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# Transforming uncertainty from a negative to a positive: assessing a novel intervention designed to increase uncertainty tolerance in individuals and teams

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## Conference paper

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## Introduction

This study aimed to evaluate the effectiveness of 'Uncertainty Experts' (UE), a novel three-part educational programme aimed at raising tolerance to uncertainty. The programme mixes science-based education, documentary-style testimonials from individuals who have been through periods of great uncertainty, and audience interaction. The goal is to empower the audience with effective coping mechanisms for dealing with the difficult emotions caused by uncertainty, and then move beyond these to gain the potential benefits that can be harnessed during uncertain times. UE was designed in response to the needs of UK employers seeking workshops around resilience, wellbeing, collaboration and psychological safety as a result of a perceived increase in uncertainty. This study sits within a body of burgeoning research exploring the benefits of uncertainty tolerance and related concepts for application across people management, employment, personal learning and development, and organisational development.

The study compares an audience going through the UE experience with a control group, comparing each before and after on several measures taken together to encapsulate 'uncertainty tolerance'. These are the Positive and Negative Affect Schedule (PANAS), used to measure negative and positive responses to uncertainty (Watson et al, 1988); Need for Closure (NFC), used to measure a willingness to remain in a state of uncertainty/ambiguity (Webster and Kruglanski, 1994; Roets and Van Hiel, 2007) and the New General Self-Efficacy Scale (NGSE), to measure changing attitudes towards self around uncertainty (Chen et al, 2001). As well as these measures on changing emotional responses and attitudes to uncertainty, the study also tested changing behaviour using the Balloon Analogue Risk Task (BART) (Lejuez et al, 2002), a simple game designed to measure an individual's willingness to take risks/tolerance to uncertainty.

The findings, as discussed below, suggest that Uncertainty Experts was successful in improving tolerance to uncertainty. We also believe that this novel educational format combining documentary-style storytelling with interaction and introspection can be successfully adapted to other areas of workplace learning or behavioural change.

## Context

Uncertainty has always been a core feature of daily human existence, but the lives of individuals in the modern globally connected world are unprecedented in the complexity and uncertainty they have to deal with (Ahir et al, 2022). Uncertainty has often been primarily seen as a negative, impacting emotional states as well as cognitive and decision-making abilities, and so to be avoided (Ladouceur et al, 1997; Anderson et al, 2019; Carleton, 2016). However, much psychological work shows that this is not inevitable (Shamionov, 2017) and that times of uncertainty, if dealt with appropriately, can be used to break unhealthy habits, develop new creative ways of thinking, and undertake new ventures and opportunities (Clark, 2015; Garrison et al, 2017; Kim et al, 2016).

This new conceptualisation of uncertainty is highly relevant across businesses today. It is in the interest of firms that their employees at every level have high tolerance to uncertainty. Uncertainty plays a role in the decision-making of every employee, and individuals with low tolerance for uncertainty are more 'cognitively vulnerable' (Dugas et al, 1997), more prone to anxiety (Grupe and Nitschke, 2013), incapable of taking calculated risks (Morriss et al, 2016) and indecisive (Rassin and Muris, 2005). Conversely, those high in tolerance to uncertainty are not only more resilient and less stressed (Blanuša et al, 2021), but crucially are also more

creative (Zenasni et al, 2008), more innovative problem-solvers (Jensen et al, 2014) and more effective decision-makers (Pavlova and Kornilova, 2013).

## Uncertainty Experts

In the first episode of UE, the audience is taught to manage the often negative emotions associated with uncertainty (Anderson et al, 2019). They are taught to become more aware of rising fear responses, as well as maladaptive coping mechanisms for dealing with that fear (Morriss et al, 2016). They are also taught about the inherent malleability of the brain, and by extension that their current emotional and behavioural responses to uncertainty are not fixed but can be changed (Shamionov, 2017).

The second episode moves past merely dealing with the negative response and focuses on becoming more open to uncertainty, laying the groundwork for greater possibility of positive responses (Roets and Van Hiel, 2007). The audience is taught to be more open-minded and to move towards a place of acceptance of uncertainty as an inevitable feature of daily life.

The final episode challenges the audience to consider how uncertainty can in fact be positive. They are taught to recognise it as a time of change and flux, which shakes us out of our normal limiting habits and routines (Lally and Gardner, 2013) into an opportunity to grow and learn as individuals with strategies that can be applied at personal and group level. The present paper seeks to determine, via a range of psychometric measures, if a pilot run of this programme achieved these aims.

## Method

319 participants took part in the study. The demographic breakdown is shown in Table 1.

