Therapist-supported Internet-based cognitive behaviour therapy yields similar effects as face-to-face therapy for psychiatric and somatic disorders: an updated systematic review and meta-analysis

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Providing therapist-guided cognitive behaviour therapy via the Internet (ICBT) has advantages, but a central research question is to what extent similar clinical effects can be obtained as with gold-standard face-to-face cognitive behaviour therapy (CBT). In a previous meta-analysis published in this journal, which was updated in 2018, we found evidence that the pooled effects for the two formats were equivalent in the treatment of psychiatric and somatic disorders, but the number of published randomized trials was relatively low (n=20). As this is a field that moves rapidly, the aim of the current study was to conduct an update of our systematic review and meta-analysis of the clinical effects of ICBT vs. face-to-face CBT for psychiatric and somatic disorders in adults. We searched the PubMed database for relevant studies published from 2016 to 2022. The main inclusion criteria were that studies had to compare ICBT to face-to-face CBT using a randomized controlled design and targeting adult populations. Quality assessment was made using the Cochrane risk of bias criteria (Version 1), and the main outcome estimate was the pooled standardized effect size (Hedges' g) using a random effects model. We screened 5,601 records and included 11 new randomized trials, adding them to the 20 previously identified ones (total n=31). Sixteen different clinical conditions were targeted in the included studies. Half of the trials were in the fields of depression/depressive symptoms or some form of anxiety disorder. The pooled effect size across all disorders was g=0.02 (95% CI: –0.09 to 0.14) and the quality of the included studies was acceptable. This meta-analysis further supports the notion that therapist-supported ICBT yields similar effects as face-to-face CBT.

Key words: Cognitive behaviour therapy, Internet-based cognitive-behaviour therapy, face-to-face therapy, depression, anxiety disorders, online psychotherapy, meta-analysis

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One of the most central challenges for health care services is dissemination of evidence-based psychological treatments[1,2]. This is especially relevant for psychiatric services, but, with a growing number of somatic disorders for which psychological treatment is providing promising results (e.g., tinnitus and irritable bowel syndrome[3,4]), the challenge is also relevant to the broader health care context.

Cognitive behaviour therapy (CBT) is the psychological treatment with the strongest empirical support, and is often the recommended first-line treatment for a range of common mental disorders[5,6]. One way to increase the availability of CBT is to use an Internet-based intervention (ICBT) with minimal clinician support. This treatment format typically means that the individual has access to a secure digital platform where treatment materials in form of texts, video and audio clips, and structured assignments to promote behaviour change, are provided[7].

In the present paper, we define ICBT as online CBT where there is some form of therapist guidance, typically through asynchronous text messages where the therapist provides feedback on assignments, encouragement, and general support. Key advantages of ICBT are that it requires substantially less therapist time per treated patient, and that no scheduled therapist-patient appointments at the clinic or via video are needed.

As conventional face-to-face CBT is arguably the gold-standard psychological treatment for many common clinical conditions, an important question is to what extent therapist-guided ICBT can produce similar effects as face-to-face CBT in terms of symptomatic improvement. In an early systematic review and meta-analysis published in this journal[8], we identified 13 randomized controlled trials comparing ICBT to face-to-face CBT and estimated the pooled post-treatment effect size as g=–0.01 (95% CI: –0.13 to 0.12). In an updated meta-analysis four years later[9], the total number of included randomized trials had increased to 20 and the pooled effect size (g=0.05; 95% CI: –0.09 to 0.20) again suggested that the two formats yield equivalent outcomes.

In both the above reviews we found that, for each specific disorder, there were relatively few randomized trials comparing ICBT to face-to-face CBT. The tendency of the field seemed to be to develop and test ICBT for new indications rather than building a firm evidence base for a specific disorder by comparing that treatment against face-to-face CBT. As ICBT is a field that moves rapidly, and five years have passed since the latest review, we considered it timely to update the systematic review and meta-analysis of randomized controlled trials comparing ICBT to face-to-face CBT for adults with psychiatric and somatic disorders.

METHODS

Design, search strategy and selection of studies

This is a systematic review and meta-analysis building on and updating the two previously published reviews[8,9] (i.e., studies included in the previous reviews were retained, and studies published since then were added), and using the same statistical methods and criteria for study eligibility and quality assessment.

We searched the PubMed database for studies comparing ICBT to face-to-face CBT published from January 1, 2016 to September 13, 2022, using search terms relating to randomized controlled trial designs in combination with a range of clinical conditions and the Internet. The full search string is available in the supplementary information.

Following the same procedures as in our previous systematic reviews, the main inclusion criteria were that, in order for a study to be included, it had to: a) compare therapist-guided ICBT with face-to-face CBT; b) use a randomized controlled design; c) target an adult population; d) test interventions that aimed to treat a manifest clinical condition (in contrast to, for example, preventive care); e) use an online intervention in which ICBT was the main component; and f) use a full-length face-to-face treatment.

We did not search "grey literature", such as dissertations or conference abstracts, and only included studies published in English.

Quality assessment

In order to evaluate the quality of the included studies, we used the Cochrane assessment of bias criteria (Version 1)[10]. This meant that we assessed, for each study, selection bias related to the generation of the randomized sequence, selection bias related to allocation concealment, detection bias (i.e., integrity of masked clinician-assessment, where applicable), attrition bias related to incomplete data, and reporting bias related to the selective reporting of results. Each of the variables was rated as "low risk", "high risk", or "unclear".

