The economic benefits of LENS treatment for people with anxiety

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PRO BONO ECONOMICS

Pro Bono Economics uses economics to empower the social sector and to increase wellbeing across the UK. We combine project work for individual charities and social enterprises with policy research that can drive systemic change. Working with over 500 volunteer economists, we have supported over 500 charities since our inception in 2009.

MQ Mental Health Research is an award-winning charity that supports much-needed scientific research globally which transforms the lives of people affected by mental illness. Together with supporters and a global network of scientists, MQ works to create a world where mental illness is understood, effectively treated and ultimately prevented.

Thanks to Professor Colette Hirsch and her team for providing both additional data and invaluable context to the research discussed in this report.

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Summary

Anxiety disorders affect large parts of the population and their impact can be debilitating. Most people experience some symptoms of anxiety in response to stress or danger; however, anxiety becomes a problem when it is regular or excessive, and difficult to control.

Generalised anxiety disorder (GAD) is one of the most common anxiety conditions. It is characterised by persistent, excessive worry about many different things (rather than anxiety about specific situations). In 2014, over 5% of people in England reported symptoms of GAD serious enough to warrant clinical recognition; two-thirds of those experienced severe symptoms. Following the Covid pandemic, people throughout the UK have reported experiencing worse anxiety than in previous years.

Current NHS treatments for GAD usually involve some form of cognitive behavioural therapy (CBT), ranging from guided self-help courses to sessions with a therapist. Many of these treatments require interaction with or supervision by a trained therapist, which limits availability and may also discourage some sufferers from seeking treatment.

A recent study funded by MQ Mental Health Research (MQ) showed that a new treatment, titled Learning Effective New Strategies (LENS), which can be administered remotely, could be effective in helping people who experience GAD to recover. The LENS treatment, which consists of a training programme designed to embed effective strategies for reducing anxiety, was delivered entirely online and has since been developed into an app.

MQ asked Pro Bono Economics (PBE) to estimate what the potential benefits of this treatment might be, if it were made available to anxiety sufferers in the general population. Using statistics on mental illness and standard valuation techniques, PBE translated the study outcomes to numbers which reflect the scale of the benefits the treatment might achieve.

Symptoms of anxiety can have a serious impact on a sufferer's quality of life. As well as feelings of worry or restlessness, symptoms might include difficulty concentrating, difficulty sleeping, dizziness, and heart palpitations. The World Health Organisation (WHO) provides representative measures of the impact of anxiety and other physical and mental health conditions on quality of life. The detrimental impact that severe anxiety has on the sufferer's quality of life is estimated to be just slightly lower than that of someone experiencing terminal cancer with medication.

The key metric used in this report is quality-adjusted life years (QALYs), used by the National Institute for Health and Care Excellence (NICE) to represent the health benefits in terms of improvement in quality of life from an intervention. Conceptually, one QALY represents one year of life in perfect physical and mental health. The impact of severe anxiety on a sufferer is more than half a QALY: that is to say, it is equivalent to losing half a year of life in full health. Treasury valuation standards are used to convert this potential improvement into an economic benefit as valued in today's pounds.

If the LENS treatment were rolled out to the 1.4 million people that might be both suffering from and likely to seek treatment for anxiety, the improved quality of life they might experience would be substantial: estimates express this as almost 40,000 QALYs, or as much as £2.9 billion in value. However, the range of estimated benefits is wide, and depends heavily on the assumptions that must be made to bridge gaps in the data used. Testing of various scenarios suggests the benefits could range between £1 billion and £5 billion.

The precision of the estimates is heavily limited by the lack of detailed, recent data on the prevalence and severity of mental health illnesses in the UK. Better data, and thus more research, is needed to improve any future attempts to quantify the potential benefits of new treatments. MQ already helps researchers to rigorously evaluate their interventions; they might be able to facilitate further economic evaluations by both helping researchers to fill in some of these gaps in their own work, and by drawing attention to the paucity of data on mental health more broadly.

LENS treatment could help an additional

160,000

people recover, at least temporarily, from generalised anxiety disorder

1 in 6

people in England experience a mental illness

6%

of people in the UK have generalised anxiety disorder

The annual potential benefits of rolling out LENS treatment are valued at between

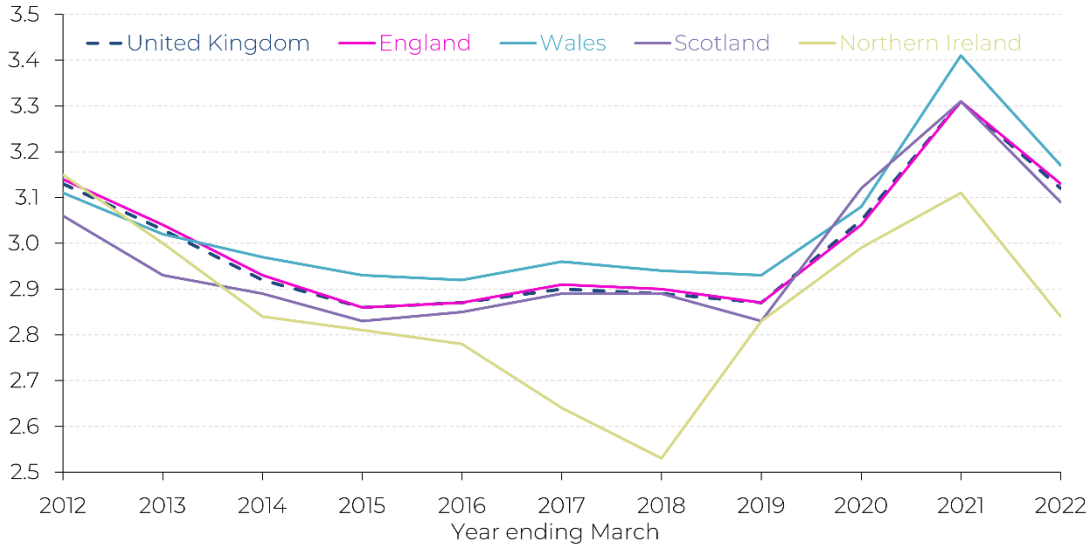
£1bn-£5bn

Introduction

Mental illness affects up to one in six people in England each year, and anxiety disorders are the most common mental health disorder.[1] Various indicators suggest that anxiety in the population may be higher currently than it has been in recent years. Figure 1 shows, for example, that throughout most of the UK people report that their anxiety is now higher than before the Covid pandemic.

Figure 1. Levels of anxiety in the UK

Self-described anxiety levels are higher than in previous years throughout the UK



Notes: Respondents are asked to respond to the question "overall, how anxious did you feel yesterday?" on a scale of 0 to 10, where 0 is "not at all" and 10 is "completely". Graph shows the average response in each nation.
Source: ONS (2023): Annual personal wellbeing estimates, year ending March 2012 to year ending March 2022, Table 10.