**Table 1: Demographics for both the UE and control groups combined**

<b>Gender</b>	Female	65.9%	<b>Age</b>	18–24	1.3%
	Male	32.7%		25–35	13.2%
	Non-binary	0.4%		35–44	40.1%
				45–54	33%
				55–64	10.1%
				65–74	2.2%
<b>Employed</b>	Employed	71.9%	<b>Industry</b>	Entertainment	8.5%
	Self-employed	26.3%		Non-profit	6%
	Unemployed	1.4%		Computing	5%
				HR	5%
<b>Country</b>	UK	61.4%	Marketing	5%	
	EU	14.4%	Training	5%	
	USA	10%			

We used a mixed between-within subjects design, taking pre/post responses on all measures for both the control and UE group. The control group (n=120) undertook a concurrent workshop on storytelling while the UE group (n=199) received three Uncertainty Experts sessions, across three consecutive weeks. Participants in both groups completed the following range of measures before and after their sessions.

The Positive and Negative Affect Schedule (PANAS) was used to measure attitudes towards uncertainty. PANAS is a 20-item scale developed by Watson et al (1988). There are ten 'positive' emotions and ten 'negative', which are summed separately producing separate positive and negative scores. For this study participants were asked to fill out this scale particularly when thinking about their experience of uncertainty.

The New General Self-Efficacy (NGSE) scale, developed by Chen et al (2001), was also used. A final separate question was also developed based on the NGSE to ask about self-efficacy specifically relating to uncertainty. The Need for Closure (NFC) scale, developed by Roets and Van Hiel (2011), was used to rate participants' ability to handle elements of uncertainty such as ambiguity.

The Balloon Analogue Risk Task (BART) is a simple game developed by Lejuez et al (2002), where each round participants press a button to pump up a balloon to earn rewards but which has a chance of exploding on each pump, and no reward. This provides a measure of willingness to take risks /engage with uncertainty. Coupled with this, participants were asked to complete the same PANAS 20-item scale again but specifically to reference their emotional experience of the BART.

## Findings

A significant change in mean scores in the expected direction was found across all the measures for the UE group. Most measures also changed for the control group, with the exception of the BART and the PANAS related to the BART. Repeated measures ANOVA was used to compare the change between the two groups, and for the majority of measures a significant or borderline interaction effect was found with the UE group outperforming the control group: the NGSE and the additional self-efficacy question both increased more for the UE group, and both positive and negative PANAS scores related to the BART also increased significantly more. Both PANAS positive and the BART showed borderline effects in the direction of UE. The summary of results can be seen in Table 2 and full details of all analyses can be found in Appendix 1.

**Table 2.** For each of the measures used in the study, in the first column the measure and the maximum possible score on that measure is given. In the next two columns the change, in bold, and pre->post scores, in brackets, are given for both conditions. In the final column the key results from the ANOVA of the interaction between pre->post and condition are given, providing the group which outperformed the other on that measure (and by what amount), as well as the p-value for the interaction. Full details can be found in Appendix 1.

In all cases a \* indicates a significant effect at  $p < .05$ .

<b>Measure (maximum score)</b>	<b>Control mean change (pre -&gt; post)</b>	<b>UE mean change (pre -&gt; post)</b>	<b>ANOVA (interaction)</b>
PANAS positive (50)	<b>+1.9</b> (32.4 -> 34.3) *	<b>+3.2</b> (35.2 -> 38.4) *	<b>UE +1.3</b> ( $p=.081$ )
PANAS negative (50)	<b>-4.3</b> (25.3 -> 20.9) *	<b>-2.2</b> (25.4 -> 23.2) *	<b>C -2.1</b> ( $p=.012$ ) *
NGSE (40)	<b>+1.1</b> (31.7 -> 32.8) *	<b>+2.4</b> (31.3 -> 33.7) *	<b>UE +1.3</b> ( $p=.011$ ) *
Self-efficacy uncertainty (10)	<b>+0.6</b> (6.2 -> 6.8) *	<b>+2.9</b> (8.4 -> 5.5) *	<b>UE +2.3</b> ( $p<.001$ ) *
NFC (90)	<b>-4.9</b> (51.0 -> 46.1) *	<b>-6.1</b> (50.2 -> 44.1) *	<b>UE -1.2</b> ( $p=.297$ )
BART (unlimited)	<b>+0.6</b> (13.1 -> 13.7)	<b>+2.4</b> (14.3 -> 16.7) *	<b>UE +1.8</b> ( $p=.061$ )
PANAS positive BART (50)	<b>-0.7</b> (29.5 -> 28.8)	<b>+1.8</b> (29.2 -> 31.1) *	<b>UE +2.5</b> ( $p=.007$ ) *
PANAS negative BART (50)	<b>-0.9</b> (14.4 -> 13.5) *	<b>-2.0</b> (15.2 -> 13.2) *	<b>UE -1.1</b> ( $p=.042$ ) *

## Practical implications

This study demonstrates the effectiveness of an innovative educational programme which can be delivered en masse to large numbers of individuals. The programme has been shown to improve not just attitudes and beliefs but also behaviours around uncertainty. These findings show important potential applications within the context of work as well as for individual wellbeing.

