

Brief computerised self-help interventions, the "miracle question", and the moderating effects of openness-to-experience.

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Brief computerised self-help interventions, the “Miracle Question,” and the moderating effects of openness-to-experience

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Abstract: Brief, self-help positive psychology interventions (PPIs) have certain advantages over longer, guided interventions (e.g. higher completion rates). The “Miracle Question(s)” – the most famous intervention in solution-focused therapy and coaching – appears to be a promising brief, self-help PPI. However, very little experimental research on the “Miracle Question” has been conducted. The present study investigated the effects of a brief self-help MQ intervention on several aspects of wellbeing, including hope, expectancy, goal clarity and affect. The MQ intervention was compared against both a problem-focused and neutral coaching approach. Three online experiments were conducted with participants aged 18-76 across the world. Two experiments focused on “life problems” whilst the third focused on problems in interpersonal relationships. Results suggested that all three interventions raise expectancy in the context of life (but not relationship) problems. However, as hypothesised, the relative effects of such interventions may depend on openness-to-experience. At high[low] levels of openness-to-experience, the MQ technique was more[less] effective than the problem-focused or neutral coaching interventions, at least for some aspects of wellbeing. The study sheds much-needed light on the MQ technique and on brief self-help interventions. Widely recommended as a means of enhancing wellbeing, the MQ technique may not be universally effective (in a self-help format) and requires further investigation. On the other hand, the study suggests that brief self-help computerized PPIs may indeed be enthusiastically adopted, especially when compared with longer interventions.

Keywords: brief positive psychology interventions; computerised interventions; Miracle Question; Openness-to-experience; Hope; Expectancy; Goal clarity

1. Brief positive psychology interventions and the moderating effects of personality

Meta-analytic research suggests that positive psychology interventions (PPIs) have small-to-moderate positive effects on various aspects of wellbeing (Bolier et al., 2013; van Agteren et al., 2021). Moreover, PPIs can be effective in a single session. For example, Feldman and Dreher (2011) found that a 90-minute intervention involving college students led to increases in hope. “Best Possible Self” (BPS) interventions lasting 15-20 minutes have led to improvements in mood and positive affect (Renner et al., 2014), expectations for the future (Peters et al., 2010) and other aspects of wellbeing (Loveday et al., 2018). Brief PPIs that can be easily self-administered (e.g. the BPS intervention) are potentially very important. Krifta et al., (2021, p.4) suggested, for example, that they could be a means of “buffering the potential negative effects of the Covid-19 pandemic.” Amongst their many advantages are scalability and ease-of-access (Parks, 2015). Moreover, such

“micro-interventions” should reduce participant attrition (Elefant et al., 2017). They may also provide users with immediate results, i.e. instantaneous improvements in wellbeing (Fuller-Tyszkiewicz et al., 2019).

Nevertheless, different individuals respond to different PPIs, which makes it necessary to consider person-activity fit (Schueller & Parks, 2014). Individuals engage more or less with digital self-help depending on their standing on the “Big Five” (Khwaja et al., 2021). In addition, the effectiveness of PPIs appears to depend on personality. For example, Senf and Liao (2013) found that participants with higher levels of extraversion and openness-to-experience benefitted more from a gratitude intervention than participants with lower levels.

2. The “Miracle Question”: Enhancing hope, expectancy and goal clarity

Solution-focused interventions are often considered under the umbrella of PPIs (Boiler et al., 2013). Unlike problem-focused approaches (which encourage analysis of problems), solution-focused approaches invite individuals to focus on desired outcomes (de Shazer & Dolan, 2021). SF approaches are usually “brief” (e.g. Iveson et al., 2012) and may therefore have a great deal to offer micro-interventions. One popular text even suggests that solution-focused approaches provide the “fast track to happiness” (Field, 2007). However, specific solution-focused techniques have been relatively understudied, especially when compared to other PPIs (Abdulla & Woods, 2021c). The most famous solution-focused intervention is the “Miracle Question(s)” the first wording of which was provided by de Shazer (1988, p.5): “Suppose that one night, while you were asleep, there was a miracle and this problem was solved. How would you know? What would be different? How will your husband know without your saying a word to him about it?” As de Shazer (1988) points out, the MQ technique typically involves several questions. Hereafter, “MQ technique” refers to all questions used in the intervention.

Solution-focused practitioners and authors consider the MQ technique to be a powerful means of enhancing wellbeing. It is often claimed in the popular literature that the MQ technique enhances *hope* (e.g. Pichot & Dolan, 2013), *expectancy* (e.g. Reiter, 2010) and *goal clarity* (e.g. McKergow, 2021). Higher levels of (dispositional) hope are associated with higher levels of life satisfaction, positive affect and overall wellbeing (Pleeging et al., 2021). Like dispositional hope, state hope is positively associated with positive affect and flourishing (Demirli et al., 2015). Studies conducted with participants of different nationalities have found positive correlations between state hope and many measures of wellbeing (e.g. Ekqvist & Kuusisto, 2020; Martin-Krumm et al., 2014; Snyder et al., 1996).

Expectancy is more specific than hope and refers to the perceived likelihood of attaining a specific goal or outcome (e.g. Klein & Wright, 1994). Sometimes known as “perceived goal attainability,” expectancy is positively associated with goal commitment (Klein et al., 2013), which is in turn associated with life satisfaction (Emmons, 1986). Halisch and Geppert (2001) found that higher levels of expectancy were directly associated with better mood and higher life satisfaction. Similarly, Gamble et al. (2020) found that expectancy was negatively related to depressive symptoms and positively associated with wellbeing (Gamble et al., 2020).

Goal clarity is also important for wellbeing. Indeed, research indicates that “[s]imply having clear goals or a sense of purpose strongly correlates with wellbeing in daily life” (Crocker et al., 2010, p.1009). Ebner (2020) found that career-goal clarity was positively associated with career optimism and negatively associated with career insecurity. Similarly, Gamble et al. (2020) found a strong positive correlation between clarity and wellbeing. Positive relationships have also been found between goal clarity and life satisfaction (e.g. Freund et al., 2013; Patapas & Diržyte 2022). Finally, Csikszentmihalyi (2013) argues that clear goals are a requirement for the experience of

“flow.”

For all of the above reasons it is important to determine whether the MQ technique enhances hope, expectancy and goal clarity.

2.1 Experimental research on the MQ technique

Numerous popular books recommend the MQ technique as a self-help intervention for wellbeing (e.g. Fisher, 2012; Hermans & Meijerds, 2020; Wilson & Ferguson, 2007). The MQ technique has also been proposed (and used) as a means of improving wellbeing throughout the Covid pandemic (Binder, 2021; Situmorang, 2021; Zengin et al., 2021). Unfortunately, however, it appears that only three published experimental studies have examined the technique. The solution-focused (SF) condition in a study by Theeboom et al. (2015) appears to have been a version of the MQ technique. The study involved two experiments ($N = 75$ and $N = 54$) and participants were undergraduates at a Dutch university. Participants in the SF condition reported more positive affect, greater cognitive flexibility and less negative affect than participants in a problem-focused condition.

Neipp et al. (2021) compared the MQ technique against various other solution-focused techniques and a problem-focused intervention. Participants ($N = 246$) were undergraduates at a Spanish university. The MQ technique was associated with a greater reduction in negative affect than the problem-focused intervention. However, there were no other statistically significant differences. Finally, in a sample including medical residents and medical PhD students ($N = 232$), Solms et al. (2022) compared an MQ condition with another solution-focused condition (focusing on previous success) and a problem-focused condition. Compared to participants in the problem-focused condition, participants in the MQ and other SF condition reported (statistically) significantly higher positive affect and lower negative affect. However, there were no statistically significant differences in perceived self-efficacy or in “goal attainment” (a measure capturing the extent to which participants felt close to solving their problems). The mean score for the MQ condition was in fact slightly *lower* than the mean scores for the other conditions.

All three of the aforementioned studies were conducted online without experimenter intervention. The MQ technique *may* therefore be effective as a brief, self-help PPI, at least for variables such as affect. Nevertheless, a great deal remains to be examined. First, it would be useful to investigate the effects of the MQ technique in more heterogeneous samples. Second, it is important to examine effects on hope and goal clarity. Finally, previous research has not explored whether “Big Five” personality traits such as openness-to-experience moderate the effects of the intervention.

