 2012; Dunn et al., 2019). Studies presented here also fit within the broader literature that highlights the role of expectancies in mental disorders (Rief & Glombiewski, 2017; Rief et al., 2015). In depression, an absence of positive expectancies might manifest as low anticipated reward/pleasure from engaging in otherwise enjoyable activities.

PsychOpen GOLD

Several studies have investigated the impact of mental imagery on reward anticipation. In a case-series, Hallford, Sharma, and Austin (2020) asked participants with depression to rate anticipatory pleasure of future events over a no-treatment baseline phase. Participants then switched to an intervention phase in which they completed an episodic future thinking task involving vivid imagery of engaging in enjoyable upcoming activities, focussing on contextual and episodic detail of these events. The authors found large effects of the intervention on anticipatory pleasure. In two experimental studies, Hallford, Farrell, and Lynch (2020) further tested the impact of guided episodic thinking about past or future positive events on anticipated and anticipatory pleasure in a non-clinical sample. Participants were instructed to imagine past or future events from a first-person perspective emphasising positive aspects of the events. In general, the authors found support for their hypothesis that guided episodic thinking of positive events (past- and future-oriented) increases anticipated and anticipatory pleasure (compared to baseline ratings). In an earlier study, Pictet et al. (2016) tested the effect of an imagery cognitive bias modification (CBM) procedure on depression, anhedonia and anticipatory and consummatory pleasure in individuals with depressive symptoms. They found positive effects of the CBM intervention involving imagery of positive everyday experiences (compared to a closely matched control condition) on anhedonia and anticipatory pleasure as well as a stronger increase in consummatory pleasure (compared to a waitlist control condition). This is in line with earlier findings by Blackwell et al. (2015), who found positive effects of an imagery CBM intervention (compared to an active control condition) on the anhedonia item of the Beck Depression Inventory. These studies suggest that imagery-based interventions might have merit in targeting reward-related processes in depression.

Other studies have focussed on the effects of mental imagery on approach motivation. For example, Linke and Wessa (2017) tested the effects of an online mental imagery training, compared to a waitlist control condition, on reward sensitivity and approach tendencies towards positive activities and edibles. During the imagery training, participants imagined the positive emotions, affirmative thoughts and pleasurable sensations associated with previously selected positive activities every second day over a two-week period. The authors found that the imagery training successfully increased reward sensitivity and faster approach tendencies for activities (Linke & Wessa, 2017). Another study tested the effects of a positive prospective imagery intervention for planned everyday enjoyable and routine activities in a non-clinical sample (Renner, Murphy, Ji, Manly, & Holmes, 2019). Participants first selected and planned activities following the procedures described in behavioural activation treatment for depression (Martell, Addis, & Jacobson, 2001). Participants in a motivational imagery condition then vividly imagined engaging in each of their planned activities. Participants in a no-imagery control condition planned the activities, but did not engage in the imagery exercise. The prospective imagery intervention increased anticipated pleasure/reward and motivation to engage in the

PsychOpen GOLD

activities, compared to the control condition. In two independent experiments, Boland, Riggs, and Anderson (2018) asked non-depressed and dysphoric participants to simulate positive events using vivid mental imagery. They found that event likelihood (i.e., how likely participants thought the event would happen to them in the future) for positive events increased following imagery simulation of the events compared to a neutral imagery control task. Taken together, these studies demonstrate that engaging in positive prospective mental imagery of everyday activities has an impact on reward processing and transfers to approach motivation for engaging in the simulated activities.

Finally, a number of studies have investigated the transfer of the motivating effect of mental imagery interventions to self-reported activity levels outside the lab. One study conducted a secondary analysis of a randomized controlled trial (Blackwell et al., 2015) to test the effects of a four-week positive mental imagery intervention on self-reported behavioural activation in individuals with major depressive disorder (Renner, Ji, Pictet, Holmes, & Blackwell, 2017). Participants randomized to the positive imagery condition showed a greater increase in self-reported behavioural activation over the study period, compared to participants randomized to a control condition (Renner et al., 2017). In line with these findings, Renner et al. (2019; reviewed above) found that positive mental imagery simulations of planned activities was associated with higher completion of activities that participants had previously been putting-off doing. Considering all types of activities, mental imagery led to a higher completion compared to a control group receiving activity reminder messages but not to a control group without reminder messages. Thus, while these preliminary findings need replication, they provide initial evidence that the positive effects of prospective mental imagery on approach motivation for rewarding activities might transfer to reward-motivated behaviour outside the laboratory.

The studies reviewed here suggest that positive prospective mental imagery of activities can facilitate reward anticipation, reward motivation and reward-motivated behaviour. This is clinically relevant given that reward anticipation deficits are not adequately addressed in current treatments of depression (Treadway & Zald, 2011). Drawing from this broader literature, in the following paragraph, we provide a conceptual model describing how prospective mental imagery could promote the engagement in reward-motivated behaviour and its clinical potential to impact mood and depressive symptoms.

