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Cost-effectiveness of internet-based cognitive-behavioural therapy for obsessive-compulsive disorder

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ABSTRACT

Economic analyses of treatments for OCD have been limited. This study analysed the comparative economic benefits and costs of an internet-based CBT (iCBT) relative to internet-based progressive relaxation therapy (iPRT) control. These were benchmarked against current estimates for face-to-face CBT (ffCBT) sourced from literature. The benefits to society of providing increased access to treatment was assessed using a cost-benefit analysis based upon productivity gains arising from treatment. Identification of the most cost-effective treatment amongst the three treatments was assessed using a cost-effectiveness analysis based upon both effectiveness as measured by the Yale-Brown Obsessive Compulsive Scale (YBOCS) and percentage of responders. The cost-effectiveness analysis showed iCBT to be the most cost effective treatment of the three analysed, followed by ffCBT based upon percentage of responders and iPRT based upon overall effectiveness of treatment. The cost-benefit analyses showed all treatment options delivered substantial benefits to society. These benefits ranged from three to thirty-five times the cost of providing treatment, depending on the assumptions used and the treatment provided, with iCBT showing the greatest ratio of benefits to costs but the ffCBT providing the greatest absolute benefits. Overall, the findings provide support for increased access to CBT intervention, for all patients with OCD; with online therapist-assisted modes of delivery as a cost-effective alternative to existing face-to-face treatments. Further work to more accurately quantify the benefits and costs resulting from CBT treatment modalities is required to support these preliminary findings.

1. Introduction

Obsessive Compulsive Disorder (OCD) is a highly disabling psychiatric disorder that is characterised by the occurrence of unwanted intrusive thoughts, images or impulses (Obsessions) and overt or covert responses to neutralize the danger implied by the obsessions or the resultant distress (compulsions). OCD has been found to have a significantly greater impact on the lives of sufferers compared to other psychiatric illnesses, with 75% of individuals indicating that their OCD resulted in considerable interference in their work and regular activities compared to 50% for those with other psychiatric disorders and 7% without any psychiatric disorder (DuPont et al., 1995). Furthermore DuPont et al. (1995) also estimated that lost productivity due to OCD (estimated at 6.2 billion US dollars in 1990) was nearly three times the healthcare costs incurred to treat OCD (Andlin-Sobocki and Witchen, 2005; DuPont et al., 1995). Successful treatment of OCD therefore has potential to provide significant economic benefits.

Cognitive Behaviour Therapy (CBT) is an effective treatment for OCD (Olatunji et al., 2013), yet < 10% of people with OCD access CBT treatment (Blanco et al., 2006; Torres et al., 2007). Cost, inconvenience, lack of trained therapists, and issues related to stigma and shame are commonly cited barriers to accessing CBT treatment for OCD (Mancebo et al., 2011; Marques et al., 2010). Computer-based self-guided CBT treatments, delivered either in a blended format with face-to-face therapy or over the internet, may overcome some of these barriers by increasing access to specialist treatment whilst also reducing cost (Andersson et al., 2012; Kyrios et al., 2014; McCrone et al., 2007). Earlier blended treatments that utilised computer-based self-guided

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Table 1
Key data inputs by intervention.

Input	Internet CBT (iCBT)	Internet PRT (iPRT)	Benchmarking analysis: face-to-face CBT (ffCBT)
Effectiveness: symptom reduction	1.05	0.48	1.08
Effectiveness: responders	18.0%	6.0%	43.5%
Time saving per day	57 min	45 min	95 min
Value of time	$39 per hour		
Benefit time period	2 years		
Clinician time	12 sessions @ 15 min	12 sessions @ 15 min	12 sessions @ 60 min
Value of clinician time	$40	$40	$146.45
Program cost	$280	$280	$0

CBT in face-to-face sessions (i.e., usually a series of modules on a computer in the therapist office) had the capacity to increase access to evidence-based treatments in the absence of specialist clinical expertise (McCrone et al., 2007). More recently, the widespread availability of internet-based CBT (iCBT) that individuals can access from the privacy of their own homes has further increased accessibility to the treatment, while reducing both therapist cost and patient costs associated with travel and time taken to attend treatment (Kyrios et al., 2014).