Across both PANAS measures, UE appears to increase positive emotions towards uncertainty, and may also reduce negative emotions. It also appears to increase self-efficacy in its audience (NGSE), particularly towards uncertainty. It may also increase the audience's willingness to remain in a state of ambiguity (NFC), an important skill to explore within a work environment in the modern age.

Beyond this, it has also been shown to change behaviours and emotional responses to risk and uncertainty tolerance, as illustrated by the BART task and associated PANAS measures. In corporate roles where risk and uncertainty are often confused, attitudes towards uncertainty are vital to leadership skills (Pavlova and Kornilova, 2013). It is possible for individuals to engage positively with the principle of risk-taking but to find it uncomfortable in practice. The results here indicate both an increase in attitude as well as the ability for taking risks.

UE has been shown to increase scores more than the control group on both the NGSE and a further question based upon the NGSE specifically focused on uncertainty. The NGSE measures the *'belief in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands'* (Wood and Bandura, 1989, p408).

Higher scores on this general and fundamental attribute following the UE course are thought to lead to greater job attitudes (Saks, 1995), training proficiency (Martocchio and Judge, 1997), and job performance (Stajkovic and Luthans, 1998).

UE has also been shown to reduce scores on the 'Need for Closure' (NFC) scale. Kruglanski (1990) defined 'need for closure' as the desire for '*an answer on a given topic, any answer... compared to confusion and ambiguity*' (p337). This represents an individual's ability to be able to work under uncertain conditions without feeling the need to quickly come to a definitive answer – to tolerate ambiguity. This is related to intellectual humility, the ability to recognise one might be wrong, (Leary et al, 2017), and it also favours creative thinking and behaviours as it enables individuals to resist the urge towards partial or non-optimal solutions to complex problems (Merrotsy, 2013). This is highly relevant for today's world of work, with critical thinking and problem-solving consistently named the key skills for the ambiguity and upheaval of the twenty-first century, as summed up by the World Economic Forum's key skills for 2025.

Scores on the NFC scale decreased similarly in the control group. This may be because the control group was a storytelling workshop, delivered by a charismatic facilitator with more of a personal development angle than anticipated, offering participants confidence in 'telling your story'. The use of a different control group in future may allow us to unpack this. Alternatively, we may be seeing a demand characteristics effect in both groups, where participants respond to their beliefs about researcher expectations. However, since we do not see this effect in the control group for a range of other measures, this seems unlikely to explain this result.

We have found an increase in positive emotions on the PANAS scale (general feelings towards uncertainty) for both groups and tentative evidence that the UE group increases this more than the control group. Conversely, we see the opposite pattern for the negative emotions, with the control group tentatively leading to a greater decrease than the UE group. One possible explanation for this is that participants may not have interpreted this question in the way we intended. Furthermore, participants may struggle to think about how uncertainty as an abstract concept makes them feel. For this reason, given that the control group undertook a storytelling workshop, which is very likely to have an emotional effect upon the participants, it is possible that this question did not sufficiently tap into participants' actual emotional response to uncertainty per se, but was instead influenced by their current emotional state (Askim and Knardahl, 2021). One way to improve this question in future may be to present participants with a particular uncertainty scenario and rate their emotions with respect to that. This should provide a more vivid focus for reflection rather than the abstract concept of uncertainty.

Interestingly, participants in the EU group also showed a considerable increase in their willingness to take risks on the BART, on average being willing to pump around two more times after UE compared with the control group. Furthermore, we have found that while engaging in this they experienced fewer negative emotions and more positive emotions on the PANAS scale related specifically to that task compared with the control group. Overall, therefore, we seem to have found that UE makes participants both behaviourally and emotionally more tolerant of uncertainty. A relationship between uncertainty tolerance and a greater willingness to take risks has been demonstrated previously in the Iowa gambling task (Kornilova et al, 2018), so it is validating to see that UE also created this effect, given that its primary aim is to increase tolerance to uncertainty.

## Further application

Reinforcing the results of this paper on the efficacy of Uncertainty Experts, the take-up of UE has been rapid, reflecting a need in the community for this content. As a result of the pilot, numerous organisations have come forward with approaches to secure places in future programmes, or have 'in-house' adaptations of UE designed for their teams. These firms range

from global brands including Google, Netflix and Apple, to long-established businesses going through industrial transformation, such as Mercedes, Twinings and Lego, to public bodies including the civil service, Home Office, local authorities and the BBC.