Mental Imagery as Motivational Amplifier: A Conceptual Model

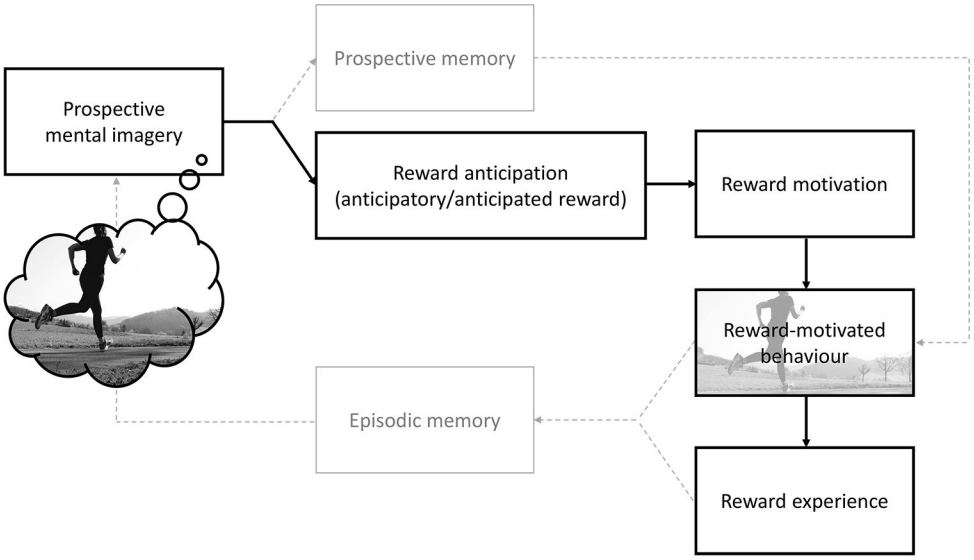
Figure 1 provides a conceptual model illustrating the expected effects of prospective mental imagery on reward-motivated behaviour: positive prospective mental imagery of activities gives rise to a *motivational amplifier* effect by facilitating reward anticipation, reward motivation and reward-motivated behaviour. Given the power of mental imagery

PsychOpen GOLD

to amplify emotions (Holmes, Geddes, Colom, & Goodwin, 2008), it has the potential to evoke the anticipation of reward-related emotions by drawing upon prior knowledge and experiences (Kavanagh et al., 2005; Moulton & Kosslyn, 2009; Schacter et al., 2008). Anticipating the positive emotional consequences of future behaviour, in turn, predicts reward motivation and reward-motivated behaviour (Hallford & Sharma, 2019; Mellers & McGraw, 2001; Sherdell, Waugh, & Gotlib, 2012; Treadway & Zald, 2011). This transfer from imagery to behaviour might be further facilitated by a boost in prospective memory for the simulated activity (Schacter, Benoit, & Szpunar, 2017). Actual engagement in simulated activities might then lead to a reward experience. The episodic memory of this experience, in turn, affects subsequent imagery simulations of similar future activities (Figure 1, see Table 1 for key term definitions).

Figure 1

Conceptual Model of the Motivational Amplifier Hypothesis



Note. Positive prospective mental imagery of engaging in (everyday) activities (e.g. running) can increase reward anticipation (anticipatory and anticipated reward) and reward motivation, which can transfer to increased engagement in reward-motivated behaviour and reward experience. Note that concepts in bold boxes are part of the literature review above.

PsychOpen GOLD

Table 1

Definition of Key Terms Used in the Conceptual Model

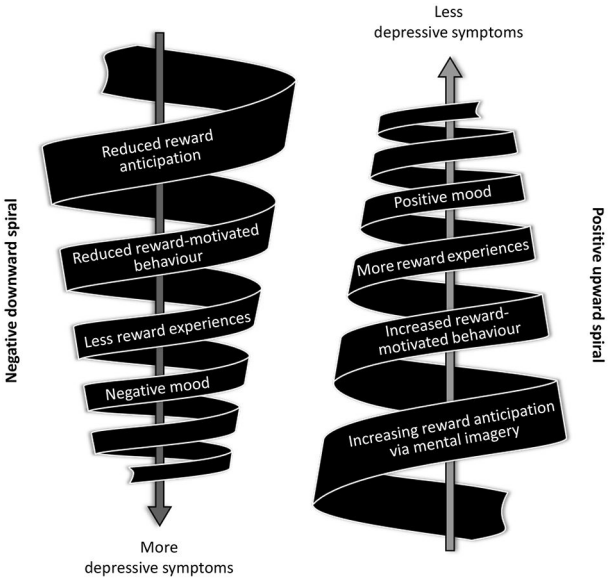
Concept	Definition
Prospective mental imagery	Future-directed imagery-based thought, involving a rich perceptual experience without external sensory input
Reward processing	
Reward anticipation	
Anticipated reward	Expectation of how rewarding/pleasant a future activity will be
Anticipatory reward	Subjective experience of how rewarding/pleasant it is to think about a future activity
Reward experience	Pleasant/rewarding feelings experienced while engaging in the activity
Reward motivation	Amount of effort an individual is prepared to expend for reward attainment
Reward-motivated behaviour	Behaviour driven by the motivation to attain rewards
Prospective memory	Remembering to carry out a planned activity in the future
Episodic memory	Memory of personal experiences

The conceptual model has clinical potential insofar as it illustrates how positive prospective mental imagery could be used to promote behavioural activation in depression. The central assumption here is that reduced reward anticipation in depression contributes to a downward-spiral of reduced reward-motivated behaviours due to a loss of interest in previously rewarding activities that reduces the experience of rewards in daily life and, consequently, worsens depressive symptoms such as low mood (Figure 2). Based on our conceptual model, we hypothesise that positive prospective mental imagery of everyday activities can reverse this process by acting as a *motivational amplifier* boosting behavioural activation and thereby alleviating depressive symptoms (Figure 2).