Most people experience some symptoms of anxiety in response to stress or danger. However, anxiety becomes a problem when it is regular or excessive, and difficult to control. This can interfere with someone's everyday life and may also manifest as physical symptoms and as dysfunctional behaviours intended to reduce anxiety.

Generalised anxiety disorder (GAD) is a common anxiety condition in which people experience persistent, excessive worry about many different things in their lives, as opposed to being triggered by specific situations.[2] On top of feelings of worry or restlessness, symptoms (which will vary from person to

[1] S McManus, P Bebbington, R Jenkins, T Brugha (eds.) (2016): Mental health and wellbeing in England: Adult Psychiatric Morbidity Survey 2014 (Leeds: NHS Digital).
[2] "Overview - Generalised anxiety disorder in adults," NHS, last modified 5 October 2022. Accessed 10 October 2023.

person) might include difficulty concentrating, difficulty sleeping, dizziness, and heart palpitations.

World Health Organisation definition of generalised anxiety disorder

"Generalised anxiety disorder is characterised by marked symptoms of anxiety that persist for at least several months, for more days than not, manifested by either general apprehension (i.e. 'free-floating anxiety') or excessive worry focused on multiple everyday events, most often concerning family, health, finances, and school or work, together with additional symptoms such as muscular tension or motor restlessness, sympathetic autonomic over-activity, subjective experience of nervousness, difficulty maintaining concentration, irritability, or sleep disturbance.

"The symptoms result in significant distress or significant impairment in personal, family, social, educational, occupational, or other important areas of functioning…."[3]

- World Health Organisation, International Classification of Diseases 11th Revision

A survey conducted by the NHS in 2014 suggested over 5% of the population have symptoms of GAD which would be considered moderate or severe.[4] Treatment usually involves some form of cognitive behavioural therapy (CBT), ranging from guided self-help courses to sessions with a therapist, but may also extend to medication.

MQ Mental Health Research (MQ) is a global charity that supports research to improve prevention, detection and treatments for mental health conditions, as well as improved capacities and infrastructure to support the mental health research community. MQ supports researchers who are making strides in improving scientific understanding of mental health issues and developing new ways of preventing and treating them.

The Learning Effective New Strategies (LENS) treatment is one such example. Trialled with the support of MQ, it showed that a training

[3] "ICD-11 for Mortality and Morbidity Statistics: 6B00 Generalised anxiety disorder," WHO, Version: 01/2023. Accessed 24 October 2023.
[4] S McManus, P Bebbington, R Jenkins, T Brugha. (eds.) (2016): APMS 2014: Chapter 2 – Common Mental Disorders - Tables (Leeds: NHS Digital), Table 2.3.

programme delivered online could effectively reduce anxiety in individuals experiencing clinical levels of GAD.[5]

Learning Effective New Strategies (LENS)

"LENS is an effective, online brain training that changes unhelpful thinking habits, and in so doing reduces anxiety and depression in people suffering from those disorders. LENS is a fully online intervention so it is highly scalable, enabling people to get help when they want it."

- Colette Hirsch, Professor of Cognitive & Clinical Psychology, Lead researcher in LENS trials

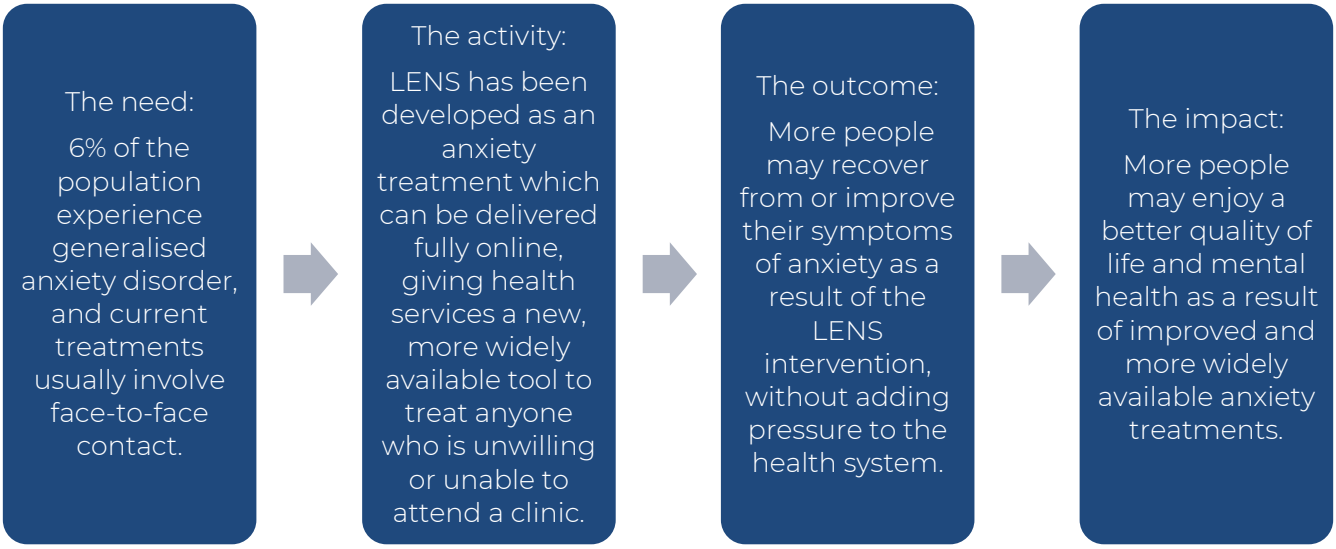
The LENS treatment is a form of Cognitive Bias Modification (CBM) which addresses the tendency for generalised anxiety disorder (GAD) sufferers to interpret ambiguous situations with a negative bias. Participants practice interpreting such scenarios in a positive manner instead.

In clinical trials, more participants who received LENS training showed an improvement in standard measures of anxiety than the active control group. In particular, more recovered from anxiety and more experienced a lowering in their measured level of anxiety. This effect was evident in follow-ups up to three months after the training.

A strength of the programme is that it can be delivered without any face-to-face contact, meaning that any sufferers who are unwilling or unable to attend a clinic can still be treated.

[5] C Hirsch, C Krahé, J Whyte, H Krzyzanowski, F Meeten, S Norton, & A Mathews, A. (2021): "Internet-delivered interpretation training reduces worry and anxiety in individuals with generalized anxiety disorder: A randomized controlled experiment," Journal of Consulting and Clinical Psychology 89, no 7: 575–589.

