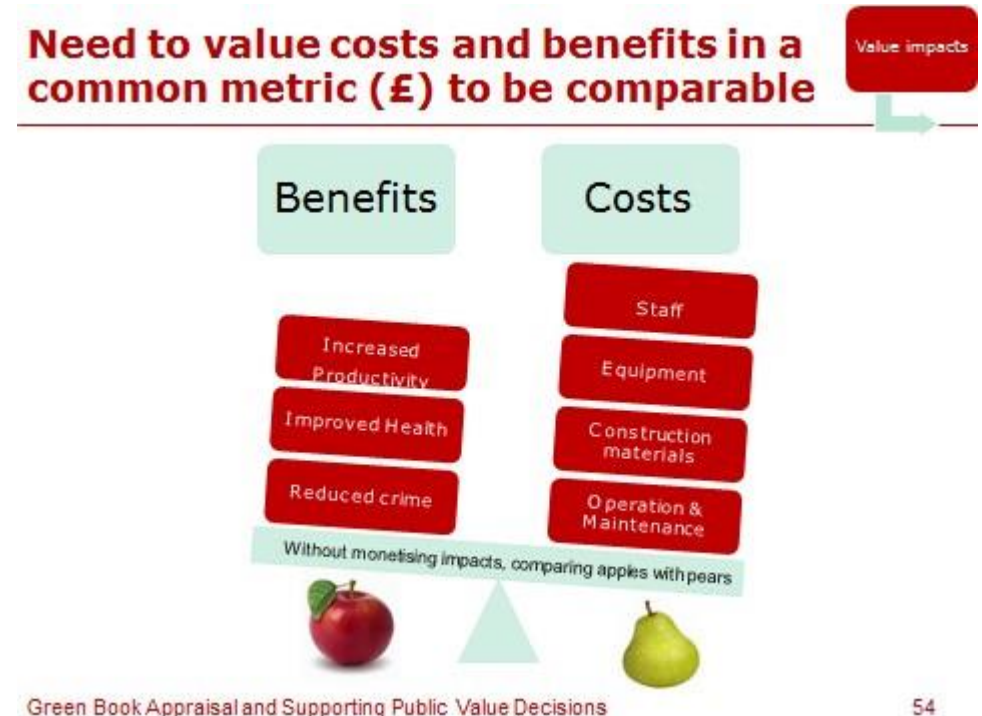# Evaluating interventions
do the benefits exceed the costs?

Cost benefit analysis (CBA)

- very widely used
  - HS2
  - Smart meter roll out
  - Welfare to work schemes
  - New computer systems
  - Drug policy reform
- both benefits and costs are expressed in monetary units £s
- allows an absolute comparison of costs and benefits
- Green Book is UK Govt's CBA manual

(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf)

Need to value costs and benefits in a common metric (£) to be comparable — Value impacts