Statistical methods

The main unit of analysis was the between-group (ICBT vs. face-to-face CBT) difference at post-treatment. We estimated the pooled standardized effect size across all studies (Hedges' g) using a linear random effects model as implemented in Review Manager (RevMan) Version 5.1. In these analyses, we used the primary outcome (provided it was continuous) as reported in the original study. If no such primary outcome was reported, we used the first reported validated outcome measure of the core symptom domain targeted by the treatment (i.e., if a treatment was designed to treat depression and no primary outcome was reported, we used the first reported measure of depressive symptoms). In studies where both intent-to-treat and per-protocol outcome data were reported, we used the former in the analyses.

To quantify heterogeneity across studies we used the I^2 test, which estimates how much of the total variance in the effect is due to between-study variability rather than chance[11]. This was complemented with X^2 tests for significance of heterogeneity. Analyses were conducted to assess how robust the pooled effect estimate was after exclusion of two studies that contributed substantially to the overall heterogeneity.

We also conducted sensitivity analyses by comparing subgroups of studies where individual treatment was used in the face-to-face arms to those which used group treatment, and by comparing studies that were rated as having high quality on all assessment of bias criteria to those which were not.

To estimate the risk of publication bias, we used a funnel plot where effect sizes of the studies were related to their respective standard errors. A symmetrical distribution around the mean would be indicative of low risk of bias.

As this was an updated meta-analysis in which we did not control trial recruitment, the study was not conducted contingent on a power analysis. However, as a reference, if we had found just one additional study with a number of participants corresponding to the mean one in our most recent meta-analysis, the statistical power to detect a small standardized mean difference of 0.2 in a random effects model analysis, given an alpha-level of 0.05 and a moderate heterogeneity (I^2=50%), would have been approximately 77% (Metapower for R application).

RESULTS

Overall description of study inclusion

Figure 1 provides the flow chart for the inclusion of studies. After removal of duplicates, we screened 5,601 records and included 11 new studies that met all inclusion criteria, which were added to the 20 studies previously identified. Thus, the total number of studies in this review was 31.

These studies included 3,053 participants in the ICBT and face-to-face CBT arms, rendering a mean number of participants per study of 98.5 (standard deviation, SD = 60.6) and a median of 80 (interquartile range, IQR = 49-163). The trials were conducted in Australia, China, Finland, Germany, Sweden, The Netherlands, the UK, the US and Switzerland.

In the 11 new studies, the clinical conditions targeted (one study each) were binge eating disorder[12], bulimia nervosa[13], health anxiety[14], insomnia[15], obsessive-compulsive disorder[16], postnatal depression[17], post-traumatic stress disorder[18], psychological distress in cancer patients[19], serious mental illness[20], social anxiety disorder[21], and subthreshold depression[22].

Table 1 provides a description of selected characteristics of all studies included in the review[12-42]. In the 31 studies, the clinical conditions targeted were depression/depressive symptoms (n=5), social anxiety disorder (n=4), panic disorder (n=3), insomnia (n=3), tinnitus (n=2), animal phobia (n=2), body dissatisfaction (n=2), binge eating disorder (n=1), bulimia nervosa (n=1), health anxiety (n=1), obsessive-compulsive disorder (n=1), postnatal depression (n=1), post-traumatic stress disorder (n=1), psychological distress in cancer patients (n=1), serious mental illness (n=1), fibromyalgia (n=1), and male sexual dysfunction (n=1).

Analysis of treatment effects

Throughout the results presentation, negative effect size (g) estimates reflect larger treatment effects for ICBT, and positive estimates reflect effects in favour of face-to-face CBT. The pooled

