Changing people's habits is associated with reductions in stress, anxiety and depression levels

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Key messages:

- **People's habitual behaviours contribute to their anxiety and depression.**
- **Changing behaviour, by doing something different, brings about significant changes in levels of anxiety and depression.**
- **Improvements in anxiety and depression come from changes in habits and behaviours.**
- **The more people change their habits, the greater the improvement in anxiety and depression.**
- **When interventions do not specifically target mental health, doing something different still reduces anxiety and depression.**
- **Significant mental health improvement can be brought about by a digital mHealth without face-to-face therapeutic contact.**

Abstract

Few would dispute the truism that humans are creatures of habit. Indeed both the formation of habits, and their extinction, has been the focus of much psychological research in recent years. Whilst habits are undoubtedly ubiquitous and useful, there may also be times when they interfere with healthy functioning. In this paper we discuss whether the strength of a person's habits is linked to their mental health, in particular their anxiety and depression. We also present data to explore this idea, demonstrating not only a link between habits and anxiety and depression, but how a Do Something Different intervention that brings about changes in a person's habits also yields a significant reduction in their anxiety and depression levels. Do Something Different mHealth programmes map the person's habits and behaviours before and after each programme, and delivers small behavioural prompts via text and/or email to encourage behaviour change in small steps.

Background to habits

All animals develop habits by deploying rapid learning mechanisms, so as to reduce their energy needs, and humans are not dissimilar. Our habitual behaviours make less demand on our cognitive resources. Habit-activation is automatic and unconscious, often triggered by external cues in the environment. Habits can be embedded in a sequence of activities and be triggered by preceding behaviors and thoughts, what we have previously called the habit web (Fletcher & Pine, 2012). Habits are cheap from an energy needs point of view because when external or internal triggers release them they run to completion without constant cognitive attention. Since the brain is a very energy-expensive organ to run, needing about 500 kcals per day in the human, or about 20% of all our energy needs, it naturally optimizes energy usage. Running on 'autopilot' reduces the energy demands. In contrast, counter-habitual processes such as self control or willpower are very demanding of energy sources such as blood glucose and/or motivation (Gailliot, Baumeister, DeWall, Maner, Plant, Tice, Brewer & Schmeichel, 2007; Wang & Dvorak, 2009; Molden, Hui, Scholer, Meier, Noreen, D'Agostino, Martin, 2012). For this reason, habits are easy to form and hard to break.

Familiar contexts have been found to have a powerful triggering effect on habits. Wood, Tam and Witt (2005) examined the

exercising, TV-watching and newspaper-reading habits of students who had just moved university. The change of context – and absence of familiar cues - disrupted the previous habits, allowing the students to do things they had intended (e.g. to exercise rather than watch TV). When context cues are weak, or the habits not well established, control of behaviour by goals is easier (Neal, Wood, Labrecque & Lally, 2012). But being on autopilot and behaving habitually causes us not to notice things and can result in us not doing what we wanted or intended. We develop "tunnel vision" (Walker et al, 2014) and are less cognitively alert. That is why a major change in environment is the best time to change the most ingrained habits.

Apart from resource minimisation, it has been suggested that habits are a way of minimising stress. Wood, Quinn & Kashy (2002), for example, ran a diary study where participants produced hourly self-reports about hat they were doing. Habitual behaviours - those performed at least daily in stable contexts - were seen as being less stressful than non-habitual behaviours. One explanation could be that habits reduce the need for cognition and as such do not present conflict or challenge. An alternative view comes from Dolan (2014) who says that habitual behaviours are more likely to create the conditions where automatic negative thoughts can intrude. His proposition is that because novel behaviours are more cognitively demanding they prevent rumination around negative thoughts and thus reduce stress.

Stress and habits

Stress has many meanings, but for modern-day psychologists it usually refers to situations in which a person feels that the demands imposed on them outstrip the resources they have to cope. These conditions give rise to a range of unwanted consequences, such as relationship problems, or poorer immune system functioning and compromised health (Fletcher, 1991; Fletcher & Pine, 2012).

Anxiety and/or depression are common outcomes from chronic felt stress. Using anxiety and depression as measures of stress also helps reduce the definitional difficulties that are common in the stress field (Fletcher, 2003).