2.2 The MQ technique and openness-to-experience

de Shazer and Dolan (2021, p.42) observe that “answering the miracle question requires a willingness to temporarily suspend everyday assumptions about conversational representations of reality.” Some individuals display that willingness more than others. de Shazer and Dolan’s (2021) caveat specifically suggests that individuals will respond better to the MQ technique if they are *open to experience*. Individuals high in openness-to-experience are “willing to entertain novel ideas” (Costa & McCrae, 1992, p.15). On the other hand, those low in openness-to-experience are “more comfortable with the familiar and have little incentive to try the new” (McCrae, 1987, p.1259). A novel approach such as the MQ technique may therefore be embraced by those high in openness-to-experience (OTE). On the other hand, low-OTE individuals may be more likely to respond to a more “down-to-earth” approach, e.g. a problem-focused or neutral intervention.

There are other reasons for thinking that OTE may moderate the effects of the MQ technique. Solution-focused approaches have their roots partly in the work of Milton Erickson, who specialised in hypnosis (de Shazer & Dolan, 2021). It has been said that the MQ technique “resembles a hypnotic induction” (Sommers-Flanagan & Sommers-Flanagan, 2016, p.195). Thompson et al. (2009, p.789) note that high OTE “has long been associated with hypnotisability, creativity and image generation.” Some studies do report correlations between OTE and hypnotic suggestibility (Glisky et al., 1991; Nordenstrom et al., 2002). Research also suggests that hypnotic interventions have a greater effect when OTE is high rather than low (Milling et al., 2013; Thompson et al. 2009). Thompson et al. (2009) suggest that high OTE individuals may respond better to guided imagery than those low in OTE either because they have more positive attitudes towards novel interventions or because (high) OTE facilitates mental imagery. Both suggestions are relevant to the MQ technique, which is (for most) a “novel” intervention and encourages the use of imagery.

3. The present study

The aim of the present study was to conduct a thorough investigation of the “Miracle Question” as a brief, self-help PPI. A computerized MQ intervention was compared against a Problem-focused and Neutral coaching intervention. In the first two experiments the dependent variables were hope, expectancy and goal clarity. The third experiment introduced positive and negative affect. The study was approved by the Ethics Committee at [Robert Gordon University]. All participants provided informed consent. The questions used for each intervention are presented in Table S1 (see Supplementary Information). The Problem-focused and Neutral coaching interventions are explained below. More details about these interventions can be found in the Supplementary Information. Participants were not given a time limit but were asked to complete their intervention in one sitting.

3.1 The problem-focused intervention

Problem-focused approaches consider the analysis of problems to be an important step towards greater wellbeing (e.g. Egan, 1994). Questions typically focus on: (i) the *duration* of the problem (e.g. Nelson-Jones, 2014); (ii) the *beginning* of the problem (e.g. McLeod & McLeod, 2011); (iii) the *causes* of the problem (e.g. Milner & Palmer, 1998); (iv) how individuals *feel* about the problem (e.g. Ko, 2020); and (v) what could be *done* about the problem (e.g. Yeo, 1993). The Problem-focused intervention included at least one question in each of these categories.

3.2 The “neutral” coaching intervention

Coaching interventions have been found to enhance happiness (Style & Boniwell, 2010), hope (Green et al., 2006) and wellbeing (Spence & Grant, 2007). The coaching intervention in the present study was based on the popular “GROW” model (Alexander & Renshaw, 2005; Whitmore, 1992). GROW may be completed in 10-20 minutes (Grant, 2017). Importantly, coaching interventions are neither totally solution-focused nor completely problem-focused (Grant & Gerrard, 2020). The questions in the coaching intervention fall somewhere in between and are hereafter described as “neutral”.

3.3 Hypotheses

The primary hypothesis in the present study was that the effects of the MQ technique relative to the Problem-Focused and Neutral coaching condition are moderated by openness-to-experience

(OTE). As explained, individuals high in OTE are more likely to embrace unusual and imaginative interventions (e.g. McCrae & Costa, 1997; Miller, 1991). Moreover, interventions that benefit from use of imagery (such as the MQ technique) should be more effective with individuals high in OTE (Thompson et al., 2009). For these reasons, it was hypothesised that the MQ technique is more[less] effective than the other interventions when OTE is high[low].

It has also been suggested that males in particular respond to solution-focused, action-oriented approaches (Liddon et al., 2019; Robertson et al., 2015; Westwood & Black, 2012). The MQ technique in the present study was both solution-focused and action-oriented. It therefore seemed possible that benefits of the technique would be more evident in men, provided that OTE is high. Analyses were therefore conducted to examine whether any moderation by OTE is itself moderated by gender.

3.4 Analytical strategy

Moderated multiple regression was used to analyse the data. Each dependent variable (e.g. hope, goal clarity) was regressed on pretest expectancy (a covariate), two dummy variables coding the conditions, OTE, gender, and product terms capturing the two-way and three-way interactions between condition, OTE and gender. An omnibus test of interaction was conducted by comparing two models - one with and one without product terms - in terms of the change in R^2 (ΔR^2). However, more attention was paid to the product terms themselves, which address specific moderation effects (e.g. the extent to which the effect of the MQ technique relative to the Problem-focused intervention depends on openness-to-experience). Whenever evidence was found for moderation, the Johnson-Neyman technique was applied to determine regions of significance (Hayes, 2018). Extreme cases were defined as those with studentized deleted residuals (SDRs) above 3 (Judd et al., 2017). If SDRs above 3 were observed, the analysis was reconducted without the relevant cases in order to test for differences. The vast majority of individuals who supplied baseline data completed the intervention. Of those who progressed to the intervention stage, 100% responded to all questions. When very few observations are missing (as in the present study), listwise deletion is considered appropriate and may even be superior to more complex methods of handling missing data (e.g. McKnight et al., 2007). Listwise deletion was therefore used for the very small number of participants who did not complete measures.

Supplementary analyses were conducted after all three experiments in order to determine whether OTE-dependent effects could be explained in terms of time-spent or number-of-words-written (see "Supplementary Information")

4. Experiment 1

Experiment 1 was conducted in a general domain - "Life Problems." Participants were recruited through *Call for Participants* – an online platform connecting researchers with participants. An advert outlining the study was posted on the website. Inclusion criteria were the same for all experiments. Participants had to be 18 and above, fluent in English and able to identify an important life problem that they wanted to solve. Prospective participants were invited to register for the study by supplying their email address. They were also informed that on completion of the study they would be entered into a prize draw for a £50 voucher.

4.1 Methods

4.1.1 Participants

Two-hundred and eighteen individuals were initially recruited and randomly assigned to one of

three interventions: (i) Miracle Question(s), (ii) Problem-focused, and (iii) Neutral (coaching). 80% in the MQ (58 out of 72), 71% in the Problem-focused (52 out of 73) and 74% in the Neutral condition (54 out of 72) actually began/completed the study. The completion rate was not significantly related to condition: $\chi^2 = 1.73$, $p = .42$. Only complete responses were recorded by the survey tool. One hundred and six participants (65%) identified as female and 57 (35%) as male. Ages ranged from 18 to 76 (Mean = 33.32; SD=12.7). Eighty-five participants were from the UK (52%); 33 were from the US (20%); the remainder reported various nationalities including German, Greek and Chinese.

4.1.2 Measures

For each of the measures below, scores were calculated as the mean of participants' scores on the items.

4.1.3 Hope

Hope was assessed by means of the "State Hope Scale" (Snyder et al., 1996). Correlational, experimental, and measurement studies support the construct and factorial validity of the measure (Snyder et al., 1996). Participants were asked to indicate the extent to which they agreed with each of the six items on a scale from 1 to 8. Higher scores indicated higher hope. Estimated reliability was high ($\alpha = .84$). The State Hope Scale can be analysed either in terms of two subscales ("Agency" and "Pathways") or in terms of overall "state hope". The latter approach was adopted in the present study.