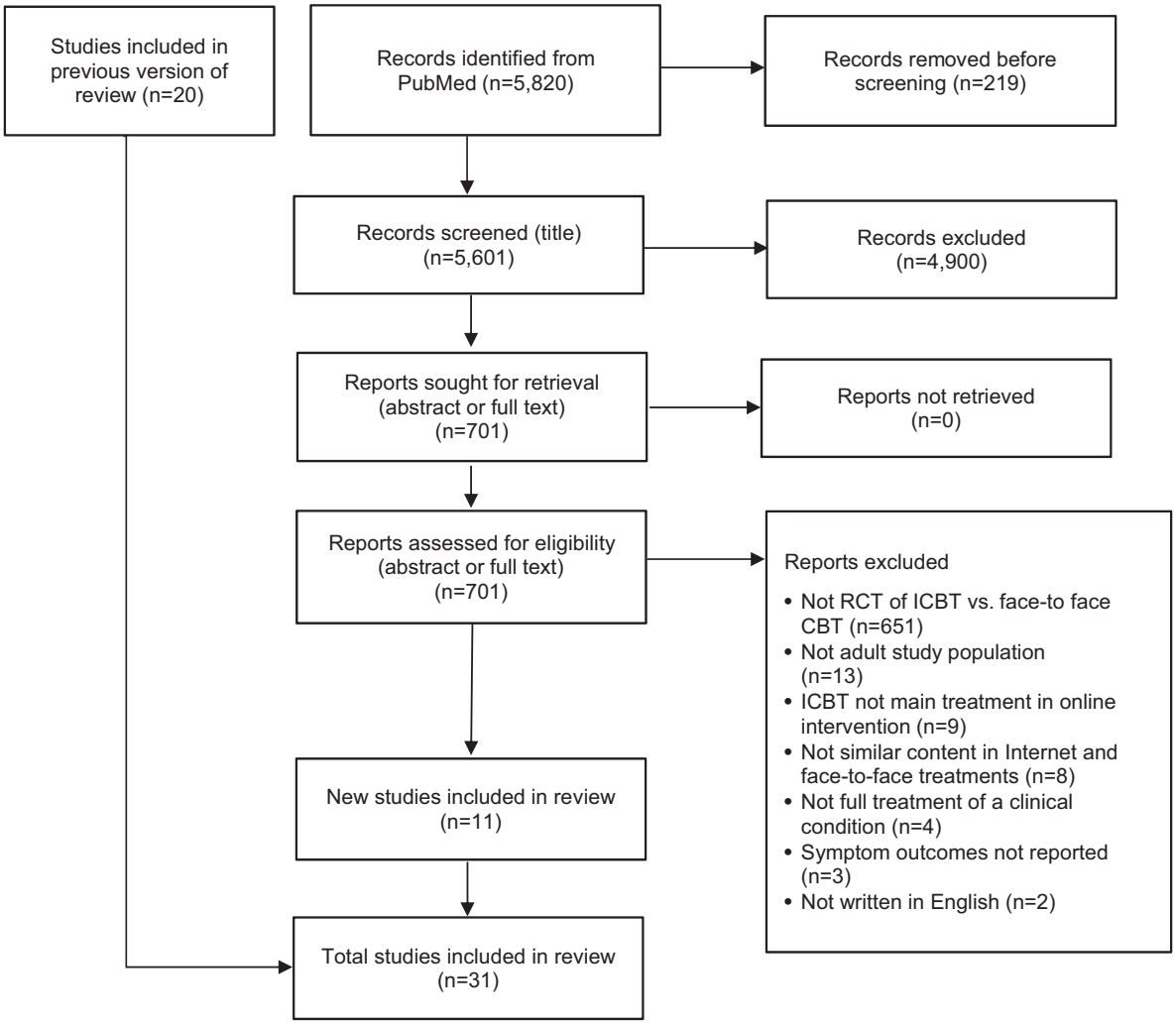

Figure 1 Flow chart of inclusion of studies. RCT – randomized controlled trial, CBT – cognitive behaviour therapy, ICBT – Internet-based cognitive behaviour therapy

standardized effect size post-treatment was g=0.02 (95% CI: –0.09 to 0.14), suggesting similar effects for ICBT and face-to-face CBT in terms of symptomatic improvement across all studies.

Figure 2 presents a forest plot showing the effects of the individual studies as well as the effects according to clinical subgroups. The I^2 test indicated the presence of moderate heterogeneity (54%), also reflected in significant X^2 test results (X^2=65.43, df=30, p=0.0002). We ran a sensitivity analysis after removal of two studies that were clear outliers (large effect sizes with CIs that did not overlap with those of the pooled effect size)[17,41], which reduced the heterogeneity to 23% (X^2=36.13, df=28, p=0.14) and yielded a similar pooled effect size of g=0.01 (95% CI: –0.07 to 0.10).

As one study[20] used a form of face-to-face treatment where we were uncertain as to whether it should be classified as CBT, we also conducted a sensitivity analysis with that study removed, which did not affect the pooled effect size (g=0.02; 95 % CI: –0.10 to 0.14).

Of the 31 randomized trials, 12 used face-to-face treatment in a group format and 19 used an individual format. We explored the potential role of type of format (individual vs. group) in a subgroup analysis, which indicated that the effect estimate was g=0.09 (95% CI: –0.07 to 0.25) in trials using individual treatment as compared to g=–0.08 (95% CI: –0.23 to 0.07) in those using group treatment. Despite the slight differences in observed effect sizes, there was no significant difference in pooled treatment effect between those subgroups (X^2=2.32, df=1, p=0.13), suggesting that the type of format in the face-to-face arms did not significantly affect the main outcome.

Quality of included studies

Figure 3 displays the results of the assessment of study quality based on the Cochrane risk of bias criteria. The criterion related to blinding of outcome assessors (detection bias) was not applicable in most studies, due to the use of self-report measures as outcome. We ran a subgroup analysis comparing studies rated as having a low risk of bias on all applicable criteria (n=17) to those which did not (n=14), and found a pooled effect size of g=–0.03

Table 1 Description of the studies included in the review – Internet-based treatment (INT) vs. face-to-face treatment (FTF)