We hypothesise here that the Do Something Different behaviour change intervention would result in reductions in clinical or unhealthy levels of anxiety and depression. We have suggested this is because the individual is freed from unhelpful automatic habits that are at odds with other cognitive needs or wants (Fletcher & Pine, 2012). The small new behavioural steps serve to inhibit old habits and expand people's experience and behavioural repertoire (Fletcher, Hanson, Page & Pine, 2011). As well as the intervention helping people to break habits and leading to more novel experiences, which would impact positively on mood, the corresponding uplifts in behavioural flexibility would also reduce levels of stress. The development of behavioural flexibility would also be predicted to have many other benefits to the individual (Fletcher & Pine, 2012).

Behavioural flexibility and stress

This latter notion is derived partly from research by Linville (1985, 1987) which suggests that the tendency to feel depressed or anxious is related to self-complexity. Linville showed that people with lower levels of self-complexity (or fewer dimensions with which to view experiences) experienced more emotional ups and downs. They were also more vulnerable to depression and stress. The research showed that a wider range of self-representations was associated with better emotional adjustment.

Our research has also suggested that changes in behavioural flexibility – defined as the number of personality dimensions that represent the individual, another way of conceptualising self-complexity – is related to changes in anxiety and depression over time (Fletcher et al. 2011). Furthermore, we have demonstrated that the more variation people show in their personality traits (i.e. the less a trait is fixed) the lower their levels of depression and anxiety (Churchyard, Pine, Sharma & Fletcher, 2014). By applying personal construct methodology to cognitive complexity we have shown that the variability

with which people behave towards others correlates with general anxiety. This too is moderated by their behavioural flexibility – seeing others as requiring different behaviours from you can be stressful unless you are behaviourally flexible (Churchyard, Pine, Sharma & Fletcher, 2013). This supports Rothermund & Meininger (2004) who also report that complexity - in terms of the number and distinctness of self-representations - moderates the relationship between stress and well-being. And research shows that the more elements that make up the self, the less damaging it is when one element is threatened.

Therefore, it may be that having a relative paucity of self-defining dimensions, or being inflexible in personality traits generally, is why people who struggle to tolerate uncertainty or ambiguity are more likely to be worried and stressed (Furnham, & Marks, 2013). They do not have the cognitive complexity or behavioural flexibility with which to buffer themselves from the demands of the world.

We would propose therefore that behaviour change approaches which develop greater self-complexity and behavioural flexibility through new experiences give people new behaviours in their repertoire with which to cope with varying demands. This is also likely to change their way of looking at the world. This results in a reduction in depression, anxiety and stress.

Another reason new behavioural experiences may help reduce depression and anxiety is that old habits can remain powerful in a dormant state in brain cells even when it seems the habits have been unlearnt (Barnes, Kubota, Hu, Jin &. Graybiel, 2005). These latent habits may explain why people revert to habits when stressed independently of whether the habits are good or bad ones. We would predict that the depletion of cognitive resources caused by stress gives these latent habits a boost and this results in goal desensitisation (Neal, Wood & Drolet, 2013). Recent experimental brain research has also shown that stress alters the patterns of connectivity between brain regions - the amygdala, dorsolateral and ventromedial prefrontal cortex and the striatum - to reduce self control (Silva, Makwana & Hare, 2015). Being stressed devalues the things we want, the habits make things easier for us, and low levels of self complexity or behavioural flexibility fail to buffer the relationship. Depression and stress may be dehumanising because it brings into play our more primitive brain regions in the control of our behaviour (and thoughts), especially for those who do not have the personal resources to muster self-mastery. New experiences build tolerance, reduce the impact of old habits and enhance a person's capacity to deal with stress (Fletcher & Pine, 2012).

Does changing habits reduce stress?

The research would, therefore, lead us to make some new and potentially counter-intuitive predictions. First, we would predict that new experiences and behaviours, instead of being stressful in themselves because they produce uncertainty and demand, would serve to reduce depression and anxiety. Previous research suggests that being anxious or depressed causes people to recall emotionally ambiguous events; this produces cognitive distortions that feed negative thoughts (Hertel & Brozovich, 2010). Engaging in non-habitual behaviour, or doing something different, may enhance personal resources to cope because it develops new ways of seeing the world and reduces this tendency. Second, we posit that old habits play a maintenance role in depression and anxiety, so that certain general habit tendencies will be correlated with depression and anxiety. It is well known that health habits and affect are related (Frederick et al., 1988) but this prediction extends this to behavioural habits more generally. Third, we would predict that new experiences will reduce the likelihood of people reporting old habit tendencies, because doing something different results in cognitive reshaping. Fourth, we would predict that the reduction in old habits expands behavioural flexibility and that this will result in lower levels of depression and anxiety. Finally, we would expect the reductions in anxiety and depression would not require the intervention to be specifically addressing stress or anxiety and depression. All Do Something Different interventions (independent of their focus) would be predicted to improve stress

through the expansion of behavioural experiences.