Figure 2. A theory of change for a potential roll-out of the LENS treatment



Scope of this report

This report focuses on quantifying the potential economic benefits which might arise from making LENS treatment, which was effective in an experimental setting, available to the broader population. The scope does not include a full cost-benefit analysis, and is limited to estimating the number of people potentially treated and the likely improvement in their quality of life as they recover from anxiety.

Discussions with the researchers involved suggests that scaling up the treatment would not require significant adjustments to the LENS treatment from its trialled version, nor would there be substantial per-participant costs which might make the treatment uneconomic at scale. In fact, this treatment is ready to be delivered en masse. Since the trial, the LENS treatment has been developed into an app prototype.

Background

The role of economic analysis

Even once treatments have been found effective in a trial setting, it is important to understand which have the most potential to make an impact outside such settings. Estimating the potential aggregate benefits of a new treatment is an important guide to decisions in public health, research funding and medical practice.

MQ has asked Pro Bono Economics (PBE) to analyse the LENS trial, one of its most promising supported anxiety studies to have already gone through the trial phase. Through this analysis, PBE can demonstrate what the scale of the potential benefits of the LENS treatment might be if it were made available to the whole UK population.

Understanding QALYs

While many economic evaluations include benefits such as reduced reliance on healthcare services or better employment outcomes, the success of the LENS treatment was measured purely in terms of the participants' experience of anxiety. In this report, two key quantifications of this success are considered: the effect of the alleviation from anxiety in terms of quality-adjusted life years (QALYs), used by the National Institute for Health and Care Excellence (NICE) to represent the health benefits in terms of improvement in quality of life from an intervention, and its monetary equivalent.[6]

With one QALY representing one year of life in perfect physical and mental health, a condition which detracts from quality of life can be represented as a subtraction from one. It follows that the further from 1, the poorer a sufferer's quality of life. For example, a mild anxiety disorder is represented as having a much smaller effect on quality of life than a severe anxiety disorder. The World Health Organisation (WHO) provides QALY-equivalent measures of a range of broadly-defined physical and mental illnesses, including for mild, moderate, and severe anxiety disorders.[7]

The WHO health weights provide a representative measure of the impact on quality of life of a condition and enable comparisons across a range of conditions. As an illustration, the impact of a mild anxiety disorder on the quality of life of a sufferer, as measured by (reduction in) QALYs, is

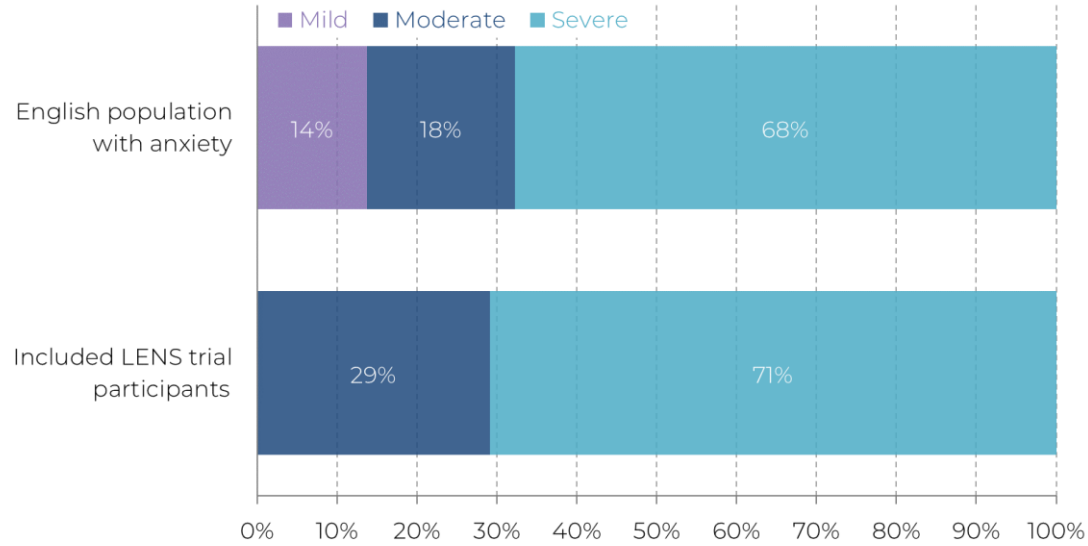
[6] Treasury standards value one QALY at £70,000 in 2020/21 prices; this value has been uprated to 2022/23 prices using the GDP deflator.
[7] World Health Organisation (2020), "WHO methods and data sources for global burden of disease estimates 2000-2019," Global Health Estimates Technical Paper WHO/ DDI/DNA/GHE/2020.3: Annex Table C.

comparable to that from a mild motor and cognitive impairment. Similarly, the impact of a moderate anxiety disorder is comparable to that of uncontrolled asthma; and having severe anxiety is estimated to be just slightly less detrimental to quality of life than experiencing the terminal phase of cancer with medication.

Measuring anxiety and its severity

The categorisation of anxiety into mild, moderate, and severe also exists in standard measures of anxiety. The GAD-7 assessment, a standard tool for assessing anxiety, has ranges corresponding to minimal, mild, moderate, and severe anxiety. While these distinctions are arbitrary, they are also helpful to have: for example, they enable comparisons across different treatments.

Figure 3. A large share of anxiety sufferers have severe anxiety



Note: LENS trial participants bar excludes those who had mild anxiety as measured before receiving LENS training, for consistency with later results.
Sources: McManus et al, 2016; Hirsch et al, 2021.

NHS data suggest that two-thirds of English adults who experience anxiety have severe anxiety; of the remainder, there are more sufferers of moderate anxiety, with mild anxiety being relatively less common (Figure 3).[8] While LENS was intended for people with moderate or severe anxiety, comparable treatments such as NHS Talking Therapies are also available to individuals without a formal diagnosis, or with lower measured levels of anxiety.

In the LENS trial, participants' anxiety levels were tested twice using the GAD-7 assessment before they undertook the training: once as part of an

[8] McManus et al (2016), Table 2.5.

initial screening and again to establish their pre-treatment anxiety level. As the treatment was designed for people with 'clinical' levels of anxiety (moderate or severe), only participants with moderate or severe anxiety at the screening stage took part in the trial. However, as with most measurements, there is some small variability in how people respond to questions from day-to-day, which may not be indicative of an overall trend. In this case, this randomness means that some of the trial participants who were measured as having relatively severe anxiety at screening reported mild anxiety at the pre-treatment stage. In keeping with the researchers' intentions, these participants are excluded from results making up the central estimates in this report.

GAD can be difficult to diagnose, it is experienced in different ways by sufferers, and often occurs alongside other mental illnesses, such as depression. For the purposes of translating the research into wider measures of benefits, it is necessary to discuss anxiety as though it were an 'on/off' or easily quantifiable experience, with clear thresholds distinguishing the severity of experiences, when in fact each person's experience is rarely so easy to categorise. While this necessarily imperfect exercise in quantification cannot capture the diversity of experiences of GAD sufferers, it can be a powerful demonstration of the potential representative impact that such a treatment could have on their lives.