PsychOpen GOLD

Figure 2

Reversing the Downward Spiral of Depression with Prospective Mental Imagery



Note. Key assumption: Reduced reward anticipation leads to a downward spiral of reduced reward-motivated behaviour and less reward experiences, resulting in increased depressive symptoms (left side). Key hypothesis: Targeting reward anticipation using vivid prospective mental imagery leads to increased reward-motivated behaviour and more reward experiences, resulting in a decrease of depressive symptoms (right side).

In summary, the recent literature reviewed above supports the idea that positive prospective mental imagery of activities can facilitate reward anticipation, reward motivation and reward-motivated behaviour. However, the reviewed studies primarily relied on self-report and more work is needed to investigate how the transfer of imagery to behaviour beyond the laboratory can be facilitated and how prospective mental imagery might benefit clinical practice.

Future Directions

Recent literature has emphasised the importance of conducting multimodal research to understand and thereby improve clinical interventions (Holmes, Craske, & Graybiel, 2014). A future endeavour might thus be to extend previous research on the mechanism underlying prospective mental imagery beyond self-report. Neuroimaging, for instance, has provided initial evidence for a recruitment of brain regions implicated in reward processing, such as the dorsal (caudate nucleus) and ventral striatum (nucleus accumbens),

PsychOpen GOLD

during prospective mental imagery of positive events (D'Argembeau, Xue, Lu, Van der Linden, & Bechara, 2008; Gerlach, Spreng, Madore, & Schacter, 2014). Other measures that have been used to evaluate imagery-based manipulations and reward processing include pupil size, attention bias and approach/avoidance tendencies (Anderson, Laurent, & Yantis, 2011; Henderson, Bradley, & Lang, 2018; Linke & Wessa, 2017; Schneider, Leuchs, Czisch, Sämann, & Spoormaker, 2018; Werthmann, Jansen, & Roefs, 2016). Similar approaches could prove useful to further investigate reward processing as a working mechanism of prospective mental imagery for behavioural activation. Ultimately, investigations beyond self-report will help us fine-tune imagery-based interventions and thereby guide treatment innovation for depression.

Another important question in experimental psychopathology research is how lab-based findings hold up under everyday circumstances. Recent research in the broader field of clinical psychology demonstrated the added value of combining laboratory experiments with Ecological Momentary Assessment (EMA; e.g. Bakker et al., 2019; Moran, Culbreth, & Barch, 2017; Ramirez & Miranda, 2014) and of integrating experimental manipulations into daily life (Huffziger et al., 2013; Huffziger, Ebner-Priemer, Koudela, Reinhard, & Kuehner, 2012). For example, Bakker and colleagues (2019) showed that when neural activity in reward processing regions was lower, assessed in the lab, EMA of reward anticipation and activity pleasantness were increasingly dissociated from one another. Findings like these can be valuable to refine or develop interventions by identifying treatment targets (e.g. coupling of anticipation and engagement) under well-specified circumstances (e.g. low neural activity in reward-processing brain regions). These findings are also relevant in the context of earlier findings regarding challenges with the transfer of experimental prospective mental imagery interventions from lab to the real world (Renner et al., 2019). Integration of EMA with lab-based experiments as well as the use of Ecological Momentary Interventions (EMI; Myin-Germeys, Klippel, Steinhart, & Reininghaus, 2016) or manipulations of reward processing through prospective mental imagery in daily life may offer an additional means to facilitate the transfer from lab to real-world behaviour.

Moreover, individuals may differ in the extent to which they benefit from prospective mental imagery interventions. Studies already pointed to individual variation in processes related to prospective mental imagery, such as anticipatory pleasure (Hallford, Sharma, & Austin, 2020) and the perception of reward (Locke & Braver, 2008), and suggested promising potential predictors or moderators that should be investigated in future studies. Potential moderators include individual differences in generating vivid mental imagery (Blackwell et al., 2015; Renner et al., 2017, 2019), procrastination (Renner et al., 2019) and the number of depressive episodes (Blackwell et al., 2015). Additionally, when moving towards clinical applications, the question of how individual differences interact with the active ingredients of prospective imagery interventions becomes relevant. For example, initial evidence highlights the importance of simulating rewarding aspects of

PsychOpen GOLD

planned activities in non-clinical participants, but it has not yet been investigated if individuals who have difficulties experiencing pleasure/reward from (thinking about) activities (i.e., individuals with anhedonia) benefit from simulating rewarding aspects of planned activities. Relatedly, prospective mental imagery interventions developed in the lab might need to be adjusted for clinical groups. For example, individuals with low mood and depression experience more difficulty in generating vivid prospective imagery and experience less spontaneous positive imagery (Hallford, Barry, et al., 2020; Holmes et al., 2016; Ji, Holmes, MacLeod, & Murphy, 2019; Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011). Individuals with depression might thus benefit from additional training in generating vivid imagery for positive events.