Next we look at the data to see whether our hypotheses are supported:

Method

Methodology: Our data source is the anxiety and depression scores from individuals who have participated in a Do Something Different intervention, and who fully completed the diagnostic measures both pre- and post-intervention.

Here the 'intervention' refers to any of the Do Something Different programmes that was delivered digitally through the Do Something Different online technology. There are a wide range of programmes delivered digitally that tackle many domains (e.g. diversity & inclusiveness, leadership, weight loss, healthy habits, emotional intelligence). Only one of the programmes specifically targets stress (called Do Stress Less) which specifically deals with behaviours and habits that stressed individuals report. Therefore, the goal of the intervention may have differed for participants, but all will have completed the same *Thoughts and Feelings* measure of anxiety and depression before and some weeks after Do Something Different (usually an intervention lasts six weeks) and people complete the post-intervention measures within two weeks of the intervention finishing.

Participants: The data are drawn from 1,799 male and female adults, aged 18 – 78, who either self-selected for the intervention or were directed to it by their employer.

Measures:

Anxiety and Depression: The Thoughts & Feelings scale is a reliable and valid 8-item measure of anxiety (4-items) and depression (4-items) each item having four response options.

Habits: All participants completed a 10-item Habit questionnaire pre- and post-intervention. Each question asked the participant 'How often do you…' with the question topic relating to the target behaviour of the programme goal. Participants answered on a sliding scale from 'Never' to 'A Lot', the system automatically converted the position to scores between 0 and 100 for data analysis.

Behavioural Flexibility: The Behaviour Rater measures behavioural range (out of 30 possible traits) and behavioural polarity, or the degree to which people can show polar behaviour at both ends of a trait dimension (there are 15 trait dimensions, such as extroversion-introversion) and all items are completed in terms of *'Which of these describe you?'.*

Results

1. The categorisation of participants' anxiety and depression levels before and after the intervention

Scores on the *Thoughts & Feelings* scale correspond to one of three distinct categories for either anxiety or depression (Clinical, At Risk, Healthy).
Anxiety: Table 1 shows the number of people in each category for anxiety before and after the intervention. This is across all programmes for the 1,799 participants. The number of people in the Healthy category increased by 420 after the intervention, or from 58% of the sample to 81%.

Category	Before	After	Difference
Clinical	403 (22.4%)	175 (9.7%)	-228
At Risk	350 (19.5%)	158 (8.8%)	-192
Healthy	1046 (58.1%)	1466 (81.4%)	+420

Table 1: Anxiety levels - the number of people in each category (Clinical, At Risk, Healthy), before and after the intervention.

It is interesting to note that 228 people who were clinically anxious before the intervention moved out of that category after the Do Something Different programme. Figure 1 shows in graph form the reductions in the Clinical and At Risk categories before and after Do Something Different.

Depression: Table 2 shows the number of people in each category before and after the intervention for depression. This is across all programmes for the 1,799 participants. The number of people in the Healthy category increased by 214 after the intervention, or from 73% of the sample to 85%.

Category	Before	After	Difference
Clinical	239 (13.3%)	109 (6.1%)	-130
At Risk	241 (13.4%)	157 (8.7%)	-84
Healthy	1319 (73.3%)	1533 (85.2%)	+214

Table 2: Depression levels - the number of people in each category (Clinical, At Risk, Healthy), before and after the intervention.

Figures 1a and 1b show substantial changes in the percentage of people in anxiety and depression categories after Do Something Different, an intervention that involves no talking therapy or any specific focus on thoughts or affect but is about changing habits of behaviour.