Internet-based CBT for people with OCD has been found to be comparable in effectiveness to face-to-face CBT (Andersson et al., 2012; Kyrios et al., 2018; Wootton et al., 2013). Internet-based CBT treatments for OCD are usually delivered in modules which present information through use of text, audio or video and which individuals can access and work through on their own (self-guided) or with an assistance of therapist (therapist-guided). However, the therapist time required to support computer-based self-guided treatments, regardless of delivery method (with or without therapist), is often substantially less than the time required for traditional face-to-face treatment. Additionally, the cost of delivering internet-based CBT is likely to be much less than the cost of delivering standalone computer programs as multiple users can access treatment at any time. Overall, then, internet-based CBT treatment is likely to be a very cost-effective treatment. To date, however, there has been limited analysis of the cost-effectiveness of comparable treatment modalities for OCD. Lenhard et al. (2017) examined the cost-effectiveness of therapist-guided iCBT, relative to waitlist control in a pediatric sample of 67 adolescents. They found that relative to the control, the iCBT delivered considerable societal saving of US$144 per patient. In adult populations, Andersson et al. (2015) estimated that iCBT was associated with an average of $931 societal cost per one additional remission. However, the study used less stringent remission criteria, four-point decrease on the Yale Brown Obsessive Compulsive Scale (YBOCS). Thus, there is emerging evidence that iCBT treatments are not only effective, but also cost-effective when compared to waitlist or supportive therapy. However, there is limited evidence for the cost-effectiveness of iCBT relative to the current gold standard CBT delivered face-to-face. The only comparisons of computerised CBT with standard face-to-face CBT are two earlier studies comparing face-to-face CBT with computer-based CBT provided on standalone computer applications rather than the internet. These have produced contradictory results. One study showed face-to-face treatment to be more cost-effective (Kaltenthaler et al., 2006) and the other showed the self-help standalone computer-based treatment to be more cost-effective (McCrone et al., 2007). Given, the potential of iCBT to provide a wider access at potentially lower cost, it is important to benchmark the cost-effectiveness of iCBT treatment to current gold standard treatment.

The primary aim of this study was to conduct an economic analysis comparing two treatment conditions for OCD delivered as part of Randomised Controlled Trial (RCT): internet-based CBT (iCBT) and internet-based Progressive Relaxation Therapy (iPRT; control treatment). In addition, a benchmarking comparison with standard face-to-face CBT (ffCBT) sourced from available literature, was conducted to contextualise internet-based treatments in the current treatment offerings for OCD. Cost-benefit analyses were undertaken to quantify the productivity benefits of each treatment condition, and a cost-effectiveness analysis was undertaken to identify whether iCBT was more cost-effective than the control (i.e., iPRT) and potentially the current gold (or face-to-face) standard treatment. Both types of analyses provide information necessary to inform government policy for mental health treatments for those with OCD.

2. Method

2.1. Data inputs

Data inputs for this study were sourced from a recent clinical trial that investigated the effectiveness of iCBT against iPRT as a control (Kyrios et al., 2018). To benchmark these treatments against current standard treatment (ffCBT) effectiveness data was sourced from recent academic literature. Gaps in information, such as cost inputs to value time were obtained from established data sources. The key inputs used in the analyses by intervention are listed in Table 1. The sources, assumptions and analysis conducted to arrive at these inputs are described thereafter.

2.1.1. Effectiveness of interventions

The primary outcome measure for the analysis was the Yale-Brown Obsessive Compulsive Scale (YBOCS; Goodman et al., 1989). The pre-post effectiveness based upon intention to treat analysis (ITT) and reported as Cohen's *d* for the iCBT and iPRT interventions were 1.05 and 0.48 respectively (Kyrios et al., 2018). The effectiveness for the ffCBT was based upon a recent meta-analysis conducted by Olatunji et al. (2013) which reported an effect size, for adults, of Hedges $g = 1.08$. This result was similar to a previous meta-analysis, which also found a similarly large reduction in obsessions and compulsions for face-to-face treatment (Cohen's $d = 1.08$) (Rosa-Alcáxar et al., 2008).