Imagery based interventions have been used as stand-alone interventions as well as part of regular CBT for depression (Renner & Holmes, 2018). So far, we have mainly discussed the use of prospective mental imagery to target specific core clinical features in depression. Another line of inquiry involves integrating prospective imagery procedures to enhance the effects of established treatments for depression. Recent studies have suggested that CBT might be improved by the use of cognitive support strategies that enhance memory for the session content, and subsequently outcome (Harvey et al., 2017, 2014). We suggest that prospective mental imagery could potentially work as a cognitive support strategy for CBT skill acquisition. CBT skills have been defined as the ability to re-evaluate the accuracy of one's own automatic beliefs or underlying stable cognitive patterns (a cognitive therapy skill; CT skill) and to engage proactively in pleasurable activities (a behavioral therapy skill; BT skill) (Strunk, DeRubeis, Chiu, & Alvarez, 2007). In non-clinical settings, mental imagery has been linked to improved skill acquisition in health-related and sport contexts (Anton, Bean, Hammonds, & Stefanidis, 2017; Dana & Gozalzadeh, 2017). In a clinical setting, mental imagery has been indirectly linked to BT skill by demonstrating an impact on self-reported behavioural activation (Renner et al., 2017; reviewed above). Future studies should investigate how and for whom prospective mental imagery may increase the acquisition of CBT skills. Further down the road, for a successful clinical implementation, training sessions in prospective mental imagery could be included as part of a regular behavioural activation treatment protocol (Martell et al., 2001) to facilitate engagement in pleasant and rewarding activities.

Overall Conclusion

In this review, we provided a selected update of the recent scientific literature on prospective mental imagery and its impact on reward processing and reward-motivated behaviour in depression. Overall, the studies presented here suggest that prospective mental imagery simulations of activities can increase reward processing related to these activities as well as reward motivation and reward-motivated behaviors. Thus, these initial studies suggest that prospective mental imagery is a promising experimental

PsychOpen GOLD

intervention in the context of depression, where the aim is to increase engagement in potentially rewarding activities. Future directions for research in this area may focus on multimodal assessments of prospective mental imagery effects to gain a better understanding of the processes involved, from basic mechanisms to everyday situations and its clinical applications.

Funding: All authors are supported by a Sofja Kovalevskaja Award from the Alexander von Humboldt Foundation and the German Federal Ministry for Education and Research awarded to FR.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

Twitter Accounts: @Fritz_Renner, @andreaspaetsch

References

Alloy, L. B., Olino, T., Freed, R. D., & Nusslock, R. (2016). Role of reward sensitivity and processing in major depressive and bipolar spectrum disorders. *Behavior Therapy, 47*(5), 600-621. https://doi.org/10.1016/j.beth.2016.02.014

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA, USA: American Psychiatric Publishing.

Anderson, B. A., Laurent, P. A., & Yantis, S. (2011). Value-driven attentional capture. *Proceedings of the National Academy of Sciences of the United States of America, 108*(25), 10367-10371. https://doi.org/10.1073/pnas.1104047108

Anton, N. E., Bean, E. A., Hammonds, S. C., & Stefanidis, D. (2017). Application of mental skills training in surgery: A review of its effectiveness and proposed next steps. *Journal of Laparoendoscopic & Advanced Surgical Techniques, 27*(5), 459-469. https://doi.org/10.1089/lap.2016.0656

Arntz, A. (2020). A plea for more attention to mental representations. *Journal of Behavior Therapy and Experimental Psychiatry, 67*, Article 101510. https://doi.org/10.1016/j.jbtep.2019.101510

Bakker, J. M., Goossens, L., Kumar, P., Lange, I. M. J., Michielse, S., Schruers, K., . . . Wichers, M. (2019). From laboratory to life: Associating brain reward processing with real-life motivated behaviour and symptoms of depression in non-help-seeking young adults. *Psychological Medicine, 49*(14), 2441-2451. https://doi.org/10.1017/S0033291718003446

Bakker, J. M., Goossens, L., Lange, I., Michielse, S., Schruers, K., Lieverse, R., . . . Wichers, M. (2017). Real-life validation of reduced reward processing in emerging adults with depressive symptoms. *Journal of Abnormal Psychology, 126*(6), 713-725. https://doi.org/10.1037/abn0000294

PsychOpen GOLD

Baumgartner, H., Pieters, R., & Bagozzi, R. P. (2008). Future-oriented emotions: Conceptualization and behavioral effects. *European Journal of Social Psychology, 38*(4), 685-696. https://doi.org/10.1002/ejsp.467

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression.* New York, NY, USA: Guilford Press.

Blackwell, S. E. (2019). Mental imagery: From basic research to clinical practice. *Journal of Psychotherapy Integration, 29*(3), 235-247. https://doi.org/10.1037/int0000108

Blackwell, S. E., Browning, M., Mathews, A., Pictet, A., Welch, J., Davies, J., . . . Holmes, E. A. (2015). Positive imagery-based cognitive bias modification as a web-based treatment tool for depressed adults: A randomized controlled trial. *Clinical Psychological Science, 3*(1), 91-111. https://doi.org/10.1177/2167702614560746

Boland, J., Riggs, K. J., & Anderson, R. J. (2018). A brighter future: The effect of positive episodic simulation on future predictions in non-depressed, moderately dysphoric and highly dysphoric individuals. *Behaviour Research and Therapy, 100*, 7-16. https://doi.org/10.1016/j.brat.2017.10.010