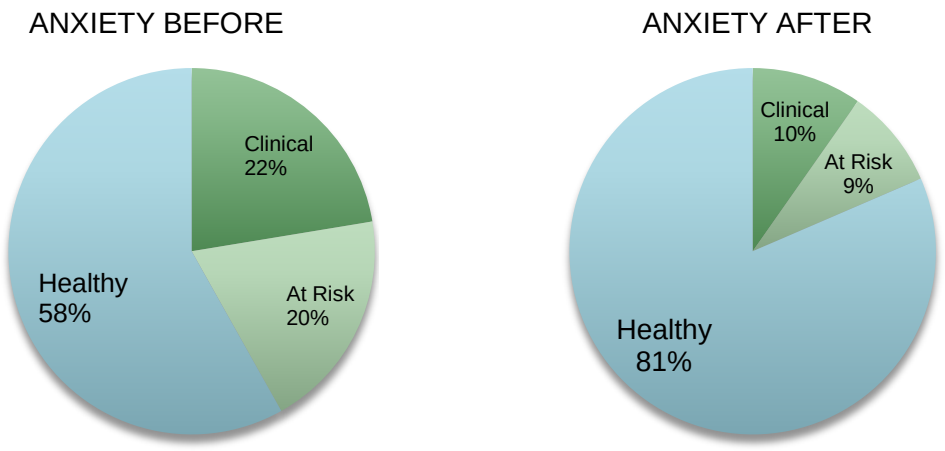

Figure 1a: Anxiety. The percentage of people in the Clinical, At Risk and Healthy categories before and after the Do Something Different intervention. Based on 1799 people.

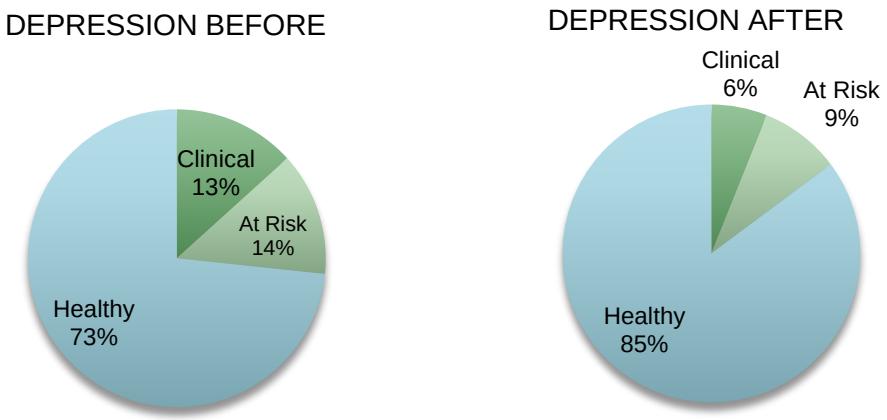

Figure 1b: Depression. The percentage of people in the Clinical, At Risk and Healthy categories before and after the Do Something Different intervention. Based on 1799 people.

2. Anxiety and depression scores, before and after the intervention

Based on the raw scores rather than categories, the average scores for depression went down from 8.571 (SD 3.078) pre-intervention to 7.560 (SD 2.752) post-intervention. Average scores for anxiety reduced from 10.071 (SD 2.908) before to 8.809 (SD 2.680) post-intervention. This is shown in Figure 2. It is worth emphasizing again that none of the programmes focus on anxiety or depression, or thoughts generally. The emphasis is on positive changes to behavioural habits.

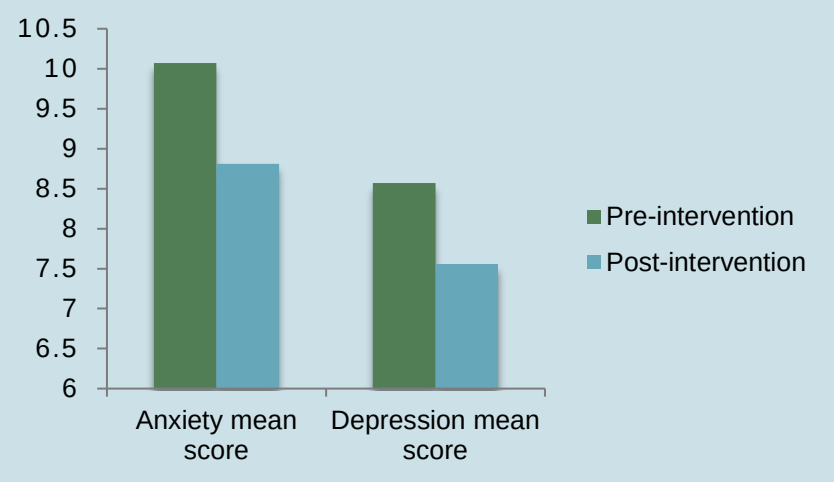

Figure 2: The reductions in mean depression and anxiety scores before and after a Do Something Different intervention.