Benefits
- Increased Productivity
- Improved Health
- Reduced crime

Costs
- Staff
- Equipment
- Construction materials
- Operation & Maintenance

Without monetising impacts, comparing apples with pears

Green Book Appraisal and Supporting Public Value Decisions

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Evaluating interventions
do the benefits exceed the costs?
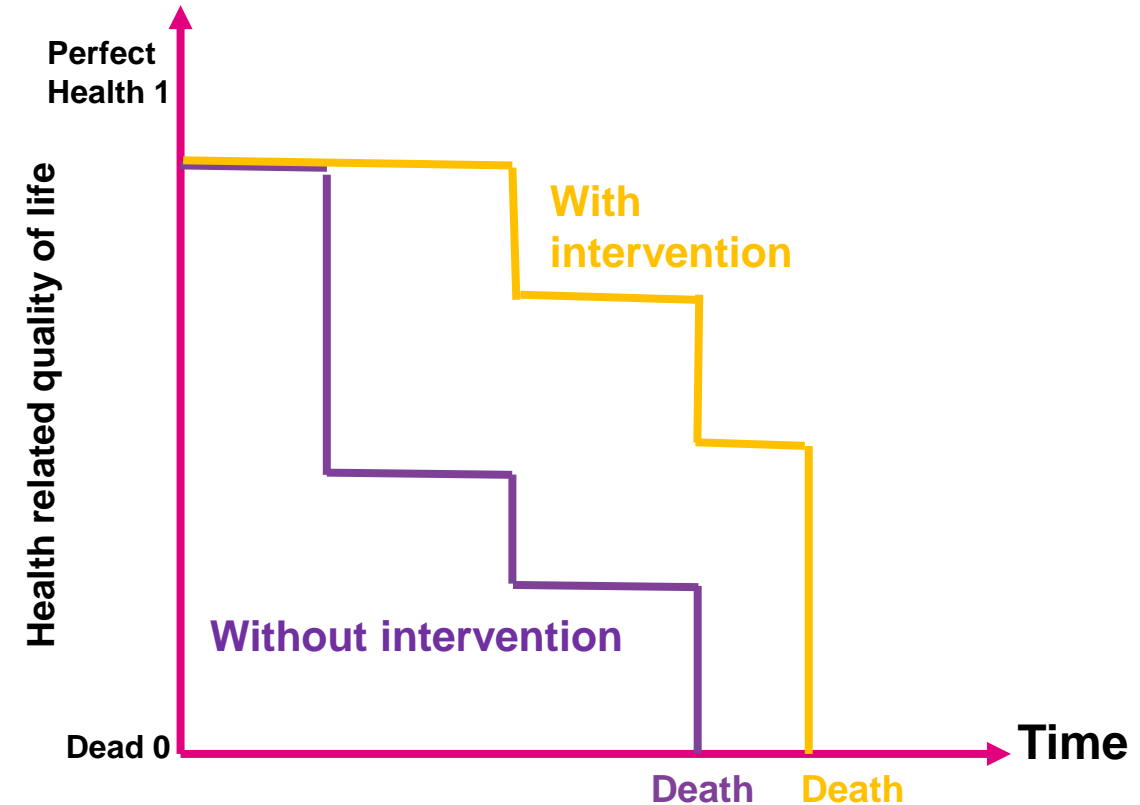
Return on Investment (ROI)

- Widely used in business to evaluate new projects

- Similar to CBA but results presented differently

- CBA: Benefits – Costs

- CBA tells us whether to go ahead with project (yes if B-C>0)

- ROI: (Benefits – Costs) / Costs (or sometimes Benefits / Costs)

- ROI tells us the net gain (or return or profit) for every £1 spent

- ROI usually limited to tangible costs and benefits (those relevant to investment decision)

- CBA may also include intangible costs and benefits, converted to monetary equivalents

  - Not always possible, so need other methods

Evaluating interventions
do the benefits exceed the costs?

what works wellbeing

Cost effectiveness analysis (CEA) using quality-adjusted life years (QALYs)

- applied to evaluate health interventions

- costs are expressed in monetary units £s

- but benefits are measured in terms of healthy quality of life and number of years the intervention is expected to last (and any increase in life expectancy)

  - Derived from health-related quality of life measures (e.g. EQ-5D)

  - 1 QALY is the value of a year of full health – equivalent to, e.g., 2 years at ½ of full health