Study	Disorder	N INT	N FTF	Outcome	Mean (SD) INT pre	Mean (SD) INT post	Mean (SD) FTF pre	Mean (SD) FTF post	Quality	Dropout rate	ITT	Sample
New studies included in current review												
de Zwaan et al[12]	Binge eating disorder	89	89	OBE days	14.1 (7.8)	3.9 (5.5)	13.5 (7.5)	2.0 (4.1)	Low risk of bias on all criteria	10%	Yes	Clinical
Zerwas et al[13]	Bulimia nervosa	98	98	Binge eating frequency	27.8 (22.5)	9.6 (10.6)	24.3 (17.1)	9.0 (10.2)	Unclear/high risk on at least one criterion	33%	Yes	Clinical
Axelsson et al[14]	Illness anxiety or somatic symptom disorder	102	102	HAI	33.9 (6.5)	21.0 (8.8)	34.2 (6.4)	20.4 (8.7)	Low risk of bias on all criteria	5%	Yes	Mixed
Gieselmann & Pietrowsky[15]	Insomnia	23	27	PSQI	12.0 (2.7)	6.8 (2.5)	11.4 (3.6)	7.7 (3.7)	Unclear/high risk on at least one criterion	8%	Yes	Self-referred
Lundström et al[16]	Obsessive-compulsive disorder	38	42	Y-BOCS	22.5 (3.9)	13.93 (4.9)	22.6 (3.8)	12.2 (5.8)	Low risk of bias on all criteria	8%	Yes	Mixed
Milgrom et al[17]	Postnatal depression	39	39	BDI-II	28.1 (7.9)	11.6 (9.0)	27.2 (10.0)	21.4 (12.2)	Low risk of bias on all criteria	13%	Yes	Mixed
Bisson et al[18]	Post-traumatic stress disorder	97	99	CAPS-5	34.6 (6.8)	13.1 (11.7)	35.6 (6.7)	13.0 (11.1)	Low risk of bias on all criteria	18%	Yes	Clinical
Compen et al[19]	Psychological distress in cancer patients	90	77	HADS	17.2 (7.1)	11.9 (6.2)	18.8 (6.7)	13.3 (6.3)	Low risk of bias on all criteria	17%	Yes	Mixed
Ben-Zeev et al[20]	Schizophrenia, schizoaffective disorder, bipolar disorder or depression	82	81	SCL-9	12.71 (7.2)	10.0 (6.5)	11.9 (8.1)	9.5 (7.3)	Low risk of bias on all criteria	9%	Yes	Clinical
Clark et al[21]	Social anxiety disorder	49	50	SAC	0.80 (0.7)	−1.27 (0.9)	0.71 (0.9)	−1.60 (1.0)	Low risk of bias on all criteria	1%	Yes	Clinical
Ying et al[22]	Subthreshold depression	110	110	CES-D	25.1 (2.5)	14.2 (4.7)	24.8 (4.7)	15.8 (2.7)	Low risk of bias on all criteria	27%	No	Self-referred
Studies retained from previous versions of the review												
Hedman et al[23]	Social anxiety disorder	64	62	LSAS	68.4 (21.0)	39.4 (19.9)	71.9 (22.9)	48.5 (25.0)	Low risk of bias on all criteria	12%	Yes	Mixed
Andrews et al[24]	Social anxiety disorder	23	14	SIAS	54.5 (12.4)	44.0 (15.9)	57.8 (43.9)	43.9 (18.7)	Unclear/high risk on at least one criterion	32%	Yes	Clinical
Botella et al[25]	Social anxiety disorder	62	36	FPSQ	53.3 (14.3)	39.7 (15.5)	50.5 (11.9)	39.3 (13.0)	Unclear/high risk on at least one criterion	55%	Yes	Mixed
Carlbring et al[26]	Panic disorder	25	24	BSQ	48.7 (11.7)	31.8 (11.6)	52.6 (10.8)	31.3 (9.1)	Low risk of bias on all criteria	12%	Yes	Self-referred
Bergström et al[27]	Panic disorder	53	60	PDSS	14.1 (4.3)	6.3 (4.7)	14.2 (4.0)	6.3 (5.6)	Low risk of bias on all criteria	18%	Yes	Mixed

Table 1 Description of the studies included in the review – Internet-based treatment (INT) vs. face-to-face treatment (FTF) *(continued)*