PBE's approach

PBE's approach has been to flesh out a hypothetical scenario in which LENS treatment is available online to anyone with moderate or severe levels of anxiety, although other restrictions applied in the LENS trial would not be able to be replicated, as discussed below.

The calculations follow a four-step process:

1. Quantifying the potentially affected population: Data from the NHS and Office for National Statistics (ONS) is used to assess the number of moderate and severe GAD sufferers in the UK who seek some form of treatment
2. Identifying the potential increase in recovery rates: The trial results predict the increase in the rate of recovery from anxiety that might be expected if the treatment were made available to the whole population; other work gives a guide as to how enduring such an improvement might be.[9]
3. Measuring the recoveries in QALYs: International standards from the WHO are used to quantify the improvement in quality of life (measured in QALYs) that someone who suffers anxiety might experience from alleviation of their condition.
4. Converting the QALY improvement into economic benefits: Treasury valuation standards are used to convert this potential improvement into an economic benefit as valued in today's pounds.

Key limitations of economic analysis

In quantifying this hypothetical scenario, there are various points at which the limit of what can be known or shown with data are reached. The choices or assumptions made at such points could critically affect the resulting estimates of the potential benefits of this treatment. The most important choices which have been made are:

- To assume that three different measures of severity of anxiety are comparable: GAD-7, CIS-R, and the WHO health weights.[10]

[9] The measure of the effectiveness of the LENS treatment is taken from the difference in the rate of reliable recovery from anxiety between the control and treatment groups. All participants responded to the GAD-7 assessment at screening, before the treatment, and in the three post-treatment follow-ups. To be considered as having 'reliably' recovered, trial participants' measured anxiety had not only to pass below the standard clinical threshold for anxiety but also to decrease by a substantial amount. In this report, recovery rates should be interpreted as rates of reliable recovery.

[10] It should be noted that an early study of the CIS-R measure, which underlies statistics on the severity of anxiety in the population, showed that it compared quite poorly with the international definitions

- To assume the treatment would be available to the population of people who suffer moderate and severe anxiety only, as the training was intended to treat only those with moderate or severe anxiety.
- To assume the effect the treatment had on people who participated in the LENS trial would be replicated on those who did not.[11]
- To assume the same share of people who suffer anxiety would seek LENS treatment as those who currently seek other available treatments.
- To make moderate assumptions about the effectiveness of the LENS training in helping participants recover from anxiety.[12]
- To assume the effectiveness of the treatment tails off after three months, and at a similar pace to documented relapses after CBT treatment.[13]

The sensitivity tests explored below show that making different choices could lead to very different overall estimates. Further assumptions, which could not be directly tested, are also discussed in Annex A. Given the importance of these assumptions, it is worth emphasising that these estimates should be treated as indicative of the broad scale of potential benefits, rather than as precise measures.

underlying the WHO health weights (T Brugha, P Bebbington, R Jenkins, H Meltzer, N Taub, M Janas, & J Vernon. (1999): "Cross Validation of a General Population Survey Diagnostic Interview: a Comparison of CIS-R with SCAN ICD-10 Diagnostic Categories," Psychological Medicine 29, no. 5: 1029–42).

[11] This includes not only people who would have been eligible but did not participate, but also people excluded by restrictions placed on participants, which would not be replicable in a real-world roll-out.

[12] The improvement in anxiety levels was measured at three points after the trial was completed; at each point the measured improvement was different. Central estimates are based on the average of the measured improvements in only the second and third follow-ups, as the improvement immediately after the trial was not statistically significant.

[13] The LENS trial only tracked participants for three months after the training ended; recovered sufferers of conditions like anxiety are prone to relapse, which would attenuate the benefit of such a treatment over a longer time period. Using documented CBT relapses to model that from LENS assumes that recovery following LENS treatment is, over a longer term, no more or less persistent than in low-intensity CBT treatments.

Results of the analysis

Making LENS treatment available to all people suffering moderate and severe anxiety in the UK might open the treatment up to 1.4 million people.[14] Over 160,000 more people might make at least a temporary recovery from anxiety than would without LENS treatment being available.

The aggregate benefits of these recoveries depend crucially on how lasting the impact of LENS is. The trial showed the effect of LENS in the three months after the trial, but left its effectiveness after that an open question. The authors of the LENS evaluation themselves remarked that "…future research assessing diagnostic status beyond three-month follow-up is needed to determine whether the intervention can help individuals with GAD to no longer meet diagnostic criteria…".[15] A standard GAD diagnosis is for a six-month period; QALYs represent a measure of wellbeing over the course of a year. The estimates of the impact of LENS treatment are given over a year in this report to understand some of these longer-term implications on welfare of someone undertaking the training.

Ideally, anyone who recovers from anxiety in the three months of the trial would remain recovered, but as anxiety sufferers are prone to relapse, alternative scenarios must also be considered. Three possible paths for the persistence of LENS training are modelled:

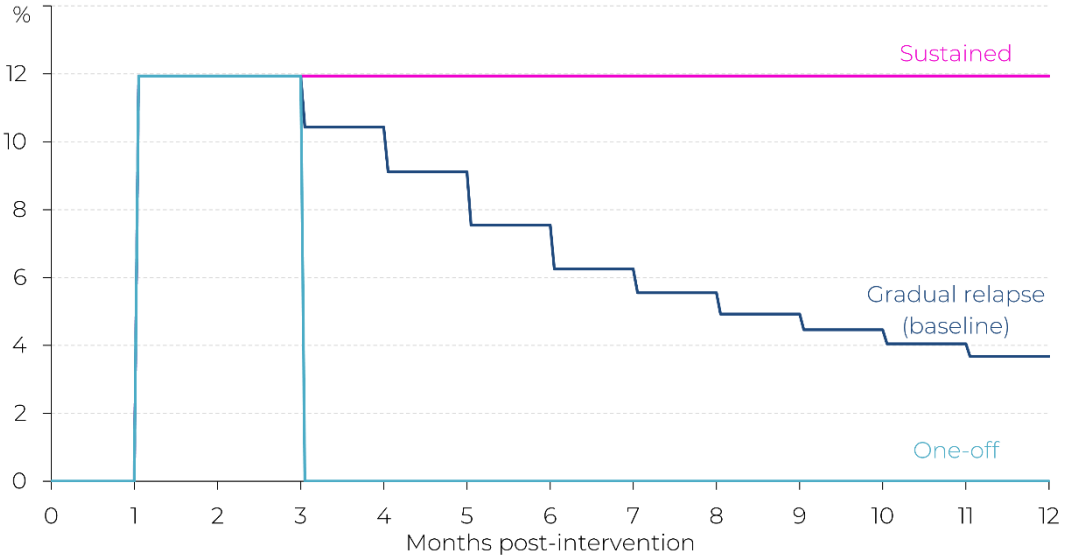
- 'Sustained': everyone who undertook LENS training and recovered from anxiety remains recovered for a full year.
- 'One-off': LENS is only effective for three months.
- 'Gradual relapse' (the central scenario): LENS is effective as measured for three months, and gradually dissipates for the rest of a year, as some of the people who initially recovered gradually relapse into anxiety.