Perfect Health 1

Health related quality of life

With intervention

Without intervention

Dead 0

Time

Death   Death

Adapted from Knapp, 2017

4

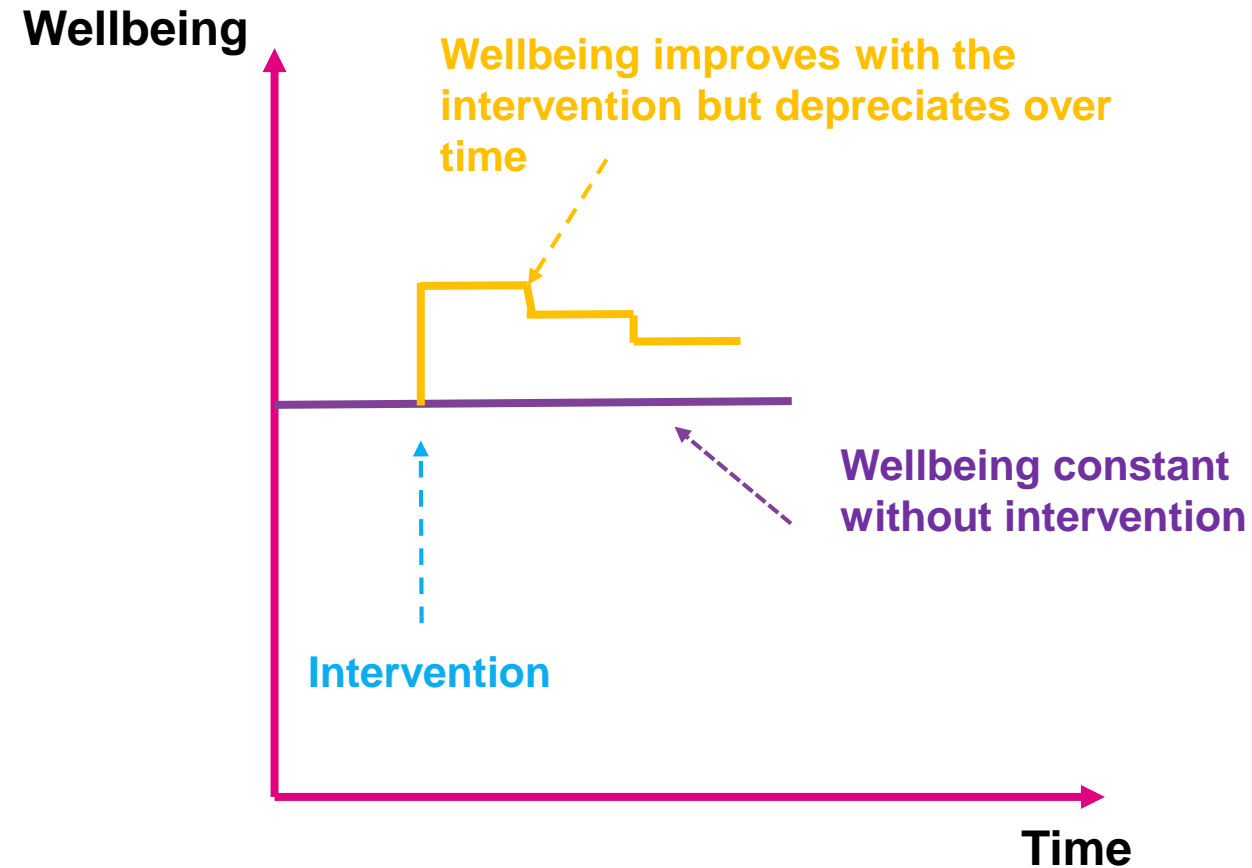# Evaluating interventions
do the benefits exceed the costs?

- Benefits = total number of extra QALYs produced by intervention

- Costs = cost of intervention (+ indirect costs – indirect savings)

- Results of CEA expressed as cost-effectiveness ratio (CER)

- CER = costs / extra QALYs

- CER tells us the cost of 1 extra year in full health

- CER can be used to rank different interventions – which ones represent the best use of scarce resources?

- In practice, NICE use an indicative threshold: treatments are less likely to be recommended to NHS if they cost more than £20k-£30k per QALY.

Evaluating interventions
do the benefits exceed the costs?

what works wellbeing

The New CEA

- innovative approach, adapted (by What Works Wellbeing) from QALYs

- costs are expressed in monetary units £s

- but benefits are measured in terms of life satisfaction (LS) and number of years the intervention is expected to last

- Benefits = total number of extra LS-years produced by intervention

- Costs = cost of intervention (+ indirect costs – indirect savings)
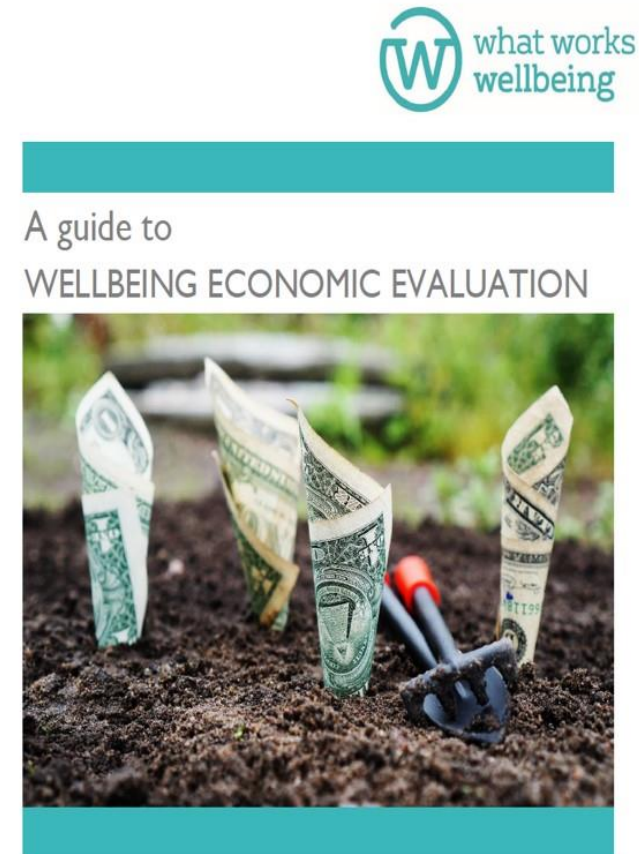
- CER = costs / extra LS-years