4.1.4 Expectancy

Problem-solving expectancy was assessed with the measure developed by Abdulla & Woods (e.g. Abdulla & Woods, 2021a; 2021b; 2021c; 2022). Scores on that measure have been consistently associated with scores on validated measures of commitment (e.g. Abdulla & Woods, 2021c). Participants responded on a scale from 0 to 10. Higher scores indicated greater expectancy. Estimated reliability was high at both pretest ($\alpha = .86$) and posttest ($\alpha = .91$).

4.1.5 Goal clarity

Goal Clarity was assessed by the four-item "Clear Goals" subscale of the "Dispositional Flow Scale" developed by Jackson & Eklund (2002). Participants were asked to indicate their agreement with each item (on a 1-5 scale) with reference to the problem that they had identified (e.g. "I know clearly what I want to do"). Higher scores indicated greater goal clarity. Estimated reliability was high ($\alpha = .80$).

4.1.6 Openness-to-experience (OTE)

This was assessed by means of the "Openness" subscale of the Big Five Inventory (BFI) (John et al., 1991). A technical issue meant that the last item was not presented. OTE was therefore assessed by means of the other 9 items. Estimated reliability was reasonable ($\alpha = .77$). Comparison with Experiments 2 and 3 (in which all 10 items were presented) revealed that reliability estimates for the 9-item and 10-item measure were almost identical and results of inferential tests were the same no matter which measure was used. Participants indicated their agreement with each statement on a scale from 1 to 5. Higher scores indicated higher OTE.

4.2 Procedure

Participants were sent a link to one of three surveys. After supplying demographic data, they were initially asked to complete the OTE measure. They were then asked to describe the problem that they wanted to solve, after which they were presented with the pretest expectancy items. At this point, surveys differed according to condition.

In the MQ condition, participants read: “The following may seem strange and takes some imagination. Would you be willing to consider a slightly unusual question?” After providing a “Yes/No” response, participants were encouraged to imagine completing the survey and then going about their day/evening as normal. They were then asked whether they were able to imagine this. This preamble is recommended by solution-focused experts (de Shazer & Dolan, 2021). Participants were then presented with the MQ questions in Table S1. Questions in all conditions were presented one at a time and participants were asked to type their answers into a box.

In the Problem-focused intervention, participants read: “The following questions go into more detail. Would you be willing to explore the problem in more detail?” Participants were then presented with the problem-focused questions in Table S1. In the Neutral condition, participants read: “The following asks about ways around the problem. Would you be willing to consider different ways?” Participants were then presented with the neutral coaching questions in Table S1. After responding to the condition-specific questions, all participants were presented with the dependent measures.

4.3 Results

Participants identified a wide range of life problems, including career dissatisfaction, feeling “burnt out,” and dealing emotionally with the pandemic. Table S2 displays the mean time spent by individuals on each intervention and the mean number of words written in each condition (see “Supplementary Information”). Means and standard deviations for the key variables in the study are presented in Table 1 below.

Table 1. Means (M) and standard deviations (SD) for measured variables for each condition in Experiment 1.

	MQ		PF		Neutral	
	M	SD	M	SD	M	SD
OTE	3.71	0.54	3.56	0.74	3.63	0.69
PreExp	5.56	1.96	4.61	1.60	5.30	1.91
PostExp	5.86	2.17	5.00	1.75	5.78	1.89
Hope	5.73	1.22	5.24	1.27	5.75	1.45
G. Clarity	4.28	0.71	3.98	0.88	4.17	0.73

Note. OTE = Openness-to-Experience, PreExp = Pretest Expectancy, PostExp = Post-test Expectancy, G. Clarity = Goal Clarity.

No three-way *omnibus* interactions involving gender were significant. The results reported below were not significantly moderated by age. Three participants spent an unexpectedly long time on the interventions (see “Supplementary Information”) and are referred to below as “slow-completers.”

4.3.1 Hope

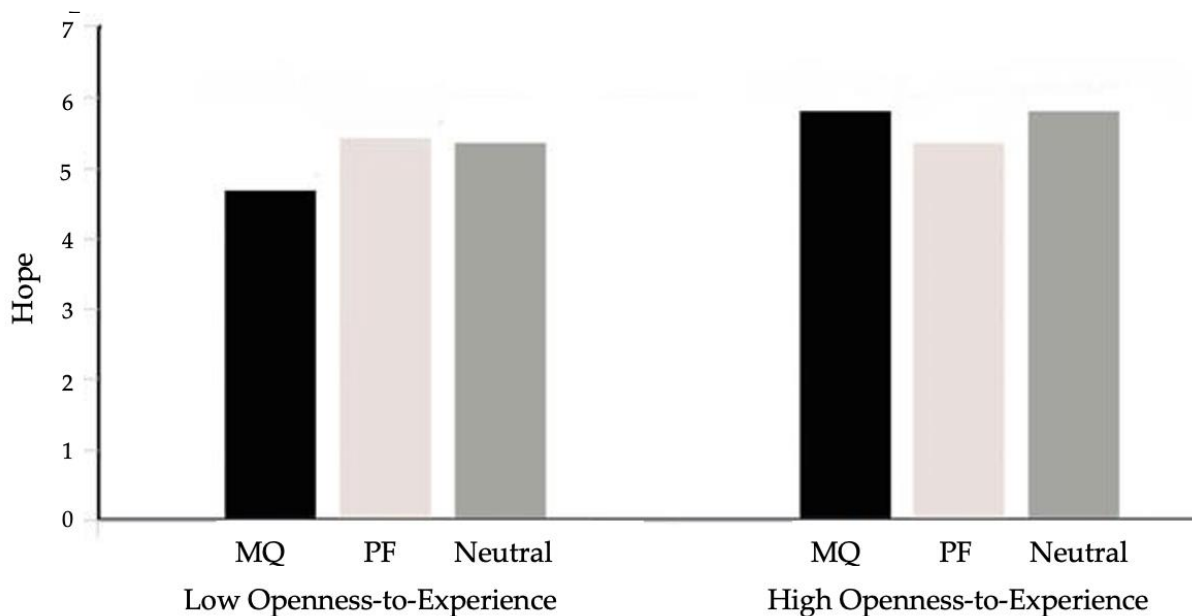
With the slow-completers excluded from the analysis, the result of the omnibus test of interaction between condition and OTE was significant: $\Delta R^2 = .03$, $F(2,153) = 3.31$, $p = .04$.

When the slow-completers were included, the result was still on the verge of significance:

$\Delta R^2 = .02$, $F(2,157) = 2.93$, $p = .056$. Moreover, the product term capturing OTE's moderation of the effect of the MQ condition relative to the Problem-Focused intervention was significant: $b = -0.79$ [1.43, -0.15], $t = 2.42$, $p = .02$. When a case associated with an SDR close to 4 was removed, the omnibus test was also clearly significant ($\Delta R^2 = .03$, $F(2,156) = 3.83$, $p = .02$) and the product term significant at the .01 level: $b = -0.87$ [-1.49, -0.25], $t = 2.76$, $p = .007$.

When OTE was lower than 2.64, the MQ technique was associated with significantly less hope than the Problem-focused intervention. At precisely 2.64 on the OTE scale, the advantage of the Problem-focused intervention was estimated to be 0.74 of a point - a moderately large effect. At OTE levels greater than 4.02, the MQ technique was estimated to have a *positive* effect relative to the Problem-focused intervention. When OTE was precisely 4.02, the advantage of the MQ condition was estimated to be almost half a point (0.46) - a smaller but potentially meaningful effect. Figure 1 depicts the interaction. When OTE was low (2.64), the MQ technique was estimated to be less effective than the Neutral technique by 0.65 of a point, whereas at the high level of OTE (4.02) hope was estimated to be approximately the same across the MQ and Neutral conditions. However, the product term for this interaction was not significant: $b = -0.47$ [-1.13, 0.19], $t = 1.41$, $p = .16$.

Figure 1. The effect of the MQ technique on hope relative to the problem-focused and neutral condition at low (= 2.64) and high (= 4.02) OTE.



4.3.2 Post-test expectancy

With the slow-completers excluded from the analysis, product terms capturing the three-way interaction between condition, OTE and gender were not significant ($p > .10$). However, the product term capturing the interaction between condition (MQ vs. Problem-focused) and OTE was significant: $b = -0.71$ [-1.31, -.12], $t = 2.37$, $p = .02$.