Dana, A., & Gozalzadeh, E. (2017). Internal and external imagery effects on tennis skills among novices. *Perceptual and Motor Skills, 124*(5), 1022-1043. https://doi.org/10.1177/0031512517719611

D'Argembeau, A., Xue, G., Lu, Z.-L., Van der Linden, M., & Bechara, A. (2008). Neural correlates of envisioning emotional events in the near and far future. *NeuroImage, 40*(1), 398-407. https://doi.org/10.1016/j.neuroimage.2007.11.025

Dijkstra, N., Bosch, S. E., & van Gerven, M. A. J. (2019). Shared neural mechanisms of visual perception and imagery. *Trends in Cognitive Sciences, 23*(5), 423-434. https://doi.org/10.1016/j.tics.2019.02.004

Dunn, B. D. (2012). Helping depressed clients reconnect to positive emotional experience: Current insights and future directions. *Clinical Psychology & Psychotherapy, 19*, 326-340. https://doi.org/10.1002/cpp.1799

Dunn, B. D., Widnall, E., Reed, N., Owens, C., Campbell, J., & Kuyken, W. (2019). Bringing light into darkness: A multiple baseline mixed methods case series evaluation of Augmented Depression Therapy (ADepT). *Behaviour Research and Therapy, 120*, Article 103418. https://doi.org/10.1016/j.brat.2019.103418

Fried, E. I. (2015). Problematic assumptions have slowed down depression research: Why symptoms, not syndromes are the way forward. *Frontiers in Psychology, 6*, Article 309. https://doi.org/10.3389/fpsyg.2015.00309

Fried, E. I. (2017). Moving forward: How depression heterogeneity hinders progress in treatment and research. *Expert Review of Neurotherapeutics, 17*(5), 423-425. https://doi.org/10.1080/14737175.2017.1307737

Gard, D. E., Germans Gard, M., Kring, A. M., & John, O. P. (2006). Anticipatory and consummatory components of the experience of pleasure: A scale development study. *Journal of Research in Personality, 40*, 1086-1102. https://doi.org/10.1016/j.jrp.2005.11.001

PsychOpen GOLD

Gerlach, K. D., Spreng, R. N., Madore, K. P., & Schacter, D. L. (2014). Future planning: Default network activity couples with frontoparietal control network and reward-processing regions during process and outcome simulations. *Social Cognitive and Affective Neuroscience, 9*(12), 1942-1951. https://doi.org/10.1093/scan/nsu001

Gorka, S. M., Huggins, A. A., Fitzgerald, D. A., Nelson, B. D., Phan, K. L., & Shankman, S. A. (2014). Neural response to reward anticipation in those with depression with and without panic disorder. *Journal of Affective Disorders, 164*, 50-56. https://doi.org/10.1016/j.jad.2014.04.019

Hallford, D. J., Barry, T. J., Austin, D. W., Raes, F., Takano, K., & Klein, B. (2020). Impairments in episodic future thinking for positive events and anticipatory pleasure in major depression. *Journal of Affective Disorders, 260*, 536-543. https://doi.org/10.1016/j.jad.2019.09.039

Hallford, D. J., Farrell, H., & Lynch, E. (2020). Increasing anticipated and anticipatory pleasure through episodic thinking. *Emotion.* Advance online publication. https://doi.org/10.1037/emo0000765

Hallford, D. J., & Sharma, M. K. (2019). Anticipatory pleasure for future experiences in schizophrenia spectrum disorders and major depression: A systematic review and meta-analysis. *British Journal of Clinical Psychology, 58*(4), 357-383. https://doi.org/10.1111/bjc.12218

Hallford, D. J., Sharma, M. K., & Austin, D. W. (2020). Increasing anticipatory pleasure in major depression through enhancing episodic future thinking: A randomized single-case series trial. *Journal of Psychopathology and Behavioral Assessment, 42*(4), 751-764. https://doi.org/10.1007/s10862-020-09820-9

Harvey, A. G., Dong, L., Lee, J. Y., Gumport, N. B., Hollon, S. D., Rabe-Hesketh, S., . . . Armstrong, C. C. (2017). Can integrating the Memory Support Intervention into cognitive therapy improve depression outcome? Study protocol for a randomized controlled trial. *Trials, 18*, Article 539. https://doi.org/10.1186/s13063-017-2276-x

Harvey, A. G., Lee, J., Williams, J., Hollon, S. D., Walker, M. P., Thompson, M. A., & Smith, R. (2014). Improving outcome of psychosocial treatments by enhancing memory and learning. *Perspectives on Psychological Science, 9*(2), 161-179. https://doi.org/10.1177/1745691614521781

Henderson, R. R., Bradley, M. M., & Lang, P. J. (2018). Emotional imagery and pupil diameter. *Psychophysiology, 55*(6), Article e13050. https://doi.org/10.1111/psyp.13050

Holmes, E. A., Blackwell, S. E., Burnett Heyes, S., Renner, F., & Raes, F. (2016). Mental imagery in depression: Phenomenology, potential mechanisms, and treatment implications. *Annual Review of Clinical Psychology, 12*, 249-280. https://doi.org/10.1146/annurev-clinpsy-021815-092925