Reliable recovery was used as the basis for identifying responders. Consistent with Fisher and Wells (2005), a person was deemed to have made a reliable recovery if there was a reliable improvement and they scored below 14 on the YBOCS post treatment. Reliable improvement was deemed to have occurred if the person's YBOCS score improved by > 10 units. For the iCBT and iPRT interventions, 18% and 6% of participants, respectively, were classified as responders (Kyrios et al., 2018). For the benchmarking analysis, ffCBT the percentage of responders was sourced from two recent studies that used a similar approach (Fisher and Wells, 2005). The average percentage of responders across the two studies was 43.5% (Anderson and Rees, 2007; Twohig et al., 2010).

2.1.2. Time saving per day

Time savings, that is the increase in productive hours for each participant, were based upon the reduction in time spent daily on obsessive thoughts and compulsive behaviours as a result of the interventions.

Time-based data for the iCBT and iPRT interventions were sourced from the recent clinical trial (Kyrios et al., 2018) using the YBOCS items

which asked how much time was spent on obsessions (question 1) and compulsions (question 6) per day. Time lost per day was calculated based upon the time assumptions for each possible response listed in Table 2, and by summing the assumed times for both questions. Analysis of the correlation for the responses to Questions 1 and 6 found the relationship between the two questions was moderate-to-strong ($r = 0.48$) but the items were not redundant, indicating participants in the study were able to discriminate between compulsions and obsessions and that summing the times was appropriate.

Time was estimated through a regression equation with YBOCS as independent variable for each of the conditions. The regression analysis outputs were then used to predict the average time savings per day for the interventions. The average time reduction per YBOCS unit was 0.126 and 0.188, the one-off reduction in time (β) was 0.397 and 0.031, and the average YBOCS reduction was 4.33 and 2.79, for the iCBT and iPRT interventions respectively. These input values were used to calculate the time savings per day for the iCBT and iPRT interventions.

Information on time savings for ffCBT was not able to be sourced from the literature. Time savings for ffCBT were instead predicted using the one-off reduction (0.397) and average time reduction per YBOCS unit (0.126) from the iCBT intervention, and applied to an average YBOCS score reduction of 9.38 sourced from two recent face-to-face CBT intervention trials (Anderson and Rees, 2007; Twohig et al., 2010). This recognises that face-to-face interventions often result in a higher YBOCS score reduction and are thus more likely to have a greater impact on time savings.

The average time savings per day as a result of the intervention were calculated at 57, 45 and 95 min for the iCBT, iPRT and ffCBT interventions respectively. To calculate the annual time benefits for the cost-benefit analysis, the average savings per day for all three interventions were multiplied by 365.

As the time savings calculated were based upon questions in the YBOCS which captured broad time ranges rather than exact times, a more conservative time saving scenario was also calculated to assess the impact on the analyses. For this alternative scenario, the estimated time benefits were halved.

2.1.3. Value of time

Value of time was calculated based on the average employee hourly earnings sourced from the Australian Bureau of Statistics (Australian Bureau of Statistics, 2019). Consistent with Lensberg et al. (2013), all time was valued using the opportunity cost approach which assumed that the value of the individual's time was equivalent to the average wage, regardless of whether the person was employed or not (Tranmer et al., 2005; Zhang et al., 2011).

2.1.4. Benefit time period

Prior to the introduction of effective treatments, such as psychotherapy, the prognosis for those with OCD was poor, with the majority expected to experience lifelong disability (Skoog and Skoog, 1999). Recent studies suggest that the effects of CBT can be maintained for at least a year (Whittal et al., 2010) and as long as two years (Braga et al., 2010). Therefore, for the purpose of this economic analysis, the time period for calculating benefits was two years. A one-year period was considered as an alternative scenario to identify how the reduction in time for realisation of the benefits may affect the outcomes.

