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# psychometrics: lies, damn lies, and statistics?

**In a quote variously attributed to Mark Twain or Benjamin Disraeli, lies are described on a continuum: there are ordinary lies, there are damn lies and, worst of all, statistics. In fact, statistics are just numerical ways of expressing things and have no particular valence, but they can certainly be used to mislead people, and when they're presented without clarification they are easily misunderstood.**

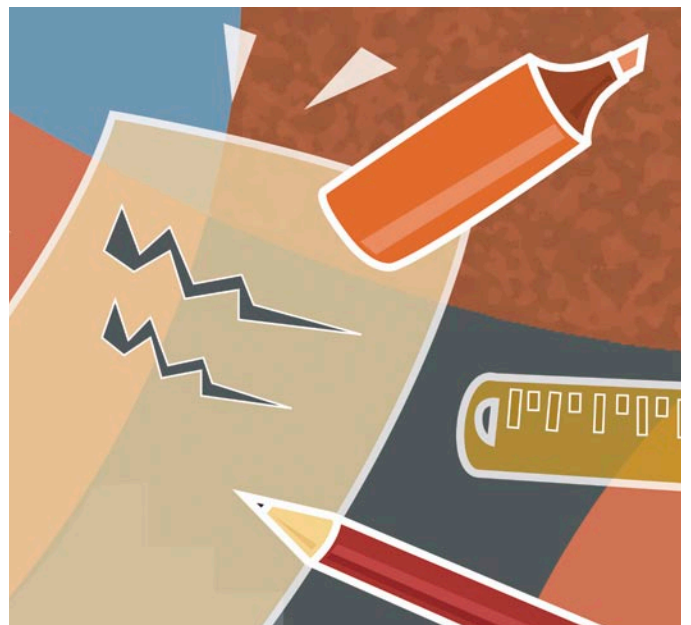
A good example is the Happiness of New Zealand Survey conducted last year. Taken at face value, the findings suggested that going to live in Nelson would make you happy, since over 40 percent of the people in the survey who live there gave ratings of 9 or 10 (out of 10) on the scale. Retired people and those aged over 65 or preferably over 75 were also happiest. However, Nelson is a favoured retirement destination, so are people in Nelson happier because they live there, or because they've retired or are over 75? And statistics aside, why wait until you're 75 to be happy? Average life expectancy in New Zealand is around 76 years for men and 81 years for women, so if you're a man you'll only have about a year's happiness to enjoy.

## Valid and reliable

The problem is not just misinterpretation. Responses to questionnaires of any description rely on a shared understanding of what the questions actually mean, and in the Happiness Survey, for example, people will have widely differing views about what it means to be 'happy'. Expressed statistically, questionnaires need to be both valid and reliable – in other words, they should actually measure what they claim to measure, and they should do so consistently.

One important issue is the way the questions themselves are generated. Conventionally, this might involve adopting items from existing questionnaires, but they will only be useful if the original questionnaire was valid. Another approach is simply to make up items based on some theoretical notion of what you intend to measure, or to ask experts in the field for their opinions. These 'face valid' items are no more than that – at face value, they look right. The provisional item pool is then subjected to a series of statistical analyses to discover the structure of the new questionnaire: how many different dimensions does it assess, and how many of the original items are unrelated to these dimensions and can be removed?

This process of factorial validation gives you a final form for the questionnaire, but that's only the beginning. Each of the



dimensions must then be tested against existing constructs. For example, if I'm trying to develop a valid measure of extraversion, does the new questionnaire correlate with existing extraversion scales? And is the new questionnaire reliable? In other words, since extraversion is a stable facet of personality, do the same people get the same scores on my new scale when they're tested on two different occasions? A series of predictions are then made and tested in carefully controlled experiments, aimed at addressing the question of whether the people identified as extraverts by my new questionnaire do actually behave in the way that the model would expect. And all of this takes time: typically three years or more to arrive at a valid and reliable instrument.

## Ensuring the accuracy of psychometric tests

Given the multitude of constraints and pitfalls it is little wonder that so few of the widely available questionnaires are either valid or reliable. However, with sufficient skills and resources it is possible to ensure the accuracy of psychometric tests. An illustrative example is the Rumination scale that forms a core measure in our Challenge of Change Resilience training programme. Rumination emerged from a research project I initiated while directing the Stress Research Unit at the University of York in England. The Unit was one of the foremost dedicated stress and resilience research centres in the UK, and the aim of the research was to identify and measure those aspects of personality which seem to protect some people from stress and

make others vulnerable.

At the time the received wisdom was that emotional expression or inhibition was a critical factor, but rather than simply basing our questionnaire on that assumption we developed a new strategy for generating items. A large number of people were given descriptions of a range of emotional situations, and they were asked to say how they would think, act and feel in each of them. After removing duplicates we had a collection of statements obtained directly from ordinary people rather than 'experts'. The responses were also kept just as they were, expressed in the way people actually speak.

The item pool was then subjected to statistical analyses which yielded two distinct dimensions. One of these was the tendency to either inhibit or express emotion, but the other was about continuing to ruminate or dwell on emotionally upsetting events. This was the first psychometric scale for rumination, and subsequent experiments showed that rumination was the most significant aspect of personality involved in stress. Much of our research is based on physiological measures involving so-called 'stress hormones', such as adrenaline and cortisol. These are in fact simply hormones doing exactly what they're designed to do, which is to facilitate fight or flight, but they need to return to resting levels once the threat has passed. If they're abnormally prolonged, the consequence is sustained cardiovascular demand and compromised immune function.

### Stress is a choice

What our experiments showed is that chronic ruminators do indeed have delayed cardiovascular recovery, prolonged cortisol secretion and suppressed immune function. It was these findings that led us to contradict the widely-held view that events are stressful, and to re-define stress as no more than ruminating about emotional upset. All that events do is to offer something to

ruminate about, if you choose to do so. Stress is a choice, which is one of the most important messages in the Challenge of Change Resilience programme. Consider all of the things you have to deal with in your day-to-day life. How many can you avoid? If all these events really were inherently stressful, as life-event scales would have us believe, there'd be no such thing as stress management.

Although rumination is the key to understanding resilience, it isn't the only behaviour that leads to people feeling stressed. The research programme on which the practical Challenge of Change Resilience training is based explored many other aspects of personality, only some of which proved to be significant for stress. The 30-year research programme that began while I was at the University of York, and which continues today at the University of Canterbury, has identified eight key behaviours that we know are implicated in making people more or less resilient. These eight scales form the pre-training Challenge of Change Profile that all participants in the training complete beforehand. The scores remain confidential to participants, and what they measure is only disclosed during the course of the training.

Most importantly, we know from the many experiments and case studies we've conducted that all eight scales assess habitual behaviour that can be changed. To be able to change to a more adaptive way of behaving we need to have a systematic way of knowing how we habitually respond. The Challenge of Change Profile provides a valid and reliable way of uncovering and explaining these habits, and the Challenge of Change Resilience training programme provides a proven set of practical tools for making the changes where they are needed. ■

**Please visit Derek's home page for more details of the Challenge of Change Resilience training days and a link to the HRINZ registration page [www.challengeofchange.co.nz](http://www.challengeofchange.co.nz)**

# Challenge OF CHANGE

presented by Dr Derek Roger

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**Led by Dr Derek Roger**  
Wellington: 10 July 09  
Auckland: 6 November 09

Presented by the Human Resources Institute of New Zealand

For more information and registration visit [www.hrinz.org.nz](http://www.hrinz.org.nz) or email [keri.bloomfield@hrinz.org.nz](mailto:keri.bloomfield@hrinz.org.nz)



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