Change we can believe in: A randomised controlled trial evaluation of a vitality training employing behaviour-change techniques

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Abstract

Background

This paper reports on the effects of a nine-week vitality training that employed behaviour-change techniques and was evaluated using a randomised controlled trial (RCT) in three large companies based in the Netherlands.

Method.

A total of 84 adult employees from three participating organisations in The Netherlands were enrolled in the study. A parallel group RCT design was used and participants were assigned using individual random assignment to either an intervention (n = 38) or a wait-list control group (n = 46). The intervention consisted of a nine-week vitality training employing the behaviour-change techniques of self-persuasion, implementation intentions and self-efficacy, which was delivered in-house over five fortnightly two-hour sessions. Primary outcomes (reported energy and stress) and secondary outcomes (reported daily life satisfaction and work capacity) were assessed prior to, immediately after, and three months following the intervention.

Results.

A doubly MANOVA revealed a significant interaction effect between treatment group and time period for the combination of reported energy, stress, daily life satisfaction, and work capacity. Subsequent univariate ANOVAs revealed significant interactions between treatment group and time period for reported energy, stress, and daily life satisfaction; however, not for reported work capacity. Improvements in outcomes were observed for both groups following their completion of the vitality training; however, not all improvements reached statistical significance. Reported self-efficacy regarding managing one's work-life balance was found to mediate the relationship between the effects of the intervention and reported energy; however, such an effect was not found for stress.

Conclusions.

An intervention drawing upon evidence-based behaviour-change techniques shows promise for improving indicators associated with burnout; although, it is recommended that in future research a larger-scale evaluation be conducted over a longer time period with an active control group to establish effectiveness.

This research was retrospectively registered as a trial (UTN: U1111-1282-1116) on the Australian and New Zealand Clinical Trials Registry (ANZCTR) (Trial registration number: ACTRN12622001268730, registration date: 26/09/2022).
Background

Vitality has important implications for individuals’ personal lives as well as for their working lives and is positively related to one’s physical and mental health (1), wellbeing, and life satisfaction (as per Guerin’s model, see (2)). At work, vitality is related to thriving (3), work engagement (see the Job Demands-Resources Model, (4)), and reduced burnout levels (e.g., (5, 6)). All of these constructs can be related to work outcomes, including performance (e.g., see (7, 8)) and turnover intentions (e.g., see (9)). Therefore, improving employee vitality not only has implications for individuals, but also for the organisations for which they work. If individuals can manage to restore their vitality (see (10)), the phenomenon may be a suitable area of focus for employee organisational interventions.

Defining And Measuring Vitality

The scientific study of vitality is fairly recent (i.e., emerging in the early 1990s; e.g., (11)). While the majority of studies consider energy to be at the core of vitality, definitions of the concept and their usage have not been applied consistently in the literature. Vitality is often used interchangeably with terms such as vigour and energy and described as either a feeling, state, or an experience (10). In a recent scoping review of the vitality-related research domain (10) – which reviewed 88 studies that were conducted between 1991 and 2017 – vitality was conceptualised as having the following fundamental characteristics: i) it is subjective in nature; ii) it is a positive experience; iii) it fluctuates and can be restored; iv) it can be managed or harnessed by an individual; and v) it is simultaneously comprised of physiological and psychological energy (10). Although acknowledging that the term ‘vitality’ has been used broadly in the scholarly literature, Lavrusheva (10) provided the following definition:

“...an individual feeling of inner energy influenced by both physiological and psychological factors, which a person currently experiences.” (p. 6).

Given that vitality is a subjective experience, an individual’s vitality is assessed using self-report measures. Much like vitality has been conceptualised in various ways, self-report measures of vitality are somewhat varied within and across disciplines (see (10)). The more common measures of vitality include the Subjective Vitality Scale (SVS; (1)), the vitality subscale of the RAND 36-Item Health Survey (SF–36; see (12)), and – in the context of workplace engagement – the vigour subscale of the Utrecht Work Engagement Scale (UWES; (13)). What is common across the diverse measures that are available is the measurement of reported energy (e.g., from the SVS “I don’t feel very energetic.”, from the SF–36 “Did you have a lot of energy?”, and from the vigour subscale of the UWES “At my work, I feel bursting with energy.”). Interestingly, although vitality appears to be characterised as having physiological and psychological aspects, many measures of vitality appear to capture experiences of energy globally, rather than specifically asking individuals about their experiences of physical and mental energy independently and directly.
Factors That Influence Vitality