2.1.5. Clinician time

The clinician time required for the iCBT and iPRT interventions was based upon the format for the program, which consisted of 12 weekly sessions and one therapist email each week. This email was designed to answer any queries from the client about the program or homework, and encourage them to complete the online session and associated homework for the week. The average time spent per email was 15 min. This time is consistent with previous reports (Lenhard et al., 2017) and was the time the clinicians were remunerated for as part of the trial.

Table 2
Assumed time spent on obsession and compulsions by response item.

YBOCS item response	Time assumed (h)
0 = None	0
1 = Mild, < 1 h/day	0.5
2 = Moderate, 1 to 3 h/day	2.0
3 = Severe, > 3 and up to 8 h/day	6.0
4 = Extreme, > 8 h/day	8.0

It was assumed that, for the ffCBT intervention, the same program format as the iCBT program would be utilised (12 weekly sessions). With ffCBT however, the program was assumed to be delivered in face-to-face standard sessions of 1 h each. This is consistent with recent research (Olatunji et al., 2013), which found 12–13 sessions was the standard length of a CBT program for OCD.

2.1.6. Value of clinician time

The value of clinician time was based upon the rates recommended by the Australian Psychological Society (APS) for a clinical psychologist as at 1 July 2018 (Australian Psychological Society, 2018). The rates are calculated based on the assumption that 1 h of billable work will involve an additional half-hour of non-billable professional time for writing notes, test scoring and phone calls, which equates to 66% productivity (Australian Bureau of Statistics, 2019). The rates for a one-hour session are $251 and for a 15 min session are $69.

Research conducted in 2007 by Linder and Stokes indicated that clinical psychologists in Australia operating in the Better Access to Mental Health initiative were charging less than the recommended APS fees (Linder and Stokes, 2007). Their research indicated that clinical psychologists were charging an average of $133 per session, which was comparable to the schedule fee recommended by Medicare at that time. Currently the scheduled fee recommended by Medicare for an hour session with a clinical psychologist is $146.45 (MBS Online, 2019), which is 62% of the current recommended APS fee. No scheduled fees are available for 15-minute sessions; therefore, the fee used for this analysis has been based upon 62% of the APS recommended rate for a 15-minute session, which equates to $40.

As there was significant variation in the value of clinician time, all analyses were conducted with both the APS recommended rates and the Medicare scheduled fee to identify whether the difference in fees affected outcomes.

2.1.7. Program cost

The program cost of the online intervention was calculated based upon information sourced from the providers of the iCBT and iPRT interventions (Klein et al., 2011). To arrive at a cost per client, the costs attributable to the online OCD and PRT programs were divided by the annual number of clients using the program. This included program updates, departmental overheads, staffing and any other costs for the trial. In line with previous studies (i.e., Lenhard et al., 2017) program development costs were not included as these were considered as “sunk costs”. This is consistent with face-to-face programs where cost for program development was also not included as part of this analysis.

The cost per client was $280. This cost is comparable but lower than OCD intervention costs reported in the current literature in the range of $278 to $500[1] (McCrone et al., 2007; Tolin et al., 2011). The lower costs reflect the higher patient volumes able to be achieved through an internet-based program as compared to the standalone programs previously used only in clinical locations.

[1] Tolin et al. cost was US$293 in 2011 which equaled A$278 in 2011; McCrone cost was £249 in 2007 which equaled A$500 in 2007.

2.2. Economic analyses

The economic analyses conducted included a cost-benefit analysis to identify the value to society of increasing access to treatment for people with OCD, and a cost-effectiveness analysis to identify which treatment option would be the most cost-effective to offer people with OCD.