Figure 4 gives a visual representation of these scenarios for how the recovery rate sustains after the first three-month period. The first month does not show an improvement; this is because the difference in recovery rates in the immediate follow-up was not significantly different between the control and recovery groups.

[14] A full summary of quantitative estimates is given in Annex B. The central estimates of the benefits of LENS treatment are premised on the treatment being made available to people with moderate and severe anxiety only. The possible additional benefits of extending treatment to people with mild anxiety are explored in the following section.
[15] Hirsch et al (2021), p. 588.

Figure 4. Recovery rates in scenarios for persistence of LENS treatment

The persistence scenarios imply a wide range of recovery rates after treatment



Notes: Y-axis shows the implied increase in the share of people recovering from anxiety over one year after LENS treatment.
Source: PBE analysis of Hirsch et al, 2021; Ali et al, 2017.

The central estimates are premised on the 'gradual relapse' scenario: a gradual tail-off in the recovery rate following the first three months after LENS training, as some of the people who initially recovered relapse back into anxiety.[16] In this scenario, the improvements resulting from recovery from anxiety are equivalent to almost 40,000 QALYs. The economic value of these quality of life improvements could be as much as £2.9 billion, equivalent to £2,170 per treated person.

However, the estimated benefits are heavily dependent on the chosen scenario. If recovery from anxiety is completely sustained then the potential benefits would be 64% higher in terms of both QALYs and economic value. The estimated benefits under this scenario amount to £4.8 billion. On the other hand, if LENS is only effective at lifting people out of anxiety for the measured three months, the potential benefits associated with the 'one-off' scenario are 70% smaller at £900 million.

The wide range of estimates is unsurprising, given that just three months' observed data are being used to impute a year's worth of outcomes. It is notable, though, that even under the most conservative assumption (the 'one-off' scenario, covering only the three months of the trial follow-up), the potential benefits are substantial, amounting to almost £650 per person.

[16] This is modelled on a profile of relapse documented by S Ali, L Rhodes, O Moreea, D McMillan, S Gilbody, C Leach, M Lucock, W Lutz, J Delgadillo (2017): "How durable is the effect of low intensity CBT for depression and anxiety? Remission and relapse in a longitudinal cohort study," Behaviour Research and Therapy 94, July: 1-8. Details are discussed in the Annex.

The economic benefits of the LENS treatment echo the experience of participants in the trial who found that having these strategies available to them made a noticeable improvement to their quality of life.

Impact of LENS

"I found the experience really helpful, which amazed me. I feel more positive and happier."

- Participant in the LENS trial

Sensitivity analysis

The estimates above are sensitive to the choices outlined earlier in this report. This is demonstrated below with a series of sensitivity tests, which explore how the estimates change under a range of different assumptions:

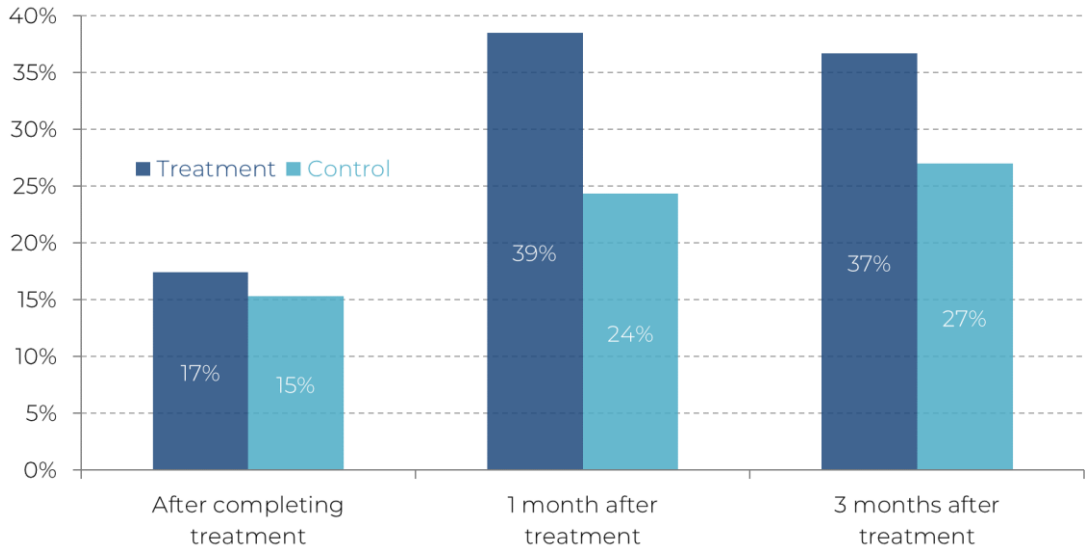
- Sensitivity test 1 – effectiveness of the treatment.
- Sensitivity test 2 – treating mild anxiety.
- Sensitivity test 3 – including recovery from mild anxiety.

Sensitivity test 1 – effectiveness of the treatment

The measured effectiveness of LENS varied across the three follow-ups after the training was completed. Figure 5 shows that the additional share of participants who recovered from anxiety due to the LENS treatment varied from 2 percentage points to 14ppts.

Figure 5. Recovery rates for treatment and control groups

Differences in the recovery rates between the groups varied at follow-up points



Source: PBE analysis of Hirsch et al, 2021.

The central estimates are based on the average difference between control and treatment groups' recovery rates at the second and third follow-up points. This gives the treatment effect as 11.9ppts. An alternative approach

would be to take the largest and smallest of the measured treatment effects.[17]

The estimated benefits of LENS treatment are highly sensitive to the assumptions made about which treatment effect is most appropriate, and the central estimates are towards the upper end of the range of imaginable outcomes.

In an optimistic scenario (taking the largest measured additional recovery rate, 14.2ppts, as representative) the potential benefits are 19% higher than the central estimates, with an estimated value of £3.5 billion. The more pessimistic scenario (the lowest measured recovery rate, 2.1ppts) generates a larger (82%) reduction in the estimated benefit but still indicates potential benefit of £500 million.