Wellbeing

Wellbeing improves with the intervention but depreciates over time

Wellbeing constant without intervention

Intervention

Time

Adapted from Knapp, 2017

New Cost Effectiveness Analysis

Layard (2016), *Measuring wellbeing and cost-effectiveness analysis using subjective wellbeing*, and Wright, Peasgood et al (2017), *A guide to wellbeing economic evaluation*.

https://www.whatworkswellbeing.org/product/measuring-wellbeing-and-cost-effectiveness-analysis-using-subjective-wellbeing/

https://www.whatworkswellbeing.org/product-category/economicsfinance/

What is a new (wellbeing) CEA?

https://www.whatworkswellbeing.org/product/measuring-wellbeing-and-cost-effectiveness-analysis-using-subjective-wellbeing/
https://www.whatworkswellbeing.org/product-category/economicsfinance/

What are the wellbeing benefits?

- overall, how satisfied are you with your life nowadays? (0-10)
- measure this before and after for the individual, and because an increase in their wellbeing will also impact their family/friends, the benefit calculation should include the changes in wellbeing for anyone else affected by the intervention.
- how long are the benefits expected to last?

Measuring costs

- these should be full economic costs – not just the direct financial costs of the intervention but also the indirect costs associated with delivery and evaluation, the opportunity costs associated with participation, plus the costs of any other resources.
- in some cases the intervention reduces other costs e.g. reduced absenteeism, and these should be included as negative costs

Cost Effectiveness Ratio = Cost per participant/ LS effect

Can set own threshold for assessing intervention or compare this with the life satisfaction equivalent of the QALY threshold, approx £2500

If CER is less than £2500, intervention is cost effective

Alternative wellbeing measures?

- Life satisfaction is preferred 'common currency' for CEA.

- But what happens if we don't measure it?

- Can use 'exchange rates' to convert other measures to life satisfaction, e.g. job satisfaction, positive / negative affect, GHQ, WEMWBS (see Layard 2016 and Wright, Peasgood et al 2017)

- Conversions are (currently) approximate and only suitable for measures with high overlap with LS (note statistical mapping functions are preferred).

Illustration

Lloyd, J., Bond, F. W., & Flaxman, P. E. (2016). Work-Related Self-Efficacy as a Moderator of the Impact of a Worksite Stress Management Training Intervention: Intrinsic Work Motivation as a Higher Order Condition of Effect. *Journal of Occupational Health Psychology*

The intervention

One hundred and fifty-three U.K. government employees were randomly assigned to a workplace cognitive behavioural therapy:

intervention group (n = 68), or to a waiting list **control** group (n = 85).

The cognitive behavioural therapy consisted of:

Three half-day training sessions of Acceptance and Commitment Therapy (ACT) spread over two and a half months.

Psychological strain was measured using the General Health Questionnaire (GHQ) scale.

The intervention and control group completed assessments at times 0, +2.5 months (before final workshop), and +8.5 months (6 months after final workshop).

We focus on GHQ at 0 and 8.5 months.

Wellbeing outcomes

Measured by changes in psychological strain: a reduction/increase represents an improvement/worsening in wellbeing

Time	Control	Intervention	Difference
Before ACT training	12.86	13.66	0.80
6 m after ACT training	13.34	11.25	-2.09
Difference	0.48	-2.41	-2.89
N	85	68	

Note: scores are Likert-coded GHQ (0-36) reported in personal communication by author. Measures in paper are GHQ coded (0-12).

Costs of the intervention

Participant time and other costs: trial group each spent 3x3 = 9 hours at the CBT training. Roughly 1/3 of participants also travelled to the courses. Materials were emailed to participants but many completed hard copies at the time of the training.

Delivery time and other costs: the researcher used existing material to develop the course (approx one week = 35 hours), delivery of course (3x3 hours courses delivered 6 times = 54 hours), travel to deliver course (travel, subsistence and accommodation costs), and data entry (approx two weeks).