The scoping review by Lavrusheva (10) revealed three broad categories of factors as antecedents for vitality, namely physiological, psychological, and environmental factors. The current paper takes a behaviour-change approach. Therefore, only components of those factors that may be amenable to change will be discussed here (cf. internal circumstances that are more difficult to be changed, such as personality traits, see (1, 14)). In the case of physiological antecedents, components such as developing healthy lifestyle habits (e.g., increased sleep, exercise, fruit, and vegetable intake) have been associated with increased vitality (e.g., see (15–17)). Psychological components that have been associated with increased vitality include self-regulation, working from one's own goals, and mindfulness (e.g., see (18, 19)). Finally, environmental components associated with increased vitality include work context (e.g., meaningful work and learning something new) and leisure activities (activities in the natural environment and during weekends) (e.g., see (20, 21)).

Broadly speaking, however, work situations may deplete or replenish an individual's vitality. As such, in helping individuals to manage their own vitality, training can focus on building individuals' capabilities to recognise and manage situations that deplete and replenish their energy (e.g., (22)). For example, individuals may be able to reconstruct aspects of their work situation to reduce opportunities for energy depletion or to enhance opportunities for energy restoration; alternatively, they may be able to manage how they respond to demanding situations. Interestingly, however, evidence from the work-life balance literature suggests that there may also be positive spill-over effects, where gains in work life spill over into the non-work life and vice versa (e.g., see (23)). Generalised to the domain of vitality, it may not be necessary for individuals to focus exclusively on managing situations in the workplace to experience benefits in their working life. Specifically, we argue that managing vitality in one's private life may also have positive spill-over effects on one's vitality in the workplace. In view of this, in this contribution, we investigate the effects of a vitality training employing behaviour-change techniques that takes a whole-life perspective (24) and that particularly considers the intersection of work and non-work roles (25).

Previous Interventions: Their Effects And Limitations

Low levels of vitality are associated with burnout symptoms, in particular with emotional exhaustion (26). It is not surprising, therefore, that earlier work in this field predominantly started from a burnout prevention point of view (e.g., (27)). A meta-analysis on the effectiveness of burnout interventions for mental health providers (28) examined 27 studies conducted between 1982–2014. Most of these studies used the Maslach Burnout Inventory (MBI) comprising emotional exhaustion, depersonalisation/cynicism, and reduced accomplishment/efficacy (29). Intervention lengths (i.e., 3 hours to 314 hours) and durations (i.e., 1 day to 18 months) varied; however, intervention intensity did not significantly moderate the intervention effects. Most studies employed organisation-directed interventions (n = 19) and most were training- or education-focussed (n = 12). While training and education-focused interventions were reported to have a greater effect than other intervention approaches
(e.g., psychosocial intervention training, starting a co-worker support group, and so on) on reducing overall burnout, this effect was not found when considering the specific dimension of emotional exhaustion. Burnout interventions, examined across intervention types falling within the three categories of organisation-directed, person-directed and a combined approach, were reported to have a significant, small, positive effect on emotional exhaustion \( (k = 13, g = .21, 95\% \text{ CI} = .04, .39) \); while person-directed interventions had stronger effects on reducing emotional exhaustion \( (k = 6, g = .38, 95\% \text{ CI} = .22, .53) \). The decrease in emotional exhaustion among mental health providers following intervention (reported in (28)) is consistent with the outcomes from another meta-analysis on the effectiveness of burnout interventions across a broad range of occupations, which included interventions based on Cognitive Behaviour Therapy (CBT), meditation and relaxation, and the development of interpersonal or work-related skills (see (30)).

A systematic review of job crafting interventions (31) across eight studies revealed that these interventions significantly increased different job crafting behaviours (i.e., behaviours that focus primarily on improving one's individual situation at work; ibid.) and wellbeing outcomes. Most relevant for the current study, however, was that there were some inconsistent findings surrounding the effects of job crafting interventions on work engagement (measured using the shorter UWES-9; (32)): Job crafting interventions that focussed on gaining job and/or personal resources and cognitions (e.g., increased meaning) enhanced work engagement, while those that focussed on reducing hindering job demands did not. On the other hand, job crafting interventions that focused on reducing hindering job demands were reported to have a positive effect on health outcomes. Overall, this suggests that the types of crafting behaviours that are the focus of an intervention should be tailored to the individual's needs (e.g., focus on gaining resources for motivational needs or focus on reducing job demands where there is a need to maintain health).