The cost-benefit analysis in this study focused on measuring the economic benefits that accrue from treatment, as research has shown that these are greater than any reduction in direct health care costs for people with OCD (Andlin-Sobocki and Witchen, 2005; DuPont et al., 1995). The production gains were calculated based upon productive time gained in a typical day, multiplied by the average Australian earnings per hour, and then extrapolated over the period for which the benefit would be realised (Lensberg et al., 2013). For the cost-benefit analysis, both a two and one year period were used.

The comparative efficiency of the interventions was determined using a net benefit approach (Torrance, 1986). The outcomes were presented as cost-effectiveness ratios based upon the cost per unit increase in effectiveness and cost per responder. The ratios were calculated by dividing the effectiveness (E), which was the reduction in the YBOCS score post-treatment or the percentage of responders, by the cost of the intervention (C) to arrive at a cost per unit of effectiveness and cost per responder.

Additional analyses were also undertaken to assess the impact of alternative assumptions on the results. For example, the time period for realising benefits could be justified as either two years or one year. Thus, both were analysed to assess the impact of the changed assumption on the outcomes.

3. Results

3.1. Cost benefit analysis

An initial cost-benefit analysis called the 'base case' was conducted for the two interventions and then compared with the benchmark ffCBT interventions using the inputs from Table 1. Three alternative scenarios were also analysed to assess the impact of changing the assumptions on the outcomes. The first scenario accounted for time savings being overstated, and halved the expected time savings across all interventions. The second scenario accounted for clinician charge rates being at APS recommended rates rather than the lower Medicare scheduled rates. The third scenario, the worst-case scenario, assumed clinician costs increased and time savings halved. Additionally, the base case and the three scenarios were calculated with a benefit period over two years and then one year in order to assess the impact of a reduced time period on the outcomes.

The total benefits and costs for each treatment option are presented in Table 3.

The outcomes for the base case and three scenarios over the two and a one year benefit period are presented in Table 4.

Both treatment options delivered benefits in terms of productive hours gained against the relatively low costs of providing treatment. This was consistent across all scenarios and both benefit periods. When assessed on the monetary value of benefits delivered, iCBT was more beneficial than iPRT. However, our benchmarking analysis indicated that ffCBT may still deliver the most benefit relative to the cost of providing the treatment.

When considering the ratio of benefits to costs, the outcomes change. Table 5 presents the cost-benefit ratios for each intervention and the benchmark by base case and for the three scenarios across the two different time periods.

When considering the ratio of benefits to the cost of treatment, iCBT, relative to iPRT provides the greater benefits when compared to the costs. iCBT provides benefits in the range of 35 to 6 times the cost of treatment compared to iPRT, which provides benefits in the range of 28 to nearly 5 times the cost of treatment. Relative to the benchmark, iCBT still provides substantially greater benefit compared to cost, with iPRT which was only marginally better than the benefits provided by ffCBT (range of 26 to 4 times the cost).

Table 3
Total benefits and costs for each intervention.

	RCT[a] iCBT[b]	RCT iPRT[c]	Benchmark ffCBT[d]
Benefits			
Average minutes saved/day	57.0	45.0	95.0
Scenario 1 – Time savings halved	27.5	22.5	47.5
Average value of time	$39	$39	$39
Base case – Total benefits over 2 years[e]	$27,046	$21,352	$45,077
Base case – Total benefits over 1 year	$13,532	$10,676	$22,539
Scenario 1 – Benefits over 2 years	$13,532	$10,676	$22,539
Scenario 1 – Benefits over 1 year	$6762	$5338	$11,265
Costs			
Base case	$760	$760	$1757
Scenario 2 – APS recommended rates	$1108	$1108	$3012

Notes:
[a] RCT - Randomised Controlled Trial.
[b] iCBT-Internet-based Cognitive-Behaviour Therapy.
[c] iPRT - Internet-based Progressive-Relaxation Therapy.
[d] ffCBT – face-to-face Cognitive-Behaviour Therapy.
[e] Assumed benefit will accrue 365 days per year.

Table 4
Cost-benefit outcomes for each intervention – base case and scenarios.