Sensitivity test 2 – treating mild anxiety

The LENS treatment was designed for people with moderate and severe anxiety; as a result, the estimated population in the central estimates is all UK sufferers of comparable levels of anxiety (moderated by the share who might seek treatment).

However, the researchers behind LENS believe that, like other comparable therapies currently available under the NHS, LENS would be appropriate and effective for people with more mild anxiety. Table 5 shows how the estimates would change if the treatment were made available to those suffering mild anxiety, as well as those with moderate or severe anxiety, as in the central estimates.

In aggregate terms the potential additional benefit of extending LENS treatment to people with mild anxiety is minimal: the aggregated benefits amount to £3 billion, 1% more than in the central estimates. This reflects two key facts: the bulk of people identified as having anxiety experience relatively severe symptoms (Figure 3); and the estimated improvement in quality of life resulting from a recovery from mild anxiety is much smaller than that from moderate or severe anxiety (Tables A1 & A2).

[17] Another alternative would be to sketch out a path for the recovery rate across these three points in time, but this does not seem sensible. For one, the increased recovery rate observed at a given point in time might last a day or two months – there is no further information with which to fill in the profile between observations. Additionally, the direction of the improvement (or otherwise) in the recovery rate is ambiguous over the three months which are known: for example, just sketching out the second and third data points implies a constantly reducing rate of recovery, which conflicts with the first observation.

Sensitivity test 3 – including recovery from mild anxiety

As noted earlier, the LENS treatment was designed with moderate or severe anxiety in mind; however, some participants were assessed as having mild anxiety immediately before undertaking the training, despite having had more severe anxiety as measured during pre-trial screening. To calculate treatment effects consistent with the intentions of the researchers, the central estimates and all sensitivity tests above exclude those participants.

Participants with mild anxiety before training were slightly more likely to make a recovery. If those participants are included in the calculated treatment effect, this would naturally raise the expected recovery rate and the resulting estimated benefits. Even so, in aggregate terms, the estimated benefits do not increase by much - amounting to £3.1 billion, a 6% increase compared to the central estimates.

Conclusions of sensitivity analysis

The modelling choices made do indeed have a large impact on the potential benefits estimated. However, under all scenarios, the LENS treatment could be expected to generate substantial benefits if it were made more broadly available.

The estimates are most sensitive to the choice of measured treatment effect and the assumptions made about the persistence of any treatment. More research into how the experience of anxiety evolves over time after such a treatment would undoubtedly be valuable. Nonetheless, as shown in the one-off scenario, even under quite restrictive assumptions the treatment would be of substantial aggregate value.

Conclusion and recommendations

The LENS training was shown to be effective in helping participants recover from anxiety in clinical trials. PBE's estimates suggest that if this treatment were rolled out to the general population, 1.4 million people might be both eligible and likely to seek treatment for their anxiety, and an additional 160,000 people might be expected to experience at least a temporary recovery from anxiety.

The improved quality of life which might result would also be substantial: central estimates suggest in aggregate these could be measured as almost 40,000 additional QALYs, which is valued at £2.9 billion. The estimated benefits depend heavily on the assumptions that are made to flesh out this roll-out scenario. The benefits plausibly range between £1 billion and £5 billion. However, even under very conservative assumptions, the potential mental health improvements and economic benefits to society to be gained from LENS training could be substantial.

LENS training has been shown to be effective in addressing one of the most common mental illnesses and having a significant impact on the quality of life of people who undergo it. In the context of elevated levels of anxiety following the Covid pandemic, this report shows that making the training available to all those who would benefit from it might lead to a significant improvement in welfare at large.

Recommendations for mental health research

Effective treatments like LENS are advancing the frontier of treatments for anxiety. The collaboration between the researchers, MQ and PBE in analysing the potential impact of this treatment is a great step in the right direction, and a valuable contribution to the mental health research sphere.

The procedure followed in this report is typical of an economic benefit analysis. However, as demonstrated, when confronted with real-world data constraints, the precision of the estimates is heavily restricted. Researchers can improve the prospects of precise benefits being made of new treatments by:

- Evaluating their treatment in a randomised control trial setting (if not in initial stages, then planning to do so in later trials);
- Running trials with large sample sizes, to enable more granular analysis;

- Running long-term evaluations of trials;
- Specifying the appropriate population for a new treatment;
- Documenting the costs of their interventions, and making estimates of how costs might change outside a trial setting.

MQ works closely with researchers and encourages them to rigorously evaluate their interventions in accordance with scientific standards. Through its role in funding research, it also can be an important lever in facilitating such improvements.

Outside the context of trialling new treatments, a major constraint on the precision of the estimates in this report is the lack of detailed, recent data on mental health in the population. The go-to sources on prevalence are from 2014. Better data, and thus more research, is needed to improve any future attempts to quantify the potential benefits of new treatments. In particular, more research is needed into:

- The prevalence of mental health illnesses, particularly in terms of severity and co-morbidities;
- What prevents people seeking treatment for mental illness, and how this might be improved.

MQ has highlighted the lack of funding for mental health research in the past; the sector might benefit from attention also being drawn to the paucity of data on mental health.

Annex A – Detailed methodology

The structure of this annex follows the four-step approach to calculations as outlined in the main body of the report.

Quantifying the potentially affected population

The size of the total UK population aged 18 and over comes from Office for National Statistics (ONS) estimates – the most recent available are for mid-2021.[18] Figures from the NHS 2014 Adult Psychiatric Morbidity Survey were used for the share of adults suffering with generalised anxiety disorder (GAD) (5.9%), the share among those who have moderate or severe anxiety (86.2%), and the share currently receiving any treatment (49.9%).[19] The potentially affected population is calculated as:

$$\begin{aligned} &\textit{Adults who might seek treatment} \\ &\quad = \textit{UK population } (\textit{aged } 18+) \\ &\quad \times \textit{Share with moderate or severe GAD} \\ &\quad \times \textit{Share of those with GAD who have sought treatment} \end{aligned}$$

The ONS estimates cover the entire UK population, but the NHS survey figures are only for England. In combining these figures to represent mental health in the whole of the UK, there is an implicit assumption that the incidence of GAD, and likelihood of seeking treatment, is not substantially different in Scotland, Wales, or Northern Ireland.[20]

The NHS figures are based on 2014 data, and comparable information for more recent years is not yet available. The sources which are available, such as the ONS wellbeing measures (shown in Figure 1), indicate that general levels of anxiety in the population have worsened since that time, particularly during the Covid pandemic. An increase in the number of people who would potentially undertake LENS training would naturally increase the aggregate estimated benefits.

It may be that the estimates may underestimate the potential benefits: given that the treatment is available without any face-to-face contact, more people may be encouraged to seek treatment than currently do, which would increase all aggregated estimates.