When OTE was lower than 2.89, the MQ technique was estimated to produce significantly

lower expectancy than the Problem-focused intervention. When OTE was at the threshold (2.88), estimated expectancy was 0.6 of a point lower in the MQ condition (a small but non-negligible effect). When OTE was higher than 4.77, the MQ technique was estimated to lead to significantly *higher* expectancy than the Problem-focused intervention. When OTE was at the threshold (4.78), estimated expectancy in the MQ condition was 0.75 of a point higher than in the Problem-focused intervention (a small-to-moderate effect). However, only 1.25% of participants had OTE scores above 4.77.

When the slow-completers were included in the analysis, the product term capturing the three-way interaction between condition (Problem-focused vs MQ), OTE and gender was on the verge of significance: $b = 1.26 [-0.03, 2.54]$, $t = 1.93$, $p = .055$. One case associated with an SDR over 3 was identified. In the analysis including the case, the interaction between OTE and condition was significant for men ($F(2,150) = 4.30$, $p = .02$) but not for women ($F(2,150) = 0.36$, $p = .70$). In men, at OTE levels lower than 2.65, MQ was associated with significantly *lower* post-test expectancy than the Problem-focused intervention. At OTE levels higher than 3.93, the MQ condition was associated with significantly higher expectancy than the Problem-focused intervention. At the low level of OTE ($= 2.65$), the MQ condition was estimated to be 1.24 points lower (a moderate-to-large effect), whereas at the high level ($= 3.93$), the MQ condition was estimated to be 0.68 of a point higher (a small effect). At low[high] levels of OTE, the MQ condition was also associated with lower[higher] expectancy than the Neutral condition, but the differences were not significant. After removal of the case associated with the SDR over 3, the product term capturing the three-way interaction between condition (Problem-focused vs MQ), OTE and gender was no longer significant: $b = 0.62 [-0.67, 1.91]$, $t = .95$, $p = .34$.

Repeated measures t -tests indicated that all three conditions were associated with a significant overall increase in expectancy from pretest to post-test ($ps \leq .01$). Effect sizes were small for the MQ ($d = 0.33$) and Problem-focused ($d = 0.40$) and medium for the neutral intervention ($d = 0.57$).

4.3.3 Goal clarity

No product terms were significant. Hierarchical regression indicated that the effect of condition on goal clarity (after controlling for OTE and pretest expectancy) was not significant: $\Delta R^2 = .002$, $F(2,159) = 0.20$, $p = .82$. The adjusted mean for the MQ condition (4.19) was higher than the adjusted mean in the Problem-focused (4.11) and Neutral condition (4.15), but differences were extremely small.

4.4 Brief discussion

Results of Experiment 1 suggested that effects of the MQ technique (at least relative to the Problem-focused intervention) depend on openness-to-experience. At high[low] levels of OTE, the MQ technique was associated with more[less] hope than the problem-focused approach. With post-test expectancy as the dependent variable, there was some evidence for a three-way interaction involving gender: for men, the MQ technique appeared to be more[less] effective than the problem-focused approach at high[low] levels of OTE. However, this moderated moderation effect was less robust. When gender was ignored, the hypothesised pattern was still observed: At high[low] levels of OTE, the MQ technique apparently produced higher[lower] expectancy. The MQ technique appeared to have little effect on goal clarity.

Some further insights into the size of the effects may be gained through comparisons with other studies. Snyder et al. (1996, Experiment 3) conducted a brief intervention in which an experimenter helped some participants mentally relive a past success whilst others were

encouraged to relive a past failure. Those in a control condition were taken through a relaxation exercise (which did little or nothing to enhance state hope). The authors report total scores on the state hope scale. Converted into means, the differences in state hope reported between “success” and control (+0.53 of a point) and “failure” and control (0.65 of a point) were similar in size to the differences observed at the thresholds in Experiment 1. Thus, at the OTE thresholds in Experiment 1 the difference between the MQ and Problem-focused interventions (in terms of state hope) may be equivalent to the difference between spending ten minutes on reliving a past success (or dwelling on a previous failure) and spending ten minutes on a neutral activity. Importantly, however, the effects in Experiment 1 occurred in *self-help* interventions whereas those in Snyder et al. (1996) required an interventionist.

5. Experiment 2

The “Miracle Question” (like solution-focused therapy as a whole) was originally developed in the context of familial and interpersonal relationships (de Shazer & Dolan, 2021). Experiment 2 was therefore conducted in the domain of relationships. Participants were recruited through Prolific and compensated at the rate of £5/\$6.50 an hour. A different survey tool was used, which allowed data from non-completers to be saved.

5.1 Methods

5.1.1 Participants

Two-hundred and thirteen individuals were recruited and randomly assigned to one of the three conditions. Eighty-three percent in the MQ (59 out of 71), 86% of the Problem-focused (61 out of 71), and 87% of the Neutral condition (62 out of 71) completed the survey. The completion rate was not significantly related to condition: $\chi^2 = 0.53$, $p = .77$. One hundred and thirty-four participants identified as female (74%); 46 as male (25%) and two as “other.” Ages ranged from 18 to 67 (Mean = 33.14; SD = 10.67). Forty-nine percent of participants were from the UK; 15% were from South Africa; 12% were from Ireland. The remainder reported various nationalities including Welsh, American and Australian. Five individuals responded to the pre-intervention questions but did not progress to the intervention. There were no significant differences in age ($t = 1.19$, $p = .24$), OTE ($t = .24$, $p = .81$) or pretest expectancy ($t = .85$, $p = .40$) between these individuals and those who completed the study.

5.1.2 Measures

Dependent variables were measured using the same instruments as in Experiment 1. OTE was measured by all ten items of the “Openness” scale on the BFI. Cronbach’s alpha provided high reliability estimates for all variables: expectancy (pretest: $\alpha = .89$; post-test: $\alpha = .95$), hope ($\alpha = .88$), OTE ($\alpha = .79$), and goal clarity ($\alpha = .88$).

5.1.3 Procedure

The procedure was identical to that in Experiment 1 except for the following. First, a common problem-focused question was added to the Problem-focused intervention: “Why is this a problem for you?” (e.g. Nezu et al., 2012). Second, participants were asked to identify a *relationship* problem involving somebody in their lives, e.g. a family member, partner or friend.

5.2 Results

Problems identified by participants included difficulties with a partner or spouse, arguments

with parents or children, and issues with relatives or friends. Table S3 displays the mean time spent and mean number of words written in each intervention. Descriptive statistics for key variables are presented in Table 2.

Table 2. Means (M) and standard deviations (SD) for measured variables for each condition in Experiment 2.

	MQ		PF		Neutral	
	M	SD	M	SD	M	SD
OTE	3.48	0.66	3.72	0.53	3.44	0.63
PreExp	3.80	1.62	4.11	1.90	4.43	1.62
PostExp	3.89	1.91	4.20	2.29	4.58	1.91
Hope	5.03	1.46	5.63	1.28	5.32	1.30
G. Clarity	3.91	0.92	4.19	0.89	3.85	0.81

Note. OTE = Openness-to-Experience, PreExp = Pretest Expectancy, PostExp = Post-test Expectancy, G. Clarity = Goal Clarity.

Three-way interactions involving gender were not significant for hope or goal clarity. The results reported below were not significantly moderated by age.