Study	Disorder	N INT	N FTF	Outcome	Mean (SD) INT pre	Mean (SD) INT post	Mean (SD) FTF pre	Mean (SD) FTF post	Quality	Dropout rate	ITT	Sample
Kiropoulos et al[28]	Panic disorder	46	40	PDSS	14.9 (4.4)	9.9 (5.9)	14.8 (4.0)	9.2 (5.7)	Low risk of bias on all criteria	0%	Yes	Self-referred
Spek et al[29]	Depressive symptoms in elderly	102	99	BDI	19.2 (7.2)	12.0 (8.1)	17.9 (10.0)	11.4 (9.4)	Unclear/high risk on at least one criterion	39%	Yes	Self-referred
Wagner et al[30]	Depressive symptoms	32	30	BDI	23.0 (6.1)	12.4 (10.0)	23.4 (7.6)	12.3 (8.8)	Unclear/high risk on at least one criterion	15%	Yes	Self-referred
Andersson et al[31]	Depressive symptoms	33	36	MADRS-S	23.6 (4.8)	13.6 (9.8)	24.1 (5.0)	17.1 (5.0)	Low risk of bias on all criteria	6%	Yes	Self-referred
Lappalainen et al[32]	Depressive symptoms	19	19	BDI-II	20.8 (9.3)	10.3 (8.2)	23.1 (6.4)	9.2 (5.2)	Unclear/high risk on at least one criterion	3%	No	Self-referred
Gollings & Paxton[33]	Body dissatisfaction	21	19	BSQ*	129.1 (27.3)	98.4 (35.6)	140.8 (37.2)	109.6 (47.7)	Unclear/high risk on at least one criterion	17.5%	Yes	Self-referred
Paxton et al[34]	Body dissatisfaction, disordered eating	42	37	BSQ*	134.3 (22.5)	116.8 (35.9)	143.3 (28.9)	105.8 (34.0)	Low risk of bias on all criteria	26%	Yes	Self-referred
Kaldo et al[35]	Tinnitus	26	25	TRQ	26.4 (15.6)	18.0 (16.2)	30.0 (18.0)	18.6 (17.0)	Unclear/high risk on at least one criterion	14%	Yes	Mixed
Jasper et al[36]	Tinnitus	41	43	Mini-TQ	12.2 (4.6)	7.4 (5.3)	14.2 (4.5)	8.1 (4.9)	Low risk of bias on all criteria	7%	Yes	Mixed
Schover et al[37]	Male sexual dysfunction	41	40	IIEF	27.4 (17.3)	31.3 (20.4)	26.4 (18.2)	34.4 (22.2)	Unclear/high risk on at least one criterion	20%	Yes	Mixed
Vallejo et al[38]	Fibromyalgia	20	20	FIQ	56.6 (19.8)	57.0 (18.2)	68.4 (19.5)	58.2 (18.6)	Unclear/high risk on at least one criterion	0%	Yes	Clinical
Andersson et al[39]	Spider phobia	15	15	BAT	6.2 (2.6)	10.5 (1.5)	7.3 (1.6)	11.1 (1.2)	Unclear/high risk on at least one criterion	10%	No	Self-referred
Andersson et al[40]	Snake phobia	15	15	BAT	4.1 (3.3)	9.6 (2.6)	3.0 (3.1)	11.2 (2.1)	Unclear/high risk on at least one criterion	13%	No	Self-referred
Lancee et al[41]	Insomnia	30	30	ISI	18.2 (2.9)	12.4 (4.8)	17.3 (2.9)	7.1 (4.2)	Unclear/high risk on at least one criterion	8%	Yes	Self-referred
Blom et al[42]	Insomnia	24	24	ISI	18.7 (4.4)	9.7 (5.3)	17.9 (3.9)	8.4 (4.9)	Low risk of bias on all criteria	6%	Yes	Self-referred

ITT – intention-to-treat, OBE – Objective Binge Eating, HAI – Health Anxiety Inventory, PSQI – Pittsburgh Sleep Quality Index, Y-BOCS – Yale-Brown Obsessive Compulsive Scale, CAPS-5 – Clinician Administered PTSD Scale for DSM-5, HADS – Hospital Anxiety and Depression Scale, SCL – Symptom Check List, SAC – Social anxiety composite, CES-D – Center for Epidemiological Studies Depression Scale, LSAS – Liebowitz Social Anxiety Scale, SIAS – Social Interaction Anxiety Scale, FPSQ – Fear of Public Speaking Questionnaire, BSQ – Body Sensation Questionnaire, BSQ* – Body Shape Questionnaire, PDSS – Panic Disorder Severity Scale, BDI – Beck Depression Inventory, MADRS-S – Montgomery Åsberg Depression Rating Scale - Self-rated, TRQ – Tinnitus Reaction Questionnaire, Mini-TQ – Mini Tinnitus Questionnaire, IIEF – International Index of Erectile Function, FIQ – Fibromyalgia Impact Questionnaire, BAT – Behavioural Approach Test, ISI – Insomnia Severity Index.