Use ASHE 2016 data on wages to derive value of participant and research time. Assume participants are "Business, research and administrative professionals n.e.c." (SOC 2429, £21.68/hr) and researcher is "Higher education teaching professional" (SOC 2311, £28.12/hr). We add on 25% to allow for overheads, employer NIC etc.

Other costs are estimated at £2,800 for travel/accommodation/subsistence and £200 for printing .

We are developing a CEA toolkit to input the data, calculate the CER, and allow scenario testing (ongoing development, thanks to Andrew Bryce).

Cost Effectiveness of this intervention

GHQ needs to be converted to a standardised Life Satisfaction measure (0-10)

Cost per participant = £334

Using conversion 'exchange rate' =, equivalent LS (0-10) effect = 0.60

CER = Cost per participant/ LS effect is: 558

CER is less than the acceptability threshold (of about £2500/LS point-year) so the intervention looks cost effective.

Caveats and complications

- GHQ was measured 6 months after the ACT training, but we assumed these effects remained for a year (and then dropped to zero)
  - If the effect disappeared after 6 months, CER would be approx 1,116. On the other hand if the effect lasted 3 years, CER would be 184.
  - So knowing how long effects last is crucial (noting longer term effects and costs should be 'discounted') and may alter the acceptability decision.
- We assume there are no (positive?) spillovers to the wellbeing of other workers or family members. So we may be under-estimating the benefits.
- We assume there are no effects on productivity. Productivity gains enter as negative costs, so reduce CER.
- We ignore other external costs and benefits, such as reduced health care costs (due to better mental health)
  - Are these relevant to employer decisions?
  - CEA from employer point of view versus CEA from society point of view.

Wish List for future research designs

- Most studies (including our example) omit some key information needed for CEA because their focus is on effects not costs (and often in the short term).

- To enable reliable CEA, studies should ideally include:

  - Life satisfaction (0-10) in addition to any other wellbeing outcomes

  - Medium-term (1 year?) follow-ups to estimate duration of effects

  - Monetary costs of intervention (travel, consumables, equipment, consultancy etc)

  - Information to calculate 'opportunity' costs (in-kind support, time diverted from other tasks, occupational grades of facilitators and participants etc).

  - Measures of productivity and productivity changes (at follow-up); any other savings or efficiency gains

  - Indicators of spillover effects (though accept that this is likely to be very difficult to capture, especially for family members)

A cost effectiveness checklist

1. What is your measure of wellbeing?

2. What is the justification for that measure?

3. What is the average per person per year improvement in wellbeing over the life course of the assessment?

4. What are the financial costs of implementing the intervention?

5. What are the total financial benefits?

6. Subtract the answer in 5 from 4, then divide by number of intervention participants to obtain net cost per person.

7. Divide the answer in 6 by the answer in 3.

8. Repeat for all considered interventions.

9. Are there any special groups to consider? If so, repeat questions steps 1-8 for those groups.

Illustration 2

Background

Airline Stewards in Australia have very scripted and regulated jobs.

When they fly, where they fly, what they do, and how they do it are all scripted.

For some, this is stressful and represents a lack of autonomy.

Intervention explored if the stewards would feel more in control and better about their lives if they were given problem-solving training.

The training

111 volunteered for training and filled in surveys before training and after training (4 weeks later).

56 got the training (the <u>Intervention</u> group),

55 did not (the <u>Control</u> group).

Training consisted of (in brief):