Even though these organisations have booked small numbers of places, or commissioned exploratory work, the breadth of cross-sector interest in the topic suggests potential for widescale application, and the pervasiveness of the impact of uncertainty.

## Conclusion

In summary, this pilot of the Uncertainty Experts programme has produced significant improvements in all measures taken related to uncertainty tolerance and self-efficacy when faced with uncertainty. The majority of these also improved more than the control group, which suggests that these effects are not due to demand characteristics and represent real effects upon the audience after taking part in an Uncertainty Experts series.

Heightened by the collision of Brexit, the climate crisis and the COVID-19 pandemic, uncertainty is at an all-time high (Ahir et al, 2022). Both in and out of the workplace, people are faced with high levels of uncertainty which impact them personally and professionally.

Coping with such levels of uncertainty takes an emotional toll, and failing to manage these emotions effectively can lead to cognitive fatigue and lower levels of wellbeing, and ultimately to a less productive and resilient workforce. Further studies and research are now being carried out to better understand, test and explore the mechanism behind the 'Uncertainty Experts' intervention and how this can be scaled to provide both individuals and firms with an innovative solution to navigate the unprecedented complexity and uncertainty of the modern world.

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## Appendix 1: Findings (expanded)

On the general measure of PANAS, where participants were asked to reflect on their experience of uncertainty. For the UE group, mean positive scores significantly increased by 3.2, which was confirmed by a paired-samples t-test ( $t[168]=7.4$ ,  $p<.001$ ). For the control group, mean positive scores significantly increased by 1.9 ( $t[112]=2.7$ ,  $p=.007$ ). A repeated measures ANOVA with pre-post positive PANAS scores as the within-subjects IV and condition (0=control, 1=UE) as the between-subjects IV found a borderline significant interaction, with the UE group outperforming the control group ( $F[1,280]=61.3$ ,  $p=.081$ ).

For negative PANAS scores, within the UE group, mean negative scores significantly decreased by 2.2 ( $t[168]=-4.7$ ,  $p<.001$ ). For the control group, mean negative scores significantly decreased by 4.3 ( $t[118]=-5.9$ ,  $p<.001$ ). A repeated measures ANOVA found a significant interaction effect with the control group outperforming the UE group ( $F[1,286]=6.5$ ,  $p=.012$ ).

For the self-efficacy question about uncertainty, mean scores significantly increased in the UE group by 2.9 ( $t[198]=19.6$ ,  $p<.001$ ). Mean scores also significantly increased for the control group by 0.6 ( $t[112]=3.8$ ,  $p<.001$ ). A repeated measures ANOVA found a significant interaction effect with the UE group outperforming the control group ( $F[1,310]=96.2$ ,  $p<.001$ ).

For the NGSE, mean scores significantly increased in the UE group by 2.4 ( $t[137]=6.7$ ,  $p<.001$ ). Mean scores also significantly increased in the control group by 1.1 ( $t[110]=3.3$ ,  $p=.001$ ). A repeated measures ANOVA found a significant interaction effect with the UE group outperforming the control group ( $F[1,247]=6.5$ ,  $p=.011$ ).

For the NFC, mean scores significantly decreased in the UE group by -6.1 ( $t[198]=-10.2$ ,  $p<.001$ ). Mean scores also significantly decreased for the control group by -4.9 ( $t[113]=4.6$ ,  $p<.001$ ). A repeated measures ANOVA found no significant interaction effect between the two groups ( $F[1,311]=1.1$ ,  $p=.297$ ).

For the BART, mean scores significantly increased in the UE group by 2.4 ( $t[137]=3.6$ ,  $p<.001$ ). Mean scores did not significantly increase in the control group ( $t[110]=.960$ ,  $p=.339$ ). A repeated measures ANOVA found a borderline significant interaction effect with the UE group outperforming the control group ( $F[1,247]=3.5$ ,  $p=.061$ ).

For the PANAS positive scores focused on the BART, mean scores in the UE group significantly increased by 1.8 ( $t[137]=2.9$ ,  $p=.005$ ). Mean scores did not significantly increase in the control group, however ( $t[110]=1.1$ ,  $p=.317$ ). A repeated measures ANOVA found a significant interaction effect, with the UE group outperforming the control group ( $F[1,247]=7.3$ ,  $p=.007$ ).

For the PANAS Negative scores focused on the BART, mean scores in the UE group significantly decreased by 2.0 ( $t[137]=-5.4$ ,  $p<.001$ ). Mean scores in the control group also significantly decreased by 0.9 ( $t[110]=2.7$ ,  $p=.007$ ). A repeated measures ANOVA found a significant interaction effect with the UE group outperforming the control group ( $F[1,247]=4.2$ ,  $p=.042$ ).

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