Holmes, E. A., Craske, M. G., & Graybiel, A. M. (2014). Psychological treatments: A call for mental-health science. Clinicians and neuroscientists must work together to understand and improve psychological treatments. *Nature, 511*(7509), 287-289. https://doi.org/10.1038/511287a

Holmes, E. A., Geddes, J. R., Colom, F., & Goodwin, G. M. (2008). Mental imagery as an emotional amplifier: Application to bipolar disorder. *Behaviour Research and Therapy, 46*(12), 1251-1258. https://doi.org/10.1016/j.brat.2008.09.005

Huffziger, S., Ebner-Priemer, U., Eisenbach, C., Koudela, S., Reinhard, I., & Zamoscik, V., … Kuehner, C. (2013). Induced ruminative and mindful attention in everyday life: An experimental

PsychOpen GOLD

ambulatory assessment study. *Journal of Behavior Therapy and Experimental Psychiatry, 44*(3), 322-328. https://doi.org/10.1016/j.jbtep.2013.01.007

Huffziger, S., Ebner-Priemer, U., Koudela, S., Reinhard, I., & Kuehner, C. (2012). Induced rumination in everyday life: Advancing research approaches to study rumination. *Personality and Individual Differences, 53*(6), 790-795. https://doi.org/10.1016/j.paid.2012.06.009

Insel, T. R., Cuthbert, B., Garvey, M., Heinssen, R., Pine, D. S., Quinn, K., . . . Wang, P. (2010). Research Domain Criteria (RDoC): Toward a new classification framework for research on mental disorders. *The American Journal of Psychiatry, 167*, 748-751. https://doi.org/10.1176/appi.ajp.2010.09091379

Ji, J. L., Burnett Heyes, S., MacLeod, C., & Holmes, E. A. (2016). Emotional mental imagery as simulation of reality: Fear and beyond. A tribute to Peter Lang. *Behavior Therapy, 47*(5), 702-719. https://doi.org/10.1016/j.beth.2015.11.004

Ji, J. L., Holmes, E. A., MacLeod, C., & Murphy, F. C. (2019). Spontaneous cognition in dysphoria: Reduced positive bias in imagining the future. *Psychological Research, 83*, 817-831. https://doi.org/10.1007/s00426-018-1071-y

Ji, J. L., Kavanagh, D. J., Holmes, E. A., MacLeod, C., & Di Simplicio, M. (2019). Mental imagery in psychiatry: Conceptual and clinical implications. *CNS Spectrums, 24*, 114-126. https://doi.org/10.1017/S1092852918001487

Kavanagh, D. J., Andrade, J., & May, J. (2005). Imaginary relish and exquisite torture: The elaborated intrusion theory of desire. *Psychological Review, 112*(2), 446-467. https://doi.org/10.1037/0033-295X.112.2.446

Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience, 2*(9), 635-642. https://doi.org/10.1038/35090055

Linke, J., & Wessa, M. (2017). Mental imagery training increases wanting of rewards and reward sensitivity and reduces depressive symptoms. *Behavior Therapy, 48*(5), 695-706. https://doi.org/10.1016/j.beth.2017.04.002

Locke, H. S., & Braver, T. S. (2008). Motivational influences on cognitive control: Behavior, brain activation, and individual differences. *Cognitive, Affective, & Behavioral Neuroscience, 8*, 99-112. https://doi.org/10.3758/CABN.8.1.99

Martell, C. R., Addis, M. E., & Jacobson, N. S. (2001). *Depression in context: Strategies for guided action*. New York, NY, USA: Norton Press.

Mellers, B. A., & McGraw, A. P. (2001). Anticipated emotions as guides to choice. *Current Directions in Psychological Science, 10*(6), 210-214. https://doi.org/10.1111/1467-8721.00151

Moran, E. K., Culbreth, A. J., & Barch, D. M. (2017). Ecological momentary assessment of negative symptoms in schizophrenia: Relationships to effort-based decision making and reinforcement learning. *Journal of Abnormal Psychology, 126*(1), 96-105. https://doi.org/10.1037/abn0000240

Morina, N., Deeprose, C., Pusowski, C., Schmid, M., & Holmes, E. A. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of Anxiety Disorders, 25*(8), 1032-1037. https://doi.org/10.1016/j.janxdis.2011.06.012

PsychOpen GOLD

Moulton, S. T., & Kosslyn, S. M. (2009). Imagining predictions: Mental imagery as mental emulation. *Philosophical Transactions of the Royal Society of London: Series B. Biological Sciences, 364*(1521), 1273-1280. https://doi.org/10.1098/rstb.2008.0314

Myin-Germeys, I., Klippel, A., Steinhart, H., & Reininghaus, U. (2016). Ecological momentary interventions in psychiatry. *Current Opinion in Psychiatry, 29*(4), 258-263. https://doi.org/10.1097/YCO.0000000000000255

Olbert, C. M., Gala, G. J., & Tupler, L. A. (2014). Quantifying heterogeneity attributable to polythetic diagnostic criteria: Theoretical framework and empirical application. *Journal of Abnormal Psychology, 123*(2), 452-462. https://doi.org/10.1037/a0036068

Pearson, J., Naselaris, T., Holmes, E. A., & Kosslyn, S. M. (2015). Mental imagery: Functional mechanisms and clinical applications. *Trends in Cognitive Sciences, 19*(10), 590-602. https://doi.org/10.1016/j.tics.2015.08.003