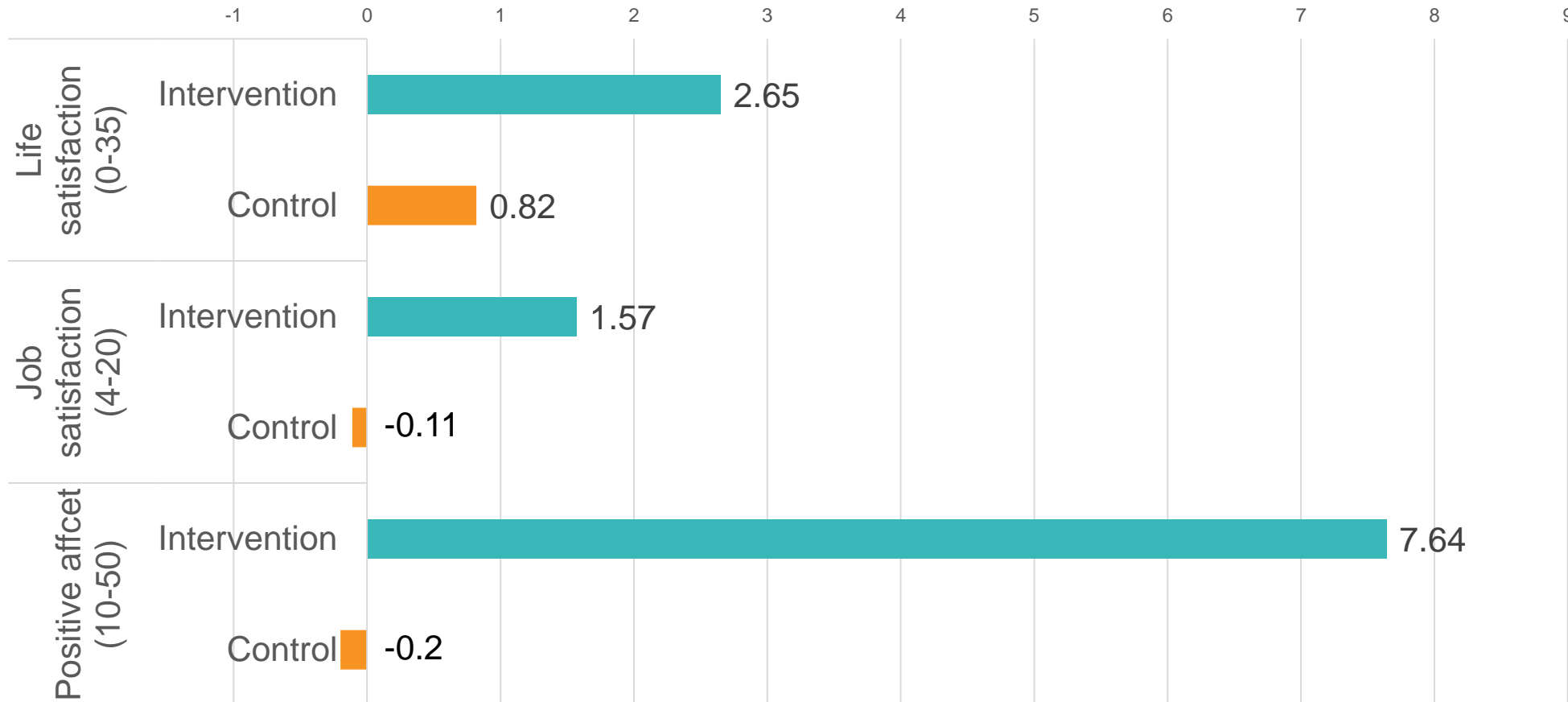A 30 minute chat about life and life's problems.

Homework whereby problems had to be written down, and participants had to write down the key elements of the problem, their strategy for solving it, and why their solution worked or not.

Regular check-ups to see if the participants did this and kept up their problem-solving diary.

Wellbeing outcomes

Change in wellbeing

Costs of the intervention

The costs of this intervention were (derived from time-value approximations) £148 per participant.

Researcher time: the researcher met with each participant in the trial face to face for 30-60 minutes in week 0, phoned in week 2 and 4 to check progress - approx 15-30 minutes of time. The materials were already established, though customised for the group, approx 1 day preparation. Some travel to meet the trial participants plus telephone and printing costs.

Participant time: trial participants kept weekly journals so a further 59 $\times$ 4 hours of participant time.

Cost Effectiveness of this intervention

Life satisfaction, Job satisfaction and Positive affect all need to be converted to a standardised Life Satisfaction measure (0-10)

Include (in this example) control group and monitoring of both groups.
Cost per participant = £148.

Life satisfaction

Equivalent LS (0-10) effect = 0.732
CER = Cost per participant/ LS effect is: 202

Job satisfaction

Equivalent LS (0-10) effect = 0.560
CER = Cost per participant/ LS effect is: 264

Positive affect

Equivalent LS (0-10) effect = 2.706
CER = Cost per participant/ LS effect is: 55

All of these CERs are less than 10 times the acceptability threshold (of about £2500/LS point-year) so the intervention looks highly cost effective.

THANK YOU & QUESTIONS

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