5.2.1 Hope

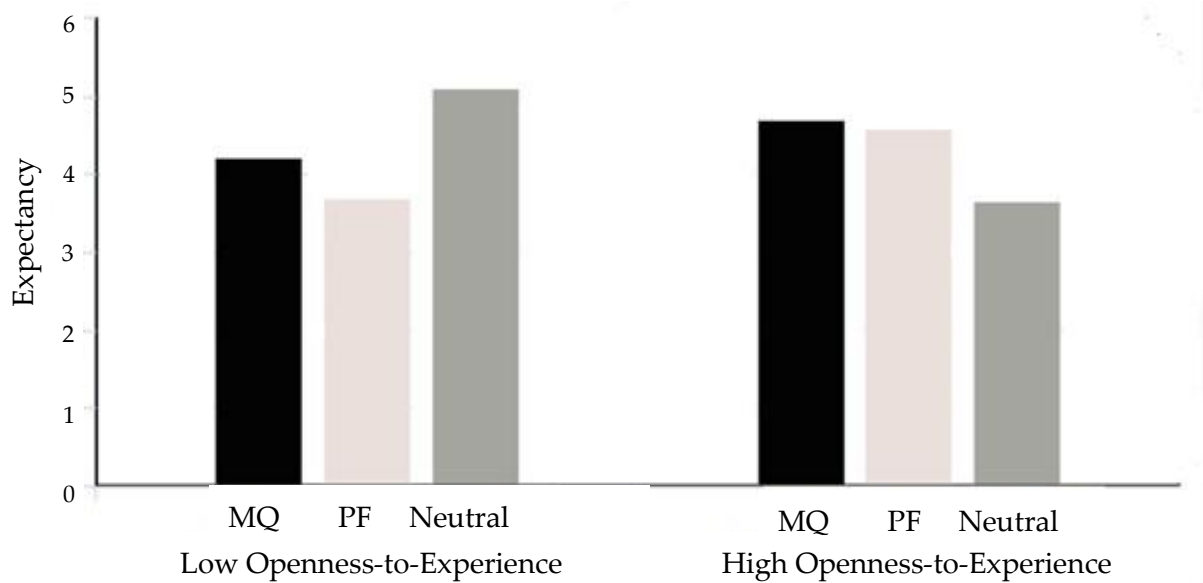
The omnibus test of an interaction between condition and OTE was not significant: $\Delta R^2 = .004$, $F(2,175) = 0.43$, $p = .65$. In addition, neither product term was significant ($ps > .43$). Hierarchical regression revealed that the effect of condition on hope (after controlling for preexpectancy and OTE) was not significant: $\Delta R^2 = .004$, $F(2,177) = 1.41$, $p = .25$. The adjusted mean for hope in the MQ condition (5.12) was slightly lower than the adjusted means in the Problem-focused (5.50) and Neutral (5.32) condition.

5.2.2 Expectancy

The omnibus test for the three-way interaction between condition, OTE and gender was significant: $\Delta R^2 = .01$, $F(2,167) = 5.53$, $p = .005$. Two SDRs above 3 were identified. With these removed, the p value for the omnibus test was even lower ($p = .0003$). The interaction between condition and OTE was significant for men ($F(2,167) = 7.24$, $p = .001$), but not for women ($F(2,167) = 1.03$, $p = .38$). Probing of the interaction for men indicated that at OTE levels below 2.89, the MQ condition had *lower* estimated expectancy than the Neutral condition. At precisely 2.89, expectancy was estimated to be 0.88 of a point less in the MQ condition - a moderately large effect. At OTE levels greater than 4.35, the MQ condition was estimated to have significantly *higher* expectancy than the Neutral condition. At precisely 4.35, the advantage was greater than 1 point (1.04) - another moderately large effect. Figure 2 displays the interaction amongst men. Amongst women, the MQ technique did not produce significantly higher expectancy at any level of OTE. Interactions involving the MQ and Problem-focused intervention were not significant ($ps > .19$).

Repeated measures t -tests indicated that the overall pre-to-post change in expectancy was not significant for any of the conditions ($ps > .16$). Effect size estimates were very small for the MQ ($d = 0.12$) and Problem-focused intervention ($d = 0.09$) and hardly any larger for the Neutral condition ($d = 0.18$).

Figure 2. The effect amongst men of the MQ technique on post-test expectancy relative to the problem-focused (PF) and neutral condition at low (= 2.89) and high (= 4.35) OTE.



5.2.3 Goal clarity

The result of the omnibus test of interaction between condition and OTE was not significant: $\Delta R^2 = .01$, $F(2,175) = 0.70$, $p = .50$. In addition, neither product term was significant ($ps > .29$). After controlling for OTE and pretest expectancy, the effect of condition was not significant: $\Delta R^2 = .02$, $F(2,177) = 1.77$, $p = .17$. The adjusted mean for goal clarity in the MQ condition (3.97) was slightly higher than that of the Neutral condition (3.85) but slightly lower than that of the Problem-focused intervention (4.13).

5.3 Brief discussion

The results of Experiment 2, like those of Experiment 1, suggested that OTE's moderation of the effect of condition on expectancy might depend on gender. However, on this occasion, the moderated moderation effect was more robust. As before, the hypothesised pattern was observed only for men but this time concerned the *Neutral* condition: at high[low] levels of OTE, the MQ condition was estimated to be more[less] effective. Moreover, if two SDRs above 3 are removed, the p -value (.0003) for the three-way interaction would survive even the most stringent Bonferroni correction. In terms of effect size (for men), the estimated differences in expectancy between MQ and Neutral at the thresholds were 0.88-1.04 of a point (approximately half a standard deviation).

The size and meaningfulness of these effects may be clarified by comparisons with those in previous research. For example, in a study comparing problem-focused and solution-focused questions using the same 0-10 expectancy scale, between-condition differences were less than 0.7 of a point - approximately half a standard deviation (Abdulla & Woods, 2021a). Those differences were estimated to lead to between-condition differences in *commitment* that were small but statistically different from zero. Thus expectancy effects of the size obtained in Experiment 2 may have consequences for people's commitment, particularly at *very* low/high levels of OTE.

6. Experiment 3

Experiments 1 and 2 focused on hope, expectancy and goal clarity – three variables upon which

the MQ technique is thought to have positive effects. The previous published experimental studies of the MQ technique suggested that it also has a positive influence on affect (Neipp et al., 2021; Solms et al., 2022; Theeboom et al., 2015). However, those studies involved students. One of the primary aims of Experiment 3 was to see whether the MQ technique has an influence on affect in a more diverse, non-student sample. The domain was once again general “life” problems, as was the case in Neipp et al. (2021). Participants were recruited from Prolific and compensated at the rate of £5/\$6.50 an hour.

6.1 Methods

6.1.1 Participants

Two-hundred and seventy-nine individuals were initially recruited through Prolific and randomly assigned to one of the three conditions. Eighty-two percent of the MQ (76 out of 93), 82% of the Problem-focused (76 out of 93) and 83% of the Neutral condition (77 out of 93) completed the survey. The completion rate was not significantly related to condition: $\chi^2 = 0.05$, $p = .98$. Ages ranged from 18 to 67 ($M = 33.01$; $SD = 11.06$). One-hundred and sixty-one participants identified as female (70%); 64 as male (28%); and 4 as “other” (2%). Fifty percent of participants were from the UK; 21% were from the US or Canada; 15% were from South Africa. The remainder reported various nationalities, including Irish, Australian, and Zimbabwean. Fourteen individuals responded to the pre-intervention questions but did not progress to the intervention. There were no significant differences in age ($t = .46$, $p = .644$) or OTE ($t = 1.71$, $p = .09$) between these individuals and those who completed the study. However, 7 participants who completed the pre-expectancy measure but did not progress to the intervention reported significantly higher pre-expectancy ($t = 2.37$, $p = .02$). These participants may have dropped out after concluding that they did not require intervention.

6.1.2 Measures

Hope ($\alpha = .87$), Goal Clarity ($\alpha = .89$), Expectancy (pretest: $\alpha = .82$; post-test: $\alpha = .91$), and Openness-to-Experience ($\alpha = .74$) were measured using the same instruments as in Experiments 1 and 2. Positive and negative affect were measured using the Positive and Negative Affect Schedule - PANAS (Watson et al., 1988). Participants were asked to consider how they were feeling “right now.” Reliability estimates were very high for both positive affect ($\alpha = .94$) and negative affect ($\alpha = .90$).

6.1.3 Procedure

The procedure was the same as in Experiment 1.

6.2 Results

Participants identified a wide range of problems including difficulties at work, dissatisfaction with weight or physical appearance, and various financial concerns. Table S4 displays the mean time taken and mean number of words written in each intervention. Descriptive statistics for key variables are presented in Table 3.