3. The relationship between habit change and changes in stress scores

First we looked to see if there was pre-intervention correlation between anxiety or depression scores and habit scores:

Habit scores pre-intervention and anxiety scores pre-intervention were highly correlated. A Pearson's test of correlation found the strength of the association to be r =+0.410 (N=1799, p<0.000).

Habit scores pre-intervention and depression scores pre-intervention were highly correlated. A Pearson's test of correlation found the strength of this association to be r = +0.418 (N=1799, p<0.000).

These correlations suggest a link between a person's habits and their stress scores – both anxiety and depression.

Next we looked to see if, when people's habit scores changed, their anxiety and depression levels fell.

This involved comparing people's scores on the habits scale pre- and post-intervention. Any shift in scores suggests the person has altered their habits, or is doing things differently.

Of those people who experienced a reduction in anxiety, depression or both 84% of them also showed changes in their habit scores.

Next we conducted analyses to investigate whether there was correspondence between the two score changes, the change in habit scores and the change in anxiety/depression scores. Habits can change independently of depression or anxiety, however correlational analysis shows whether a change in one is associated with a change in the other. We carried out an analysis of the difference in habit scores pre- to post-intervention to see if this correlated with reductions in anxiety and depression scores. There were significant associations with both anxiety r =-0.30 (N= 1799, p = < 0.0001) and with depression r =-0.350 (N=1799, p = < 0.0001).

Therefore, habits and stress levels are linked, and changes in habits are reflected in lower levels of anxiety and depression.

4. Changes in behavioural flexibility and anxiety/depression.

We statistically examined whether the reductions in anxiety and depression were also related to changes in the two measures of behavioural flexibility (behavioural range scores and behavioural polarity scores). For all the relevant correlations (e.g. between behavioural flexibility and anxiety/depression (prior to the intervention, post intervention and change) behavioural flexibility was significantly correlated with anxiety and depression. This supports the idea that improvements in anxiety and depression arose from changes in behavior and personality habits.

Although statistically significant, the sizes of the Pearson r coefficients between behavioural flexibility and anxiety/depression were smaller than those for habit scores outlines in section 2 above. We would expect this because the habit scores reflect specific behavioural habits relating to the programme target, whereas the behavioural flexibility scores are much more general 'personality' habits relevant to all situations. It takes time to change general or more distal behaviors which are at the core of the person and it is easier to change specific behaviours proximal to a goal.

5. Do all Do Something Different programmes reduce anxiety and depression?

We have suggested that behavioural habits and flexibility may play a key role in maintaining anxiety and depression. These findings suggest that changes in behaviors can have a dramatic effect on people's mood and how they feel. This may be due to the stressed individual lacking relevant behaviours in their repertoire to deal with the thoughts and situations they encounter every day. The mismatch between their repertoire and demands may cause them conscious or unconscious problems (Fletcher & Pine, 2012; Churchyard, Pine, Sharma & Fletcher, 2014). If this were so, we would predict that the changes in depression and anxiety would not be confined to those programmes that deal with stress at all – the cognitive release that doing something different might invoke would be as likely for any type of Do Something Different programme. This is, of course, assuming that individuals' thoughts and feelings are being negatively affected by some of their behaviours. We have also previously suggested that people can be 'incoherent' on many levels (e.g. desires, intentions, thoughts, what they say, how they behave) and that new behaviours may unlock some of these incoherencies as a result of the person having new experiences from doing new things (Fletcher & Pine, 2012). New small behaviours have the capacity to change thoughts and feelings).

This hypothesis can be tested to some degree here. We have one Do Something Different programme that tackles stress in terms of relating to building stronger and broader personal networks, staying active, healthy diet, emotional sharing, connecting with nature, positive noticing and relaxation. It does not deal directly with feelings of anxiety or depression. We compared the results of this programme with all the other non-stress programmes that cover a wide range of topics. Figure 3 presents the pre-intervention percentages of people in the Clinical, At Risk and Healthy categories of depression and anxiety split according to the type of programme they undertook.