On the other hand, if the effect of the treatment on people excluded from the Learning Effective New Strategies (LENS) trial is weaker than that on those who took part, the aggregate benefits will be smaller than estimated.

[18] ONS (2022): Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland, Table MYE2.
[19] McManus et al (2016), Table 2.3 and Table 3.2.
[20] Figure 1 suggests that the profiles of anxiety in England, Scotland, and Wales are quite similar.

A number of inclusion and exclusion criteria were placed on the participants by the researchers, ranging from age and fluency in English, to experience of substance abuse, brain injury, and co-morbid psychosis, or other psychological conditions. It is not possible to replicate such a combination of inclusion and exclusion conditions with aggregate data. Instead, it is necessary to assume that the people who were excluded from these studies as a result of these criteria are not likely to have very different outcomes to those who participated.

The LENS researchers indicated that these exclusions were made for the purposes of evaluation - rather than because there was some reason to expect these people would have a particularly different response to the treatment - and that if the treatment were made freely available there would be no reason to preclude most such people from treatment.

Identifying the potential increase in recovery rates

The LENS evaluation was conducted as a randomised control trial, the 'gold standard' of evaluation. The trial showed that participants who received LENS training were more likely to make a recovery from anxiety than participants who undertook the control training (which simulated treatment but was not expected to be effective). At three points after completing the training, the LENS group showed better rates of recovery from anxiety than the control group. The reduction in scored anxiety was also significantly larger for the control group.

Before extrapolating these improvements to population data, it is important to check that these are greater than what might be explained by day-to-day variation in measured anxiety scores. A z-test shows that the treatment group had significantly larger recovery rates than the control group at the 5% significance level during the second follow-up, and at the 15% significance level at the third follow-up, while the difference at the first follow-up was statistically insignificant. As noted in the main body of the report, the central estimates take the average of the second and third follow-up evaluations as the representative improvement in recovery rates. As a result, the assumed path of recovery (as shown in Figure 4) has a stepped profile, with the intervention assumed to have no effect in the first month and the average of the second and third follow-ups representing the additional improvement in anxiety recovery rates in the second and third months after training.

The LENS treatment was designed for people with moderate or severe anxiety in mind. Nonetheless, some small variation in measured anxiety from day to day means that some participants' anxiety was measured as moderate or severe during an initial screening phase, but then as mild in

pre-treatment testing. These participants were removed by Pro Bono Economics in the recovery rates used in this report, reflecting both the LENS team's intention to treat only those with moderate or severe anxiety and inevitable uncertainty about how selection into treatment might occur in a real-world rollout. Sensitivity test 2 explores a scenario in which the treatment is extended to people with mild anxiety, but is based on the same treatment effect as used in the central estimates. Sensitivity test 3 explores how the central estimates change if those who had mild anxiety before LENS training are included in the measures of the effectiveness of the treatment, as they are in the published trial results.

It is perhaps worth noting that the control group in this trial were 'active': they had some exposure to the same ambiguous scenarios as the LENS group, in order to simulate treatment. What they did not receive was the practice interpreting these scenarios in a positive light. It is possible the exposure to the scenarios may still have caused them some small improvement in their anxiety; if so, the trial outcomes would understate the real effect of LENS treatment.

Figures from a study on relapse rates after low-intensity cognitive behavioural therapy (CBT) intervention are used to model how lasting the LENS treatment might be beyond the three-month follow-up period of the trial.[21] The 'gradual relapse' scenario, which underlies the central estimates presented in this report, approximates these relapse rates. As the relapse study combines relapse into both anxiety and depression, the modelled die-off in the treatment effect may be too pessimistic, suggesting the benefits may overall be greater than shown. There is, however, uncertainty around whether relapse rates for GAD might be higher or lower than those measured for anxiety disorders in general.

Measuring the recoveries in QALYs

The World Health Organisation publishes health weights which represent a change in quality of life as a result of a comprehensive list of health states, both physical and mental.[22] The weights for anxiety disorders are given in Table A1.

[21] Ali et al (2017), p. 4.
[22] World Health Organisation (2020).

Table A1. WHO Health state weights indicate severe anxiety substantially diminishes quality of life

Health state	Lost QALY, 2019
Anxiety disorders: Mild	0.03
Anxiety disorders: Moderate	0.133
Anxiety disorders: Severe	0.523

Sources: WHO, 2020

These health weights can be applied directly to quality-adjusted life years (QALYs). QAL.YS have a maximum value of 1 and minimum value of 0. For example, having an illness with a health weight of 0.25 for a year is equivalent to reducing the amount of time lived in perfect health by a quarter, or down to nine months. In the case of anxiety, the improvement in quality of life resulting from a recovery from a severe anxiety condition is worth more than half a QALY (equivalent to increasing the amount of time lived in perfect health by more than half a year), while that from a mild anxiety condition is estimated as being worth just 0.03 QALYs.

Figures from the NHS 2014 Adult Psychiatric Morbidity Survey were again used to give the share of adults with mild, moderate, and severe anxiety (Figure 3).[23] Again, the NHS survey was only carried out in England; to use these figures to represent anxiety across the UK is to assume that the severity of GAD is not substantially different in Scotland, Wales, or Northern Ireland. It should be noted that the measure of severity used in this data is based on the Clinical Interview Schedule-Revised (CIS-R) measure which is written to cover a range of mental health disorders and may differ from the GAD-7 measure.

Measures of anxiety in the LENS trial used the standard GAD-7 measure, which scores anxiety on a range from 0 to 21, and categorises severity into minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21) anxiety. Clinical standards, as applied in the LENS trial, consider a person recovered from anxiety if their anxiety decreases by at least 4 points on the scale and crosses the 'caseness' threshold of 8. A person may, therefore, be considered clinically 'recovered' while still experiencing mild anxiety. Throughout this report, this recovery is nonetheless treated as a full recovery (i.e. returning to a health weight of 1) as the sample size of LENS trial participants is too small to precisely model recovery to mild anxiety separately to recovery to minimal (essentially, zero) anxiety. The overall impact of this decision on the central estimates is minimal.

[23] McManus et al (2016), Table 2.5.

The total improvement (in QALYs) due to improved recovery from the LENS treatment is calculated as:

$$\begin{aligned} QALYs\ gained = {} & Adults\ who\ might\ seek\ treatment \\ & \times Improved\ recovery\ rate\ due\ to\ LENS \\ & \times (health\ weight\ for\ mild\ anxiety \times \%\ mild \\ & + health\ weight\ for\ moderate\ anxiety \times \%\ moderate \\ & + health\ weight\ for\ severe\ anxiety \times \%\ severe) \\ & \times Scaling\ for\ gradual\ relapse \end{aligned}$$

As noted in the main body of the report, the high weight on recovery from severe anxiety means that, as quantified in this report, the value of a recovery from severe anxiety is substantially more beneficial than a recovery from mild or moderate anxiety. Table A2 gives indicative economic values for people with varying levels of anxiety, accounting for the fact that not everyone who undergoes LENS treatment will necessarily make a recovery.