Table 3. Means (M) and standard deviations (SD) for measured variables for each condition in Experiment 3

	MQ		PF		Neutral	
	M	SD	M	SD	M	SD
OTE	3.63	0.58	3.68	0.51	3.60	0.56
PreExp	4.88	1.52	5.16	1.42	4.89	1.48
PostExp	5.38	1.87	5.59	1.74	5.28	1.97
Hope	5.04	1.38	5.36	1.30	5.20	1.36
G. Clarity	4.08	0.94	4.22	0.68	4.24	0.79
Pos. Aff	28.46	10.60	29.17	9.92	28.60	10.11
Neg. Aff	22.33	9.62	22.07	8.36	20.56	9.15

Note. OTE = Openness-to-Experience, PreExp = Pretest Expectancy, PostExp = Post-test Expectancy, G. Clarity = Goal Clarity, Pos. Affect = Positive Affect, Neg. Affect = Negative Affect.

Omnibus tests of three-way interactions involving gender were not significant for any of the dependent variables. In addition, no interactions between condition and OTE (omnibus or specific) were significant for hope, expectancy, or affect. The results reported below were not significantly moderated by age.

7. Experiment 3

7.1 Methods

7.1.1 Participants

Two-hundred and seventy-nine individuals were initially recruited through prolific and randomly assigned to one of the three conditions. Eighty-two percent of the MQ (76 out of 93), 82% of the Problem-focused (76 out of 93) and 83% of the Neutral condition (77 out of 93) completed the survey. The completion rate was not significantly related to condition: $\chi^2 = 0.05$, $p = .98$. Ages ranged from 18 to 67 ($M = 33.01$; $SD = 11.06$). One-hundred and sixty-one participants identified as female (70%); 64 as male (28%); and 4 as “other” (2%). Fifty percent of participants were from the UK; 21% were from the US or Canada; 15% were from South Africa. The remainder reported various nationalities, including Irish, Australian, and Zimbabwean. Fourteen individuals responded to the pre-intervention questions but did not progress to the intervention. There were no significant differences in age ($t = .46$, $p = .644$) or OTE ($t = 1.71$, $p = .09$) between these individuals and those who completed the study. However, 7 participants who completed the pre-expectancy measure but did not progress to the intervention reported significantly higher pre-expectancy ($t = 2.37$, $p = .02$). These participants may have dropped out after concluding that they did not require intervention.

7.1.2 Measures

Hope ($\alpha = .87$), Goal Clarity ($\alpha = .89$), Expectancy (pretest: $\alpha = .82$; post-test: $\alpha = .91$), and Openness-to-Experience ($\alpha = .74$) were measured using the same instruments as in Experiments 1 and 2. Positive and negative affect were measured using the Positive and Negative Affect Schedule - PANAS (Watson et al., 1988). Participants were asked to consider how they were feeling “right now.” Reliability estimates were very high for both positive affect ($\alpha = .94$) and negative affect ($\alpha = .90$).

7.1.3 Procedure

The procedure was the same as in Experiment 1.

7.2 Results

Participants identified a wide range of problems including difficulties at work, dissatisfaction with weight or physical appearance, and various financial concerns. Table S4 displays the mean time taken and mean number of words written in each intervention. Descriptive statistics for key variables are presented in Table 3.

Table 3. Means (M) and standard deviations (SD) for measured variables for each condition in Experiment 3.

	MQ		PF		Neutral	
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PreExp	4.88	1.52	5.16	1.42	4.89	1.48
PostExp	5.38	1.87	5.59	1.74	5.28	1.97
Hope	5.04	1.38	5.36	1.30	5.20	1.36
G. Clarity	4.08	0.94	4.22	0.68	4.24	0.79
Pos. Aff	28.46	10.60	29.17	9.92	28.60	10.11
Neg. Aff	22.33	9.62	22.07	8.36	20.56	9.15

Note. OTE = Openness-to-Experience, PreExp = Pretest Expectancy, PostExp = Post-test Expectancy, G. Clarity = Goal Clarity, Pos. Affect = Positive Affect, Neg. Affect = Negative Affect.

Omnibus tests of three-way interactions involving gender were not significant for any of the dependent variables. In addition, no interactions between condition and OTE (omnibus or specific) were significant for hope, expectancy, or affect. The results reported below were not significantly moderated by age.

7.2.1 Hope

After controlling for OTE and pretest expectancy, the effect of condition was not significant: $\Delta R^2 = .004$, $F(2,225) = 0.58$, $p = .56$. The adjusted mean for the MQ condition (5.08) was slightly lower than that of the Problem-focused (5.26) and Neutral (5.25) condition.

7.2.2 Post-test expectancy

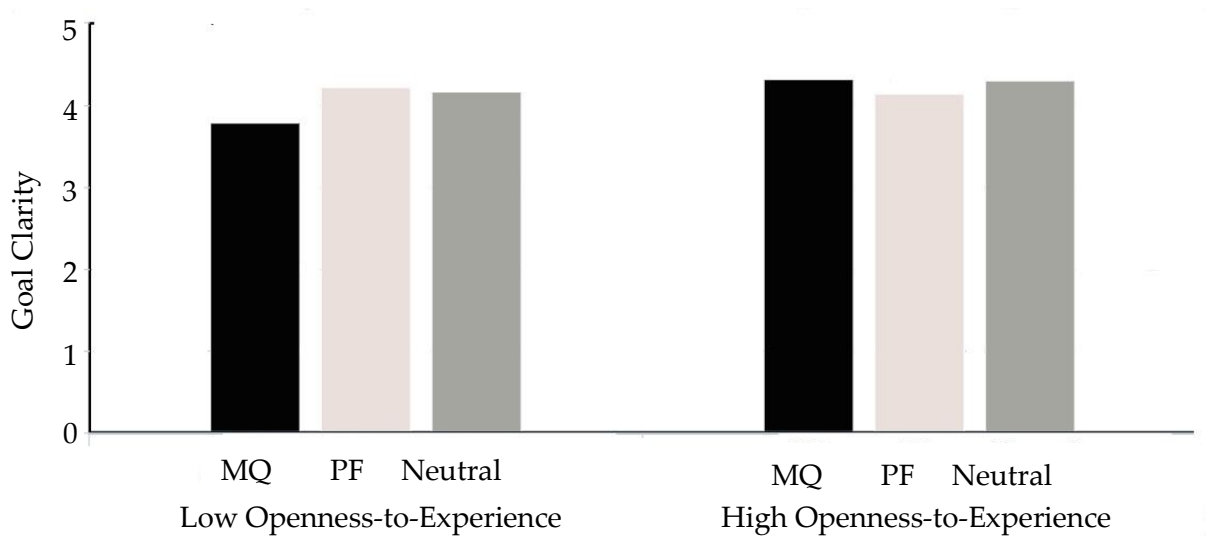
After controlling for pretest expectancy and OTE, the effect of condition was not significant: $\Delta R^2 = .001$, $F(2,224) = 0.29$, $p = .75$. The adjusted mean for the MQ condition (5.48) was very slightly higher than that of the Problem-focused (5.39) and Neutral (5.37) condition. Repeated measures *t*-tests indicated that all three conditions were associated with a significant overall pre-to-post increase in expectancy ($ps < .001$). Effect sizes were in the medium range: MQ ($d = 0.52$), Problem-focused ($d = 0.47$) and Neutral ($d = 0.41$).

7.2.3 Goal clarity

The product term capturing OTE's moderation of the effect of condition (MQ vs Problem-focused) on goal clarity was significant: $b = 0.44$ [-0.86, -0.1], $t = 2.02$, $p = .04$. The hypothesised pattern was observed: at high[low] levels of OTE, the MQ condition was associated with

higher[lower] goal clarity than the Problem-focused intervention. However, significant differences were observed only when OTE was less than 2.9. At precisely this level, estimated goal clarity in the MQ condition was 0.40 of a point lower than in the Problem-focused intervention- a moderately large effect. Three studentised deleted residuals above 3 were observed. After removing the relevant cases, the *omnibus* test of the interaction effect between condition and goal clarity was now also significant: $\Delta R^2 = .03$, $F(2,219) = 3.79$, $p = .02$. In addition, both product terms were now significant ($ps < .02$). Figure 3 displays the moderation effect.