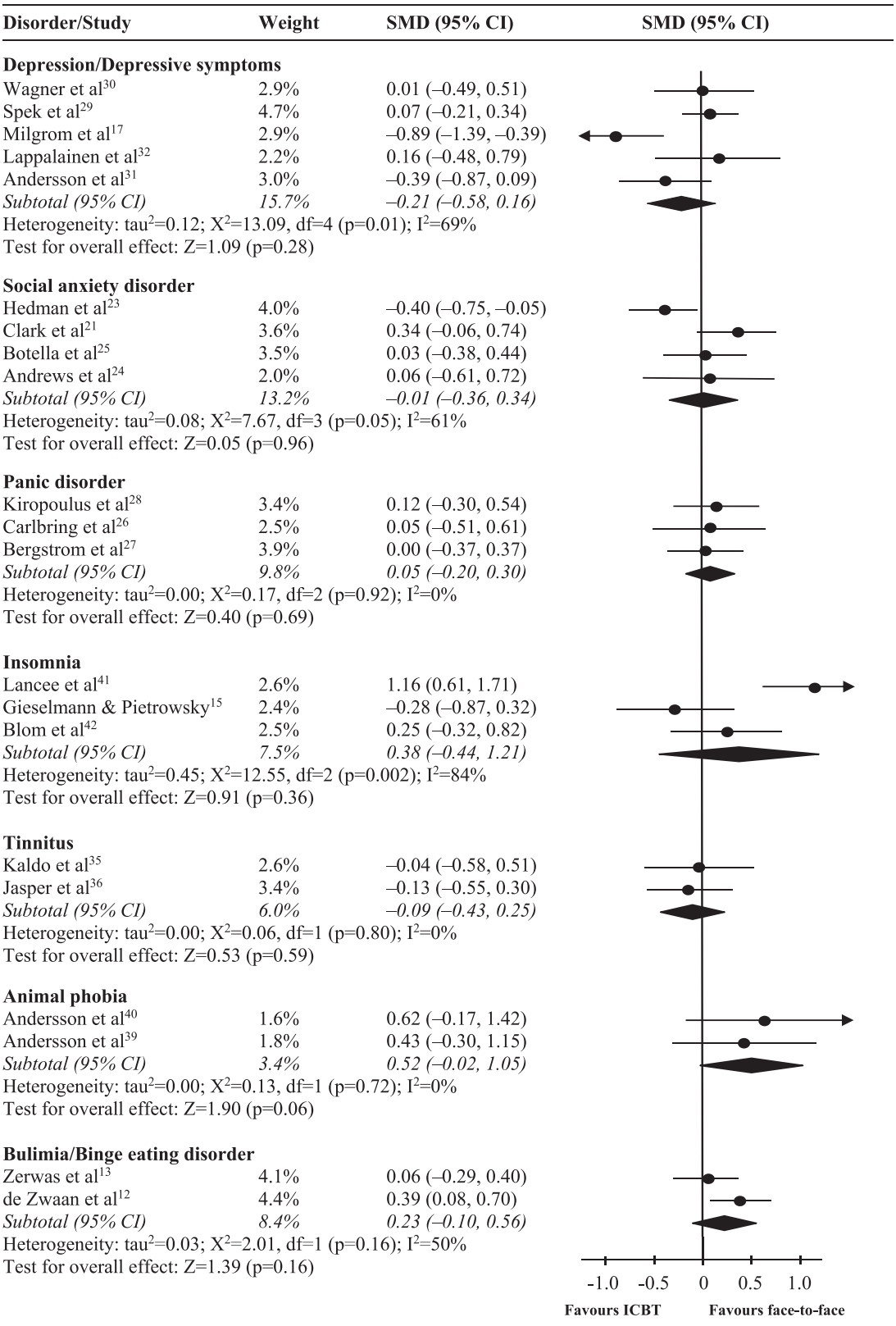

Figure 2 Forest plot of standardized effect size (g) for Internet-based cognitive behaviour therapy (ICBT) vs. face-to-face therapy (CBT). SMD – standard mean difference