Table A2. The representative benefit of treatment per person is very high for those suffering severe anxiety

Initial level of anxiety	Value of improved quality of life from recovery	Average value of improved quality of life, given not all will recover
Mild	£2,222	£148
Moderate	£9,851	£656
Severe	£38,738	£2,579

Sources: PBE analysis of WHO, 2020; Hirsch et al, 2021; Ali et al, 2017; HM Treasury, 2022; HM Treasury, 2023.

Converting the QALY improvement into economic benefits

The Treasury 'Green Book' provides a standard valuation of £70,000 in 2020/21 prices for one QALY.[24] This valuation is uprated to reflect 2022/23 prices using the GDP deflator, also published by the Treasury – an increase of approximately 6%.[25] Each monetary estimate is calculated as:

$$£\ gained = QALYs\ gained\ \times 70000\ \times 1.058$$

[24] "The Green Book (2022)," HM Treasury, last modified 18 November 2022. Accessed 28 September 2023.
[25] "GDP deflators at market prices, and money GDP June 2023," HM Treasury, last modified 2 October 2023. Accessed 10 October 2023.

Annex B – Full quantitative results

Table B1. Potential benefits of rolling out the LENS treatment under various scenarios

	Number of people who might be treated	Number of extra people who might recover	Improvement in QALYs	Equivalent economic value	Change vs central estimate
Central estimate (gradual relapse)	1,350,893	161,283	39,515	£2.9 billion	--
Scenario: Persistence of treatment effect					
One-off	*	*	11,810	£0.9 billion	-70%
Sustained	*	*	64,954	£4.8 billion	+64%
Sensitivity Test 1 – effectiveness of the treatment					
Optimistic	*	191,932	47,024	£3.5 billion	+19%
Pessimistic	*	28,583	7,003	£0.5 billion	-82%
Sensitivity Test 2 – treating mild anxiety					
Treat mild anxiety	1,567,022	187,087	39,946	£3.0 billion	+1%
Sensitivity Test 3 – including recovery from mild anxiety					
Include mild recovery	*	170,330	41,731	£3.1 billion	+6%

Notes: * indicates no change from central estimates
Sources: PBE analysis of ONS, 2022; WHO, 2020; McManus et al, 2016; Hirsch et al, 2021; Ali et al, 2017; HM Treasury, 2022; HM Treasury, 2023.

Annex C – Rates of recovery by gender and improvements in anxiety

In the main body of this report, the metric for the benefit of Learning Effective New Strategies (LENS) treatment used, the recovery rate, is as measured across all trial participants. It would be of interest to compare the results of the LENS trial for women and men, given that these groups have very different mental health characteristics in the population.[26] Over 80% of both control and treatment groups in the LENS trial were women; women are over-represented among anxiety sufferers in the population, but not to this same extent. If the LENS treatment had different effects on men and women then the total estimated benefits could look quite different. The trial results suggested that LENS was less effective for men than for women; however, the sample size of men in the LENS treatment was so small that any analysis is unlikely to be statistically significant.

The notion of different levels of severity of anxiety was also introduced in the main body of the report; however, all estimates are based on the rate of recovery from anxiety – implicitly, a change from moderate to no anxiety is one of the benefits of LENS treatment, but a change from severe to moderate anxiety is not. This might lead to an underestimate of the benefits of LENS, since the latter type of change, which would carry a much higher health weighting, is not included in the estimated benefits of LENS in this report. An alternative approach to estimating the benefits of LENS might involve valuing at a more granular level the changes experienced by the treated group from higher to lower levels of anxiety over and above those of the control group – providing those changes were appropriately large.[27] Again, because of the small sample size in this trial, such detailed analysis is, unfortunately, unlikely to be statistically significant.

[26] Most significantly, women are more likely than men to have GAD (6.8% vs 4.9%, from McManus et al (2016), Table 2.3).
[27] It should be noted that clinicians do not typically consider changes between the bands as categorised in, for example, the GAD-7 scale, as being meaningful. Whether there are meaningful quality of life improvements to be gained from moving along these scales might be a fruitful topic for future research.

Annex D – Glossary

Assumptions
A statement accepted as true without proof. In this report, assumptions represent choices made to fill in gaps in what can be known based on current data.

Control group
A group of experiment participants to whom treatment is not administered; comparing their outcomes before and after the experiment helps account for outcomes that individuals would experience in the absence of treatment.

Economic value
A measure of a concept put in monetary terms. In this report standard Treasury valuations of quality-adjusted life years (QALYs) are used to give an equivalent economic value to the quality of life someone might experience from recovering from anxiety. One way to conceptualise this is to imagine this as the amount a person would be prepared to pay to experience the same improvement in their quality of life.

Generalised anxiety disorder (GAD)
A common anxiety condition, in which people experience persistent, excessive worry about many different things in their lives. Some measures of the intensity of symptoms of GAD categorise people's experience into mild, moderate, and severe.

Quality-adjusted life year (QALY)
A measure of a person's wellbeing or quality of life. One QALY represents one year of life lived in perfect physical and mental health.

Randomised control trial
A form of experiment in which participants are randomly assigned to either a control or treatment group, and the true effectiveness of the treatment is understood by comparing outcomes for both groups.

Recovery
No longer having symptoms of anxiety serious enough to be regarded as clinical (moderate or severe anxiety). This report follows current NHS standards, which requires a person's GAD-7 score to not only decrease from 8 or more to below that (a standard clinical threshold), but also to change by at least 4 between the baseline and follow-up measures of anxiety (often referred to as 'reliable recovery').

Relapse

Returning to a clinical level of anxiety, after having previously been measured as having made a reliable recovery. Relapse is a typical characteristic of many common mental health disorders which may prove difficult to recover from in the long term. Treatments may vary in how persistent they are; that is, how long after a given treatment an individual remains recovered from anxiety before relapsing.

In this report, several scenarios around relapse are modelled: one-off (all those who initially recover from anxiety relapse back to their initial level of anxiety three months after undertaking LENS training), gradual relapse (a small share of people who initially recovered from anxiety relapse back to their initial level of anxiety each month), and sustained (no relapse).

Sensitivity test

Where assumptions must be used to fill gaps in what can be known, a sensitivity test can demonstrate how sensitive the results of an economic analysis are by varying the choices made.

Treatment group

A group of experiment participants to whom treatment is administered; comparing their outcomes before and after experiment in isolation provides suggestive, but not conclusive, evidence about the effectiveness of the treatment.

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