Figure 3. The effect of the MQ condition on goal clarity relative to the problem-focused (PF) and neutral conditions at low (= 2.80) and high (= 4.20) OTE.



7.2.4 Positive affect

Interactions were not significant. After controlling for pretest expectancy and OTE, the effect of condition was not significant: $\Delta R^2 = .00$, $F(2,225) = .06$, $p = .94$.

7.2.5 Negative affect

Interactions were not significant. After controlling for pretest expectancy and OTE, the effect of condition was not significant: $\Delta R^2 = .01$, $F(2,225) = 1.24$, $p = .29$.

7.3 Brief discussion

The MQ technique appeared to have little influence on affect relative to the other interventions. On the face of it, this finding is not consistent with results reported by Neipp et al. (2021) and Theeboom et al. (2015). Large effects on affect were obtained by Theeboom et al., (2015), who used the UWIST Mood Adjective Checklist (Matthews et al., 1990). Smaller effects were observed by Neipp et al. (2021), who used the PANAS. The PANAS was used in the present experiment, which may explain smaller “effects.” Alternatively, the differences in results may be due to the population: the present study involved a wide range of adults differing in age (and nationality), whereas the studies reported by Theeboom et al. (2015) and Neipp et al. (2021) involved college students.

Unlike Experiments 1 and 2, Experiment 3 provided no strong evidence of an interaction between OTE and condition in predicting hope or expectancy. However, the predicted

interaction was observed for goal clarity. At high[low] levels of openness-to-experience, the MQ condition apparently produced more [less] goal clarity than the problem-focused intervention. However, the difference was statistically significant only when OTE was low. When OTE was high, the goal clarity “advantage” of the MQ technique was small and not statistically significant. When OTE was at the significance threshold (2.9), goal clarity was estimated to be 0.4 of a point *lower* in the MQ condition than in the problem-focused intervention (approximately half a standard deviation). The size of this effect may be appreciated by recalling that participants in each condition spent (on average) the same amount of time on answering questions about their problems. Moreover, although diametrically opposed in terms of orientation (solution-focused vs. problem-focused) both sets of questions were equally relevant to the problem that had been identified. In this context, a difference of half a standard deviation in post-test goal clarity is a notable effect.

8. General discussion

The “Miracle Question” is widely considered to be the most powerful of all solution-focused interventions. Numerous popular texts recommend the MQ technique as a means for enhancing wellbeing (e.g. Binder, 2021; Fisher, 2012; Hermans & Meijerds, 2020; Wilson & Ferguson, 2007). However, experimental research on the MQ technique has been largely non-existent. It therefore lacks the evidential support enjoyed by PPIs such as “Best Possible Self.” The present study sought to remedy that deficiency and is, to date, the largest experimental study of the MQ intervention (Total $N = 516$) and the only study to have focused on non-student participants. As such, it makes several important contributions not only to our appreciation of the MQ technique but also to our understanding of brief, self-help PPIs.

The MQ technique is embedded in many self-help interventions, several of which are computerized (e.g. Cepukiene & Pakrosnis, 2018; Isherwood & Regan, 2005; Kramer et al., 2014; Pakrosnis & Cepukiene, 2015; Richmond et al., 2014). Murphy (2013, p.25) offers a typical perspective: “In addition to helping [individuals] develop *clear goals*, the miracle question boosts *hope* by focusing on future prospects rather than past problems” (italics added). The present study is the first to investigate such claims. Collectively, the results of the three experiments suggest that the relative advantages of the “Miracle Question” (over problem-focused or neutral coaching interventions) may not be as great as the popular literature would lead one to suppose, at least when interventions are computerized. Only one experiment (Experiment 1) suggested that the MQ technique may lead to higher hope than the other interventions. Moreover, that superiority was in evidence only at high levels of openness-to-experience. In terms of raising problem-solving expectancy, Experiments 1 and 2 provided evidence that the MQ technique may be more effective than one or the other of the interventions, but again only when openness-to-experience is high. Furthermore, there were some signs to suggest (particularly in Experiment 2) that the expectancy-benefit might be additionally confined to males. In Experiments 1 and 3 the MQ technique was associated with a significant pre-to-post increase in expectancy. However, such increases were also observed for the other two interventions. None of the experiments indicated that the MQ technique is more effective in enhancing goal clarity. Indeed, results of Experiment 3 indicated that when openness-to-experience is low, the MQ technique may lead to *lower* goal clarity than the problem-focused intervention. This is an important drawback given that the primary aim of the MQ technique is often said to be goal clarification (e.g. McKergow, 2021). Finally, there was little evidence to suggest that the MQ technique has a positive influence on affect (relative to the other interventions). Solution-focused practitioners will be quick to emphasise that the MQ technique was deployed remotely. Some SF authors stress the importance

of human factors, e.g. the tone of the practitioner's voice (de Shazer & Dolan, 2021). If the MQ technique does indeed rely on such human factors, its effectiveness as a self-help PPI may be limited.

Rozenal et al. (2014, p.12) argue that "internet interventions have great potential for alleviating emotional distress, promoting mental health, and enhancing wellbeing." However, unguided self-help internet interventions are likely to suffer from considerable drop-out. Melville et al. (2010) examined the extent of drop-out from internet-based interventions for psychological disorders. They found that drop-out could be as high as 83% (with a weighted average of 31%). Online applications focusing on *positive* wellbeing often suffer from similarly high levels of attrition. For example, in an online intervention designed to enhance wellbeing (including gratitude and confidence in the future), Torniainen-Holm et al., (2016) found that the attrition rate at 2 months was 88%. Such high drop-out has often been used as an argument for shorter interventions (Brog et al., 2022). In the present study the interventions lasted 10-20 minutes. Of those who began the study and completed pre-intervention measures only 2.7% (Experiment 2) and 6% (Experiment 3) did not complete the intervention. These percentages compare extremely favourably with those cited above. It might be argued that the prospect of payment was an important factor but at least two points should be considered in this regard. First, in Experiment 1 participants were *not* paid to complete the survey. They were merely informed that they would be entered into a prize draw upon survey completion. Second, research indicates that even when participants are paid to complete surveys, drop-out may exceed 30% (Zhou & Fishbach, 2016).

Nevertheless, shorter PPIs (not providing any support) are normally associated with smaller benefits than longer, guided interventions (Schueller & Parks, 2014). It is therefore illuminating to consider effect sizes in the present study. In Experiments 1 and 3, which focused on "life problems," all three interventions were associated with a statistically significant overall increase in problem-solving expectancy from pretest to posttest. These increases were of small-to-medium size, which is consistent with meta-analytic research on PPIs (e.g. Boiler et al., 2013). Importantly, these improvements occurred without any human interaction. Thus, it seems that (in the domain of "life problems"), brief self-help computerised techniques can lead to immediate improvements in one aspect of wellbeing. Interestingly, however, *none* of the interventions led to a statistically significant improvement in expectancy in the domain of relationships (Experiment 2). The reasons for this could be examined in future research.

Finally, the present study investigated the role of personality in brief self-help PPIs. Results suggested that the effects of the most famous solution-focused intervention (the MQ technique) may depend on openness-to-experience. Individuals high in openness-to-experience may be more likely to embrace or benefit from an unusual, imagery-based PPI. On the other hand, individuals low in openness-to-experience may be better served by a neutral or problem-focused approach. This finding – if it can be replicated – has very important implications for enhancing wellbeing, at least in brief, computerised self-help interventions.

Conflict of interest statement

The authors report no conflicts of interest.

Data availability statement

Data may be obtained by contacting the corresponding author by email.

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Supplementary information for: Brief computerised self-help interventions, the “Miracle Question,” and the moderating effects of openness-to-experience

Adam Abdulla

Table S1. Questions used in the “Miracle Question,” problem-focused, and neutral coaching conditions.