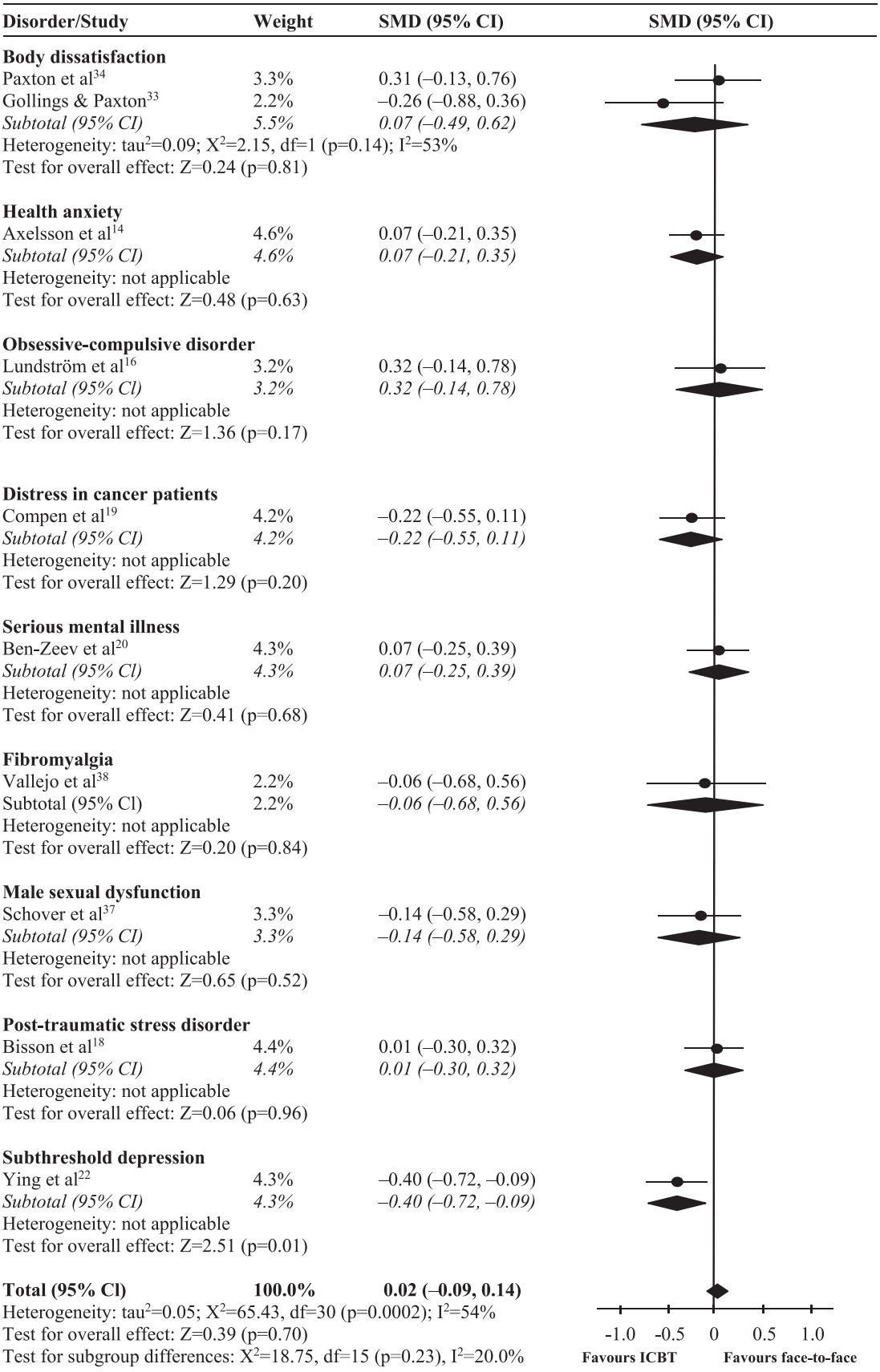

Figure 2 Forest plot of standardized effect size (g) for Internet-based cognitive behaviour therapy (ICBT) vs. face-to-face therapy (CBT). SMD – standard mean difference *(continued)*

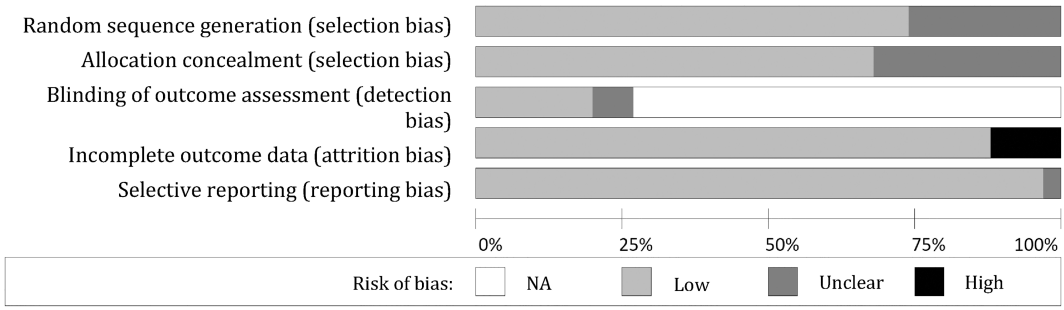

Figure 3 Results from risk of bias assessment. NA – not applicable. The white part of the blinding of outcome assessment bar is due to omission of studies that used self-reported outcomes only.

(95% CI: –0.18 to 0.12) in the former group and of g=0.10 (95% CI: –0.07 to 0.28) in the latter. The test for difference in effect between subgroups was non-significant (X^2=1.19, df=1, p=0.28), suggesting that study quality was not related to outcome.

Publication bias

Figure 4 presents a funnel plot relating the effect sizes of studies to the precision of estimates (i.e., the magnitude of standard errors). The distribution of the effect sizes was largely symmetrical, suggesting that publication bias did not skew the results substantially.

DISCUSSION

This is an updated systematic review and meta-analysis of studies comparing ICBT to face-to-face CBT for adults with psychiatric or somatic disorders, based on 31 randomized trials, conducted in nine different countries with a total of 3,053 participants. The results indicate that the two treatment formats yield similar symptomatic improvement across all study populations. The small pooled effect size and the fairly narrow confidence interval of the estimate (g=0.02; 95% CI: –0.09 to 0.14) suggest that the true effect difference between ICBT and face-to-face CBT is probably minimal.

We identified 11 new randomized controlled trials since the last update, of which most targeted disorders or patient populations for which there were no previously published randomized trials of ICBT vs. face-to-face CBT. Overall, this review reveals that there are just few clinical conditions, albeit all common mental disorders, for which ICBT has been directly compared to face-to-face CBT in at least three randomized controlled trials conducted by at least two independent research groups.

Since our first meta-analysis of ICBT vs. face-to-face CBT[8], there has been a rapid development in the field of ICBT. A search in PubMed using the search term "cognitive behavioural therapy AND Internet" with "randomized controlled trial" as search filter

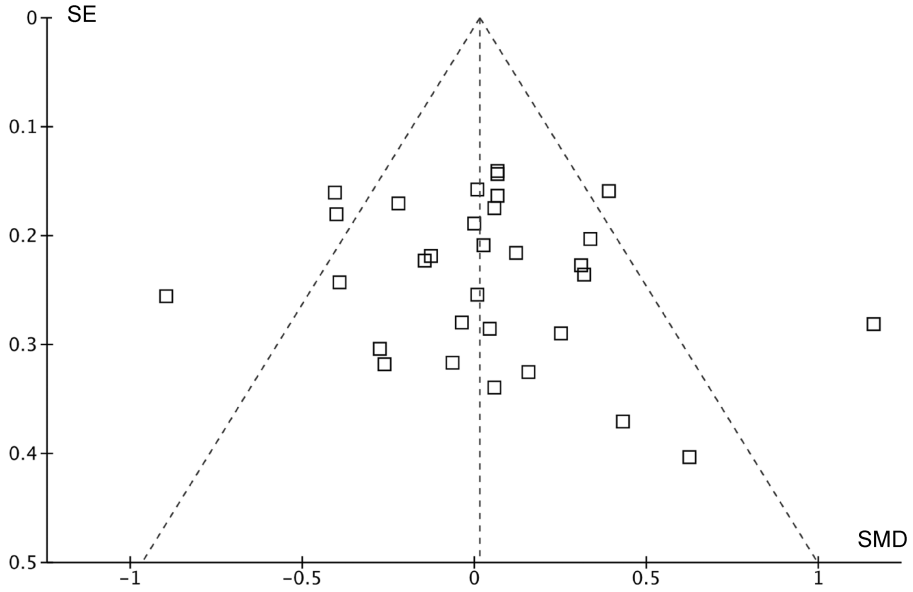

Figure 4 Funnel plot presenting the relation between effect sizes and standard errors (SE) in the included studies. SMD – standardized mean difference