	RCT[a] iCBT[b]	RCT iPRT[c]	Benchmark ffCBT[d]
Cost-benefit - 2 years			
Base case	$26,386	$20,592	$43,320
Scenario 1 – Time savings halved	$12,763	$9916	$20,782
Scenario 2 – APS recommended rates	$25,938	$20,244	$42,065
Scenario 3 – Scenario 1 and 2 combined	$12,415	$9568	$19,527
Cost-benefit - 1 years			
Base case	$12,763	$9916	$20,782
Scenario 1 – Time savings halved	$6002	$4578	$9508
Scenario 2 – APS recommended rates	$12,415	$9568	$19,527
Scenario 3 – Scenario 1 and 2 combined	$5654	$4230	$8253

Notes:
[a] RCT - Randomised Controlled Trial.
[b] iCBT-Internet-based Cognitive-Behaviour Therapy.
[c] iPRT - Internet-based Progressive-Relaxation Therapy.
[d] ffCBT – face-to-face Cognitive-Behaviour Therapy.

Table 5
Cost-benefit ratio for each intervention – base case and scenarios.

	RCT[a] iCBT[b]	RCT iPRT[c]	Benchmark ffCBT[d]
Cost-benefit - 2 years			
Base case	35.5	28.1	26.6
Scenario 1 – Time savings halved	17.8	14.0	12.8
Scenario 2 – APS recommended rates	24.4	19.3	15.0
Scenario 3 – Scenario 1 and 2 combined	12.2	9.6	7.5
Cost-benefit - 1 years			
Base case	17.8	14.0	12.8
Scenario 1 – Time savings halved	8.9	7.0	6.4
Scenario 2 – APS recommended rates	12.2	9.6	7.5
Scenario 3 – Scenario 1 and 2 combined	6.1	4.8	3.7

Notes:
[a] RCT - Randomised Controlled Trial.
[b] iCBT-Internet-based Cognitive-Behaviour Therapy.
[c] iPRT - Internet-based Progressive-Relaxation Therapy.
[d] ffCBT – face-to-face Cognitive-Behaviour Therapy.

Table 6
Cost effectiveness ratios - base case and scenarios.

	RCT[a] iCBT[b]	RCT iPRT[c]	Benchmark ffCBT[d]
Key inputs			
Effectiveness	1.05	0.48	1.08
Responders	18%	6.0%	43.5%
Effectiveness			
Base case	$724	$1583	$1627
Scenario 2 – APS recommended rates	$1055	$2308	$2789
Responders			
Base case	$4222	$12,667	$4086
Scenario 1 – APS recommended rates	$6155	$18,467	$6924

Notes:
[a] RCT - Randomised Controlled Trial.
[b] iCBT-Internet-based Cognitive-Behaviour Therapy.
[c] iPRT - Internet-based Progressive-Relaxation Therapy.
[d] ffCBT – face-to-face Cognitive-Behaviour Therapy.

3.2. Cost effectiveness analysis

Cost effectiveness ratios for the three interventions for the base case and scenario two, the increase in clinician costs, were calculated based on treatment effectiveness and the percentage of responders. The results of these analyses are presented in Table 6.

When the cost-effectiveness ratio was based upon the overall effectiveness of each treatment, iCBT was more cost-effective treatment for OCD than iPRT. This was irrespective of whether symptom reduction or responder analyses were used or variations in the clinician pay rate. Relative to estimated current benchmarks, iCBT remains cost-effective treatment, particularly when profession recommended rates are used in comparisons.

4. Discussion

This economic evaluation showed both treatment options delivered substantial economic benefits through savings in time gained as a result of reduction in symptoms. The face-to-face treatment provided the greatest absolute benefit overall at $43,320 compared to $26,286 for the iCBT treatment and $20,592 for the iPRT treatment. However, when the ratio of benefits to the cost of treatment were considered, the iCBT treatment delivered the greatest benefit compared to the cost, followed by iPRT and then ffCBT. The benefits ranged from 3.7 to 35 times the cost of providing treatment, dependent upon the assumptions used and the treatment provided. The lowest cost-benefit ratio, nearly four times the cost of providing treatment, was for the face-to-face treatment; this is comparable to the findings of DuPont et al. (1995).