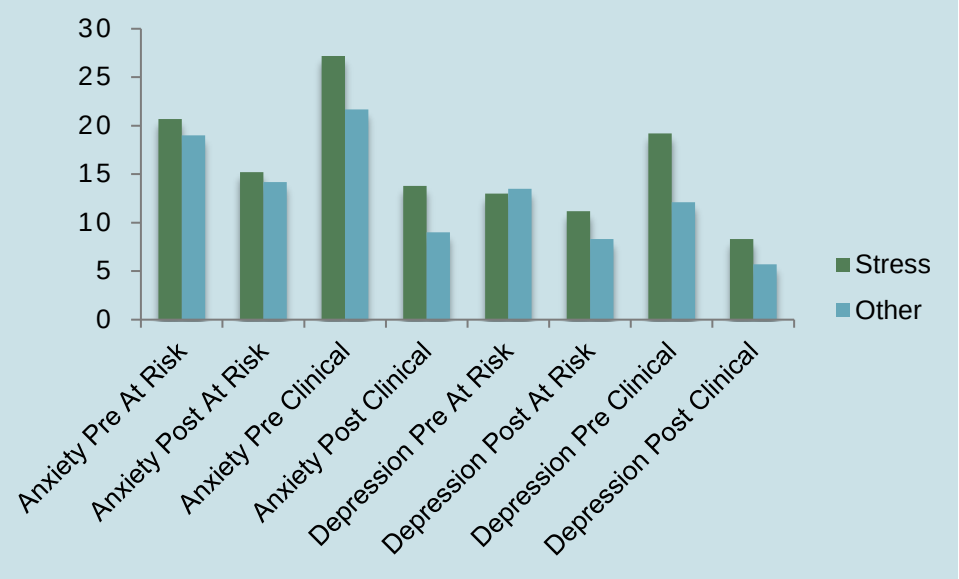

Figure 3: The percentages of people in the Clinical, At Risk and Healthy categories of depression and anxiety pre-intervention, split according to the type of programme they undertook.

As one might expect, the pre-intervention mean anxiety and depression scores for those who went through the stress programme were significantly larger than for the other programmes (stress group anxiety = 10.471, SD 2.967; stress groups depression 9.062, SD 3.338; other groups anxiety = 9.99, SD 2.894; depression =8.482, SD 3.023). Both these differences between the groups was statistically significant – anxiety t = -2.482, df 1795, p = 0.013; depression t = -2.883, df 1795, p = 0.007). It is also interesting to note that the mean habit score of the stress group was also significantly larger (43.111, SD 14.613) than for the other groups (40.369, SD 13.868) which was also statistically significant by independent t-test (t = -2.998, df 1795, p = 0.004). This might suggest that the stress group were more habitual than the non-stress group, although it should be noted that each programme considers different relevant behaviour habits. Both groups had similar behavioural flexibility scores (for both behavioural range, p=0.564; and behavioural polarity, p = 0.513, independent t-test).

After completing the Do Something Different interventions, the stress programme group and the non-stress programme groups had significantly lower mean scores on anxiety, depression and habit scores, which shows that the programmes brought about improvement. The post intervention mean scores were: stress groups anxiety 9.112 (SD 2.866), other groups anxiety 8.755 (SD 2.644); stress group depression 7.822 (SD 3.060), other groups depression 7.513 (SD 2.692); stress group habit score 36.005 (SD 14.538), other groups habit score 33.114 (SD 13.585). The pre-post changes in all these measures was statistically significant with paired samples t-tests, all df = 1798, all p<0.000, t=22.134, 18.383 and 23.958 respectively). There was also a significant effect in terms of larger behavioural range scores as a result of the intervention (paired t = 4.513, df, 1798, p=<0.000).

Various statistical tests and models were run to see if there were any differences between the stress and other programmes in terms of how effective they were in reducing anxiety or depression or habits. None showed any significant differences in effectiveness. Figures 4 and 5 presents the data by programme type.