Intervention	Questions
“Miracle Question”	<ul style="list-style-type: none"> • “So now imagine that while you're asleep, a miracle happens. The problem you've described is solved - just like that. But this happens while you're sleeping, so you don't yet know that it's happened. You wake up in the morning and start to go about your day. What would be different that would tell you the problem has been solved?” • “What else would be different?” • “What would you find yourself <i>doing</i> differently?” • “What <i>else</i> would you be doing differently?” • “Think about other people. What would <i>they</i> see you doing differently?” • “When was the last time parts of this ‘miracle’ actually happened in your life (even a tiny little bit)?”
Problem-Focused Counseling	<ul style="list-style-type: none"> • “How long has this been a problem?” • “How did the problem start?” • “What do you think is causing the problem?” • “How do you feel about the problem?” • “What could you do about the problem?” • “What else could you do about the problem?”
Neutral Coaching Approach	<ul style="list-style-type: none"> • “Ok. What have you tried to do to make things better?” • “How effective has that been?” • “What else have you tried?” • “How effective was that?” • “What could you try that you haven’t tried before?” • “How effective do you think that would be?” • “What do you think would be the best thing to do?”

Note. The “Miracle Question” (MQ) questions were modelled on those presented in solution-focused textbooks (e.g. de Shazer and Dolan, 2021). The questions used for the Problem-Focused (PF) and Neutral Coaching conditions were drawn from or based on previous studies (e.g. Grant, 2012), counseling texts (e.g. Nelson-Jones, 2014) and popular guides to coaching (e.g. Whitmore, 1992).

Table S2. Mean time spent (in minutes) and mean number of words written in each condition in Experiment 1.

	MQ ^a		PF ^b		Neutral	
	M	SD	M	SD	M	SD
Time spent	15.12	9.03	18.63	36.95	16.67	30.62
Number of Words	96.85	86.44	77.85	69.79	72.07	54.36

^aMQ = Miracle Question

^bPF = Problem-Focused Condition

For time spent, the greater standard deviations of the PF and Neutral condition were due to unexpectedly long times recorded for three participants in the PF (62, 145, and 231 mins) and one participant in the Neutral condition (229 mins). When the slow-completers were removed, the difference in mean times was significant: $F(2,157) = 3.23, p = .04$. Tukey's post hoc comparisons indicated that the only significant difference was that between the MQ and PF condition ($p = .03$). Nevertheless, mean completion times for all three conditions were in the expected 10-20 minute range. With the slow-completers in the analysis, the mean time taken by participants did not differ significantly across conditions: $F(2,161) = 0.22, p = .80$. The mean number of words written did not differ significantly across conditions: $F(2,161) = 1.83, p = .16$.

1. Supplementary analyses for Experiment 1

1.1 Associations between OTE and time spent on the interventions

The correlation between openness-to-experience (OTE) and time spent on the intervention was positive but small in the MQ condition ($r = .13, p = .32$), negative and small-to-moderate in the PF condition ($r = -.25, p = .08$), and negative but extremely small in the Neutral condition ($r = -.03, p = .81$). The correlation between time spent and hope was positive but small in the MQ condition ($r = .21, p = .12$), negative but extremely small in the PF condition ($r = -.05, p = .70$), and negative but even smaller in the Neutral condition ($r = -.01, p = .96$). The correlation between time spent and posttest expectancy was positive but small in the MQ condition ($r = .21, p = .12$), moderately negative in the PF condition ($r = -.29, p = .04$), and positive but extremely small in the Neutral condition ($r = .07, p = .62$).

Time spent was regressed on OTE, two dummy variables coding the conditions and two product terms capturing the interactions between condition and OTE. The coefficients for the two product terms ($b = -1.71$ and $b = -.43$) and the omnibus test of interaction were not statistically significant ($ps > .09$). Evidence that the effect of condition on time-spent varied with OTE was therefore not particularly strong.

Table S3. Mean time spent (in minutes) and mean number of words written in each condition in Experiment 2.

	MQ		PF		Neutral	
	M	SD	M	SD	M	SD
Time spent	10.73	5.83	10.15	6.52	9.52	5.21
Number of Words	93.88	48.53	90.77	42.81	98.97	65.90

The mean time taken by participants did not differ significantly across conditions: $F(2,179) = 0.64$, $p = .53$. Similarly, the mean number of words written did not differ significantly across conditions: $F(2,179) = 0.37$, $p = .69$.

2. Supplementary analyses for Experiment 2

2.1 Associations between OTE and time spent on the interventions

In all three conditions the correlation between OTE and time spent was positive but small (r s between .14 and .21) and non-significant ($p > .11$). Similarly, in all three conditions correlations between time spent and hope were positive but small (r s between .13 and .22) and non-significant ($p > .09$). The correlation between time spent and posttest expectancy was negative but extremely small in the MQ condition ($r = -.01$, $p = .96$), negative but small in the PF condition ($r = -.10$, $p = .56$), and moderately positive in the Neutral condition ($r = .28$, $p = .03$). Only the last correlation was significant.

Time-spent was regressed on OTE, the dummy variables coding conditions, and the product terms capturing the interactions between OTE and condition. The coefficients for the product terms ($b = .99$ and $b = 1.59$) and result of the omnibus test of interaction were not significant ($ps > .11$). There was therefore no strong evidence to suggest that the effect of condition on time spent varied with OTE.

2.2 Associations between OTE and number of words written

The correlation between OTE and number of words written was moderately positive in the MQ condition ($r = .28$, $p = .03$) and PF condition ($r = .35$, $p = .01$), and positive but extremely small in the Neutral condition ($r = .04$, $p = .77$). The correlation between number of words written and posttest expectancy was positive but small in the MQ condition ($r = .11$, $p = .40$), moderately negative in the PF condition ($r = -.30$, $p = .20$), and negative but extremely small in the Neutral condition ($r = -.01$, $p = .93$).

Number-of-words-written was regressed on OTE, the two dummy variables coding conditions and the product terms capturing the interactions between condition and OTE. The coefficients for the product terms ($b = .55$ and $b = .77$) and omnibus test of interaction were not significant ($ps > .55$). There was therefore little to suggest that the effect of condition on number-of-words-written varied as a function of OTE.

Table S4. Mean time spent (in minutes) and mean number of words written in each condition in Experiment 3.

	MQ		PF		Neutral	
	M	SD	M	SD	M	SD
Time spent	12.58	6.52	11.97	5.40	11.38	5.70
Number of Words	99.79	46.17	98.05	60.00	105.18	67.41

The mean time taken by participants did not differ significantly across conditions: $F(2,226) = 0.79$, $p = .45$. Similarly, the mean number of words did not differ significantly across conditions: $F(2,226) = 0.31$, $p = .73$

3. Supplementary analyses for Experiment 3

3.1 Associations between OTE and time spent on the interventions

The correlation between OTE and time spent on the intervention was positive and small-to-moderate in the MQ condition ($r = .25, p = .03$), positive but small in the PF condition ($r = .17, p = .14$), and moderately positive in the Neutral condition ($r = .30, p = .01$). In all three conditions, the correlation between time spent on the intervention and goal clarity was positive but small (r s between .11 and .20) and not significant ($ps > .09$).

Time-spent was regressed on OTE, the dummy variables coding conditions, and the product terms capturing the interactions between OTE and condition. The coefficients for the product terms ($b = -1.75$ and $b = -1.40$) and result of the omnibus test of interaction were not significant ($ps > .08$). Evidence to suggest that the effect of condition on time-spent varied with OTE was therefore not particularly strong.

3.2 Associations between OTE and number of words written

The correlation between OTE and number of words written was positive but extremely small in the MQ condition ($r = .01, p = .92$), negative but small in the PF condition ($r = -.15, p = .20$), and positive but small in the Neutral condition ($r = .16, p = .16$). The correlation between number of words written and goal clarity was negative but extremely small in the MQ ($r = -.05, p = .64$) and PF condition ($r = -.02, p = .89$), and positive but extremely small in the Neutral condition ($r = .06, p = .61$).

Number-of-words-written was regressed on OTE, the dummy variables coding conditions, and the product terms capturing the interactions between OTE and condition. The coefficients for the product terms ($b = .86$ and $b = -1.10$) and result of the omnibus test of interaction were not significant ($ps > .12$). Evidence to suggest that the effect of condition on number-of-words-written varied with OTE was therefore not very strong.

Conflict of interest statement

The authors report no conflicts of interest.

Data availability statement

Data may be obtained by contacting the corresponding author by email.

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