Pictet, A., Jermann, F., & Ceschi, G. (2016). When less could be more: Investigating the effects of a brief internet-based imagery cognitive bias modification intervention in depression. *Behaviour Research and Therapy, 84*, 45-51. https://doi.org/10.1016/j.brat.2016.07.008

Ramirez, J., & Miranda, R., Jr. (2014). Alcohol craving in adolescents: Bridging the laboratory and natural environment. *Psychopharmacology, 231*, 1841-1851. https://doi.org/10.1007/s00213-013-3372-6

Renner, F., & Holmes, E. A. (2018). Mental imagery in Cognitive Therapy: Research and examples of imagery-focussed emotion, cognition and behaviour change. In R. L. Leahy (Ed.), *Science and practice in cognitive therapy: Foundations, mechanisms, and applications* (pp. 142-158). New York, NY, USA: Guilford Press.

Renner, F., Ji, J. L., Pictet, A., Holmes, E. A., & Blackwell, S. E. (2017). Effects of engaging in repeated mental imagery of future positive events on behavioural activation in individuals with major depressive disorder. *Cognitive Therapy and Research, 41*(3), 369-380. https://doi.org/10.1007/s10608-016-9776-y

Renner, F., Murphy, F. C., Ji, J. L., Manly, T., & Holmes, E. A. (2019). Mental imagery as a "motivational amplifier" to promote activities. *Behaviour Research and Therapy, 114*, 51-59. https://doi.org/10.1016/j.brat.2019.02.002

Rief, W., & Glombiewski, J. A. (2017). The role of expectations in mental disorders and their treatment. *World Psychiatry, 16*(2), 210-211. https://doi.org/10.1002/wps.20427

Rief, W., Glombiewski, J. A., Gollwitzer, M., Schubö, A., Schwarting, R., & Thorwart, A. (2015). Expectancies as core features of mental disorders. *Current Opinion in Psychiatry, 28*(5), 378-385. https://doi.org/10.1097/YCO.0000000000000184

Schacter, D. L., Addis, D. R., & Buckner, R. L. (2008). Episodic simulation of future events: Concepts, data, and applications. *Annals of the New York Academy of Sciences, 1124*, 39-60. https://doi.org/10.1196/annals.1440.001

Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic future thinking: Mechanisms and functions. *Current Opinion in Behavioral Sciences, 17*, 41-50. https://doi.org/10.1016/j.cobeha.2017.06.002

PsychOpen GOLD

Schneider, M., Leuchs, L., Czisch, M., Sämann, P. G., & Spoormaker, V. I. (2018). Disentangling reward anticipation with simultaneous pupillometry / fMRI. *NeuroImage, 178*, 11-22. https://doi.org/10.1016/j.neuroimage.2018.04.078

Sherdell, L., Waugh, C. E., & Gotlib, I. H. (2012). Anticipatory pleasure predicts motivation for reward in major depression. *Journal of Abnormal Psychology, 121*(1), 51-60. https://doi.org/10.1037/a0024945

Strunk, D. R., DeRubeis, R. J., Chiu, A. W., & Alvarez, J. (2007). Patients' competence in and performance of cognitive therapy skills: Relation to the reduction of relapse risk following treatment for depression. *Journal of Consulting and Clinical Psychology, 75*(4), 523-530. https://doi.org/10.1037/0022-006X.75.4.523

Strunk, D. R., & Sasso, K. (2017). Phenomenology and course of mood disorders. In R. J. DeRubeis & D. R. Strunk (Eds.), *The Oxford handbook of mood disorders* (pp. 37-48). Oxford, United Kingdom: Oxford University Press.

Treadway, M. T., & Zald, D. H. (2011). Reconsidering anhedonia in depression: Lessons from translational neuroscience. *Neuroscience and Biobehavioral Reviews, 35*(3), 537-555. https://doi.org/10.1016/j.neubiorev.2010.06.006

Werthmann, J., Jansen, A., & Roefs, A. (2016). Make up your mind about food: A healthy mindset attenuates attention for high-calorie food in restrained eaters. *Appetite, 105*, 53-59. https://doi.org/10.1016/j.appet.2016.05.005

Zald, D. H., & Treadway, M. T. (2017). Reward processing, neuroeconomics, and psychopathology. *Annual Review of Clinical Psychology, 13*(1), 471-495. https://doi.org/10.1146/annurev-clinpsy-032816-044957

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

Clinical Psychology in Europe

PsychOpen GOLD

Letter to the Editor, Commentary

'Open Source' Opportunities for Enhanced Collaboration in Psychotherapy Science

Conal Twomey[1], Richard Cody[2], John A. Johnson[3], Gary O'Reilly[4]

[1] *Health Service Executive, Dublin, Ireland.* **[2]** *Púca Technologies Limited, Dublin, Ireland.* **[3]** *Department of Psychology, Pennsylvania State University, State College, PA, USA.* **[4]** *School of Psychology, University College Dublin, Dublin, Ireland.*

Clinical Psychology in Europe, 2021, Vol. 3(2), Article e6569, https://doi.org/10.32872/cpe.6569

Published (VoR): 2021-06-18

Corresponding Author: Conal Twomey, Ballyfermot & Palmerstown Primary Care & Mental Health Centre, Upper Ballyfermot Road, Dublin 10, D10 C973, Ireland. E-mail: conal.twomey@hse.ie

According to Marvin Goldfried, psychotherapy remains an infant science characterised by a lack of consensus surrounding core and basic principles, research-practice disparity, and excessive theory-reinvention by competing schools of therapy (Goldfried, 2020). Goldfried's concerns together point to suboptimal collaboration within the psychotherapy research community. In our view, collaboration could be improved through the wider application of 'open source' software development principles (e.g., open access, free distribution, and unconstrained modification) to psychotherapy science.