yielded 885 hits published between 2014 and 2022. This massive increase in accumulated knowledge is reflected in this updated meta-analysis: the number of 13 randomized controlled trials (total N=1,053) comparing the two delivery formats in 2014 has now increased to 31 trials with more than 3,000 participants in total. The pooled effect size estimate has remained stable since the original meta-analysis (from g=–0.01 to g=0.02), and the emerging picture is that we have reached a point where the addition of new trials does not alter the estimated (lack of) overall effect difference between ICBT and face-to-face CBT.

It is important to underscore that the research question that this meta-analysis addresses is to what extent ICBT and face-to-face CBT produce similar effects for a person with a psychiatric or somatic disorder who is suitable for both treatment formats. Although independent research groups have conducted several randomized trials comparing ICBT to face-to-face CBT for some of the most common psychiatric conditions (i.e., depression, social anxiety disorder, panic disorder, insomnia), and recently published network meta-analyses showed comparable effects across CBT formats in the treatment of depression and panic disorder[43,44], for most indications we found only one or two trials. Moreover, for a range of fairly common mental disorders (e.g., generalized anxiety disorder, borderline personality disorder), we did not find any study making the ICBT vs. face-to-face CBT comparison. This means that, for several of the individual clinical conditions, the confidence interval around the effect size estimate is considerably wider compared to that for the overall pooled effect size, or, even worse, there are no empirical data from which an effect size can be calculated. So, while the overall pooled effect size estimate can be viewed as robust, it is uncertain that the effect of ICBT vs. face-to-face CBT is comparable for individual clinical conditions.

However, since the first published trial of ICBT vs. face-to-face CBT, we have waited in vain to see for what clinical problem the online format is clearly inferior. In fact, this meta-analysis included trials that recruited participants with problems typically considered fairly severe (such as post-traumatic stress disorder, obsessive-compulsive disorder, schizophrenia and bipolar disorder[16,18,20]), but the results showed no marked differences between therapeutic formats. Against this backdrop, and in combination with our results indicating that the effect size of ICBT vs. face-to-face CBT has remained stable, and by and large around zero, despite a rapidly growing number of indications for which this comparison has been made, our assessment is that, if conventional face-to-face CBT works, then ICBT works. In other terms, for clinical problems where CBT has been demonstrated to be effective in a conventional face-to-face format (i.e., where the individual sees a therapist on a weekly basis for typically 8 to 15 weeks, learns about the clinical problem, and is given concrete homework assignments in accordance with a CBT model), the format (Internet vs. face-to-face) has minimal effect on the outcome in terms of symptomatic improvement.

Notwithstanding the foregoing, there are several unanswered research questions in this field. One is about the moderators of the treatment effect, that is, what treatment works best for whom. Even if the treatment effect is similar on average across formats, it is possible that face-to-face CBT is more suitable for some individuals and ICBT for others. Identifying such moderators would be important, as it has the potential of increasing the overall response rate to CBT. Since an inherent limitation of randomized trials is that all participants must be willing to accept randomization to either of the two treatment modalities, it might not suffice to conduct analyses of effect moderators based on data from such trials, but such analyses should be conducted also in samples collected from routine care. Other avenues for future research are the investigation of implementation strategies, and the potential benefits of using so-called blended treatments[45], in which the patient receives treatment both online and via face-to-face sessions.

Among the strengths of the current meta-analysis are the broad scope and the wide search terms, which rendered screening of 5,601 publications; the inclusion of randomized controlled trials; the high statistical power of the main analysis; and the assessment of the study quality using the Cochrane risk of bias criteria.

One limitation is that we relied on the PubMed database to identify studies. However, we do not believe that this affected our results substantially, given previous research suggesting that the additive effect of using databases other than PubMed is modest in the therapeutic field[46]. Also, in a recently conducted meta-analysis of ICBT vs. face-to-face CBT for anxiety disorders – in which the authors used Scopus, Emerald, ProQuest, and Science Direct in addition to PubMed to identify studies – no additional studies compared to our meta-analysis were included[47].

Another limitation is that we did not contact authors of the original studies to obtain individual patient data, which would have enabled more detailed statistical modelling of outcomes. Finally, we regarded it as beyond the scope of this paper to assess effects on secondary outcomes or long-term outcomes. This is another potential avenue for future research.

Based on the results of this updated systematic review and meta-analysis, including 31 randomized trials, we conclude that overall clinician-supported ICBT yields similar effects compared to face-to-face CBT. Although more studies are needed to reduce the uncertainty of effect estimates for individual clinical conditions, we regard it as unlikely that the addition of new randomized trials will change our confidence in the overall conclusion.

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