The comparative analysis identified iCBT as a cost-effective treatment option for OCD relative to iPRT. This finding was consistent regardless of whether reduction in symptoms or the percentage of responders was used as the basis for the analysis. The cost-effectiveness analysis found iCBT was potentially more cost-effective treatment than current available treatments, particularly when calculations were based on overall reduction symptoms. The differences were less clear when the percentage of responders was used as the basis for the analysis, with ffCBT outperforming iCBT when the lower therapist costs were used in the estimates, but not when APS recommended rates were used. This was largely due to the relatively low percentage of responders for the online treatment. To improve comparability with face-to-face treatment studies this study employed a more conservative criteria than that employed in previous research on iCBT (Andersson et al., 2012), However, given the lower severity of symptoms in the current sample relative to standard CBT trials, this may have limited the ability to detect responders. Nevertheless, the current findings do suggest that further developments and improvements of iCBT in terms of its effectiveness are likely to make this treatment a very cost-effective option for treating OCD.

The finding that iCBT was more cost-effective than ffCBT was expected given McCrone et al.' (2007) findings that computer-aided behaviour therapy delivered greater benefits comparative to the cost of treatment.

The current findings also indicate increasing cost-effectiveness of online treatments relative to previous research, particularly when compared to face-to-face treatments (e.g., Kaltenthaler et al., 2006). The main contributors appear to be both increasing effectiveness of programs and considerable reduction in costs of delivering programs online due to increased availability and throughput (Kaltenthaler et al., 2006; Kyrios et al., 2018).

This study found that treatment for OCD, particularly when there is even limited access to a therapist, has significant economic benefits for both the individual and society. The findings therefore support making CBT treatment available, no matter the modality, to all patients with OCD. Further work to more accurately quantify the time savings resulting from CBT treatment is required to support these preliminary findings.

4.1. Limitations

This study had a number of limitations. The main limitation was the lack of a direct comparison with the current standard CBT treatment for OCD, which is delivered face-to-face. While best available evidence (i.e., meta-analyses) was used to estimate realistic benchmarks, gaps in information (e.g., time and cost estimates), limit the generalisability of the findings. Given these preliminary findings and the proliferation of online treatments it is imperative for future research to assess not only comparative effectiveness, but also the comparative cost-effectiveness of the use of online CBT in treating OCD. Further limitation was the lack of objective data regarding productivity savings. Specifically, the calculation of time savings was based upon the YBOCS, which was not designed for collecting this type of information. Assumptions were therefore required to estimate the time benefits, which may not be entirely accurate. Future economic studies should consider directly measuring time savings as a result of treatment and/or collecting information on unproductive days or hours, alongside more broader and general estimates. This study also did not consider direct costs, such as healthcare costs, that might be impacted by treatment. While previous research (Andlin-Sobocki and Witchen, 2005) has noted that in relation to anxiety and mood problems, productivity costs tend to form a larger portion of the overall cost, including direct healthcare costs would have provided a more comprehensive estimate of the overall savings of the interventions. Also, cost savings due to attrition in treatment were not accounted for by the analysis due to complexities associated with estimating therapist involvement for the online programs. This may have further underestimated the cost-effectiveness ratios as effectiveness was based on intention-to-treat analyses, which accounted for attrition. Further, benefits were not predicted to persist beyond two years due to the lack of evidence available to support such an assumption, and may have been understated. Further longitudinal studies that measure the continued impact of CBT beyond two years are needed to confirm the extent of benefits that may be available from accessing treatment.

4.2. Conclusion

This study highlights the benefits of providing clinician-assisted CBT treatment over the internet. The results from the clinical trial have shown iCBT to be effective, and this study shows that it is most likely to be cost-effective compared to CBT delivered face-to-face and when compared to internet-based progressive relaxation therapy.

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