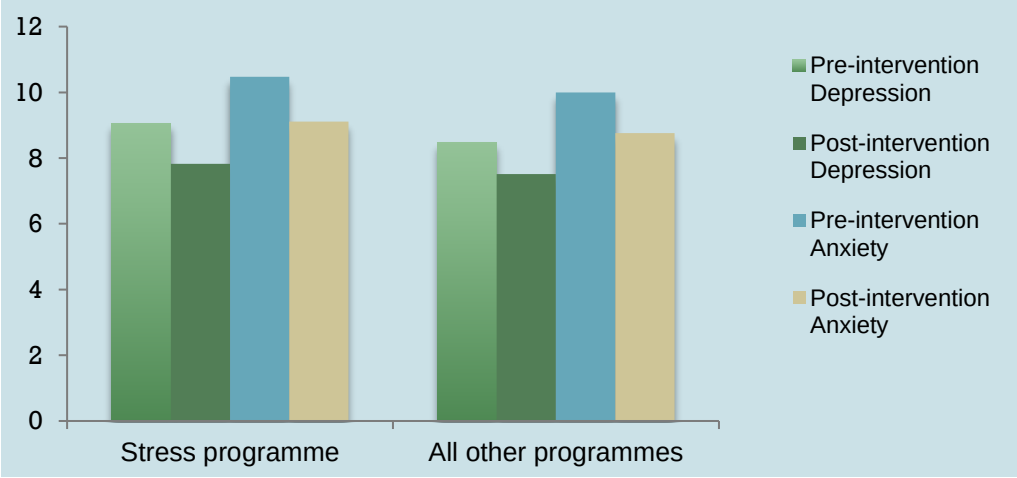

Figure 4: Mean scores for anxiety and depression pre- and post intervention on the stress and all other programmes.

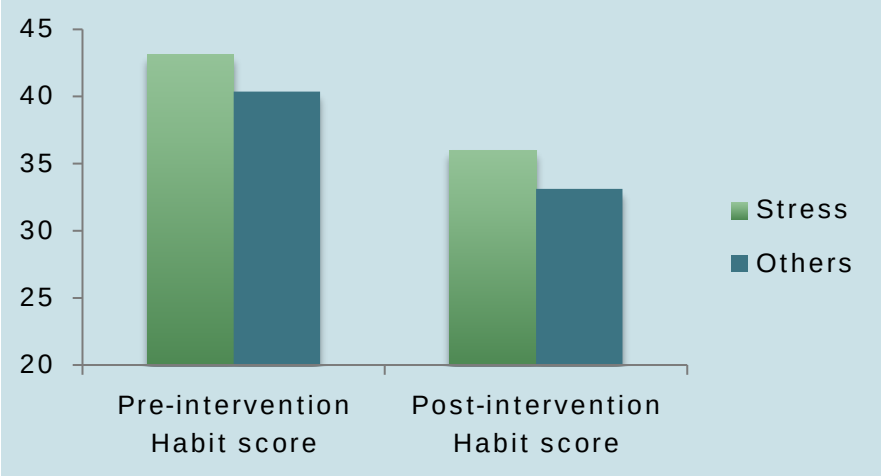

Figure 5: Mean habit scores at pre- and post intervention on the stress and all other programmes.

Summary

These data confirm that habits and behavioural flexibility are related to people's levels of anxiety and depression. The results also demonstrate that changes in people's habits and behavioural flexibility are linked to changes in anxiety and depression. When people underwent a Do Something Different intervention and changed their behavioural habits their scores for anxiety and/or depression were likely to be lower afterwards. The size of this effect was similar for the stress intervention and for the all the other programmes considered together. We posited that the reduction in anxiety and depression is a result of people being less constrained by their automatic habits. This gives people increased flexibility and connection with an expanded representation of the self and enhanced self-mastery. Further research is currently underway to fully elucidate the mechanisms responsible for the outcomes revealed in these data.

Improving mental health is of critical importance to the nation's health, and to the management of long-term physical health conditions. A King's Fund report in 2012 reported that many people with long-term physical health conditions also have mental health problems that can lead to significantly poorer health outcomes and reduced quality of life. This leads to significant costs for

the health care system– by interacting with and exacerbating physical illness, co-morbid mental health problems raise total health care costs by at least 45 per cent for each person with a long-term condition and co-morbid mental health problem. This intervention has significant potential for improving the lives of people with mental and physical health conditions, at low-cost and without adding further burden to health care resources.

A caveat to our conclusions must point to the type of data, i.e. the reliance on self-report data, and the absence of control data. However, given the large sample size and the strength of the correlations we are confident that by helping people to be less habitual Do Something Different significantly reduces their stress.

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