The origins of open source illustrate its promotion of collaboration. Initially, software products were invariably perfected 'behind-closed-doors' before being released as copyrighted products. In the mid-1990s, however, the Internet enabled a new way of working: members of online developer communities started to freely share modifiable software source code with each other, leading to the creation of open and free networks of online collaboration (Raymond, 1999), and subsequently to the production of several high-quality software and Internet products (e.g., Linux and Wikipedia) and mainstream adoption across industries.

Like open source, science is—at its best—an open, collaborative endeavor (Johnson, 2014). It is therefore unsurprising that open source has increasingly infiltrated science in recent years, most notably in the 'open science' movement, which promotes methodological transparency and open access to data and research outputs (Vicente-Saez & Martinez-Fuentes, 2018); but also in the production of laboratory equipment (Pearce, 2014), off-patent medications (Woelfle et al., 2011), and psychometric questionnaires (Dworak et al., 2021; Goldberg et al., 2006). Regarding psychotherapy, journals routinely

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License, CC BY 4.0, which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited.

promote open-science practices, data from psychotherapy studies are often shared (e.g., in patient level meta-analyses), many outcome measures are freely available online, and there are an increasing number of open research networks.

Regrettably given their potential to enhance the open collaboration inherent in good science, there exist few applications of open source principles to the development of psychotherapy interventions. Most intervention manuals are not freely available online, limiting access and creating a financial barrier to the exploration of manuals from different schools of therapy. Moreover, for the vast majority of psychotherapies, copyright control and vested interests discourage (a) the collaborative modification and distribution of new versions of intervention manuals, and (b) the collaborative combination of components from different schools of therapy into transtheoretical interventions, or ‘process-based therapies’ (Hofmann & Hayes, 2019).

Regarding (a), such collaboration could be enabled if freely *modifiable* versions of intervention manuals were periodically released on open source platforms such as the Open Science Framework (https://osf.io). This would signpost progress and later facilitate the empirical comparison of different versions, in turn facilitating ‘component analyses’ that tap into basic principles. On a cautionary note, there is potential for the misuse of open source intervention manuals by unqualified persons and this should be closely monitored (Goldberg et al., 2006). Regarding (b), the vested interest of a school of therapy is to keep the learner within their school, so that the learner can eventually graduate as a proponent of the school’s teachings; however, the wider community interest is to build unifying theories that transcend the teachings of particular schools (Goldfried, 2020). Transtheoretical open source interventions provide a means for this theory unification.

Funding: The authors have no funding to report.

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

References

Dworak, E. M., Revelle, W., Doebler, P., & Condon, D. M. (2021). Using the International Cognitive Ability Resource as an open source tool to explore individual differences in cognitive ability. *Personality and Individual Differences, 169*, Article 109906. https://doi.org/10.1016/j.paid.2020.109906

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality, 40*(1), 84-96. https://doi.org/10.1016/j.jrp.2005.08.007

PsychOpen GOLD

Goldfried, M. R. (2020). The field of psychotherapy: Over 100 years old and still an infant science. *Clinical Psychology in Europe, 2*(1), Article e2753. https://doi.org/10.32872/cpe.v2i1.2753

Hofmann, S. G., & Hayes, S. C. (2019). The future of intervention science: Process-based therapy. *Clinical Psychological Science, 7*(1), 37-50. https://doi.org/10.1177/2167702618772296

Johnson, J. A. (2014). Measuring thirty facets of the Five Factor Model with a 120-item public domain inventory: Development of the IPIP-NEO-120. *Journal of Research in Personality, 51*, 78-89. https://doi.org/10.1016/j.jrp.2014.05.003

Pearce, J. M. (2014). Laboratory equipment: Cut costs with open-source hardware [Correspondence]. *Nature, 505*(7485), 618. https://doi.org/10.1038/505618d

Raymond, E. (1999). *The cathedral and the bazaar: Musings on Linux and Open Source by an accidental revolutionary*. O'Reilly Media.

Vicente-Saez, R., & Martinez-Fuentes, C. (2018). Open Science now: A systematic literature review for an integrated definition. *Journal of Business Research, 88*, 428-436. https://doi.org/10.1016/j.jbusres.2017.12.043

Woelfle, M., Olliaro, P., & Todd, M. H. (2011). Open science is a research accelerator. *Nature Chemistry, 3*(10), 745-748. https://doi.org/10.1038/nchem.1149

EACLIPT

Clinical Psychology in Europe (CPE) is the official journal of the European Association of Clinical Psychology and Psychological Treatment (EACLIPT).

leibniz-psychology.org

PsychOpen GOLD is a publishing service by Leibniz Institute for Psychology (ZPID), Germany.

PsychOpen GOLD