A meta-analysis of work engagement interventions across 20 studies (33) revealed a significant, yet small, positive overall effect of work engagement interventions on work engagement \( (k = 14, g = .29, 95\% \text{ CI} = 0.12–0.46) \). Across the 20 studies included in the meta-analysis, interventions fell into four main categories: (1) personal resource building; (2) job resource building; (3) leadership training; or (4) health promotion. Moreover, almost all of the studies employed the UWES-9 (32) to measure work engagement. Importantly, a significant positive effect was found for the work engagement component of vigour \( (k = 11, g = .95, 95\% \text{ CI} = 0.49–1.41) \). Intervention type did not appear to be a significant moderator in these empirical studies. Although some interventions employed goal setting and cognitive behavioural therapy as a training method, none employed a behaviour-change approach.

Across the aforementioned studies, there has been a call for controlled evaluations (e.g., using Randomised Controlled Trials (RCTs)) and to include follow-up measures to examine the effects over a time (e.g., 1–6 months after intervention completion, see (28, 30)). Particularly in the burnout literature, experts have called for a broader range of interventions to be developed, implemented and evaluated (28), and for the development of interventions that can be tailored to individual participants (30) that address
both individual and organisational needs (28). Doing justice to a whole-life perspective (24) is important in the light of protecting and further enhancing one’s career sustainability across the life-span (34, 35).

A related limitation of previous intervention evaluation approaches in the scholarly literature is that they often apply a ‘one-size-fits-all’ approach by delivering the same intervention to every participant, while each participant’s needs may be quite different. Although a ‘one-size-fits-all’ approach may be desirable in terms of the internal validity of an evaluation, its effects may be diminished if they are not carefully aligned to the needs of the participants. Therefore, an alignment between a participant’s needs and the intervention’s focus may be important. This has been alluded to by the findings of Dreison et al. (28), where person- and organisation-directed intervention approaches were reported to have differential effects on specific dimensions of burnout; individual-directed interventions were more effective than organisation-directed interventions on reducing emotional exhaustion. To this end, an intervention that applies an evidence-based method, while allowing participants to target their individual needs in using these methods, may be a valuable approach.

To the best of our knowledge, no previous interventions have employed behaviour-change techniques that would enable such an approach. Therefore, this contribution comprises an RCT study in three large companies based in the Netherlands and aims to help close the gap in the scholarly literature by evaluating a vitality training that employs behaviour-change techniques on reported energy (including physical and mental energy) and subjective experiences of stress, daily life satisfaction, and work capacity. The current empirical evaluation contributes to the literature in this field in the following key ways. First, we use a training method comprised of evidence-based behaviour-change techniques (see (36)). Second, we use a training method that allows individuals to tailor the focus of the training to their individual needs (see (37)). Third, we examine the effects of the training three months after its implementation. Fourth, we explore whether reported self-efficacy is a mechanism by which the training influences reported energy (cf. (38)).

The Current Study And Hypotheses

Given that vitality fluctuates and can be managed by individuals (see (10)), a training that utilises behaviour-change techniques may allow individuals to self-manage situations in their work or non-work lives to influence their vitality. In many ways, the approach of the vitality training that was employed in this study could be considered analogous to interventions targeting ‘job crafting’ behaviours (see (31, 39, 40)), where individuals make tangible behavioural adjustments to their work tasks or relationships, and/or employ cognitive crafting (41) to improve work engagement. However, one main difference between the approach of the intervention employed in the current study and previous job crafting interventions, aside from the different areas of focus, was that employees could tailor the focus of the vitality training to their specific needs—whether their vitality needs fell in the area of work or in their non-work life. That is, participants were not required to focus all of their goals set during the training directly on their work situation. For example, to increase vitality, personal goals could be developed like: i) “When I
am at home, I will not check my work email account” (reduce opportunities to deplete energy); or ii) “On the weekend, I will go for a hike with my friend” (increase opportunities to restore energy). Both of these boundary management tactics (42) could help to influence vitality, but would do so via different routes.

The current evaluation was designed to assess the effects of a vitality training employing behaviour-change techniques that were repeatedly used throughout the intervention, and whether any observed effects of the intervention were maintained three months following its implementation. To do so, participants were randomly assigned to either an intervention or a wait-list control group. As creating new behavioural habits is a process that requires repetition over time (43), the behaviour-change techniques were recurrently implemented during five two-hour group sessions, which were held fortnightly over a nine-week period. To estimate the immediate and longer-term effects of the intervention, reported energy, stress, daily life satisfaction, work capacity, and self-efficacy to manage one’s work-life balance were assessed prior to, immediately after, and three months following the intervention. We hypothesised that the intervention would significantly improve the aforementioned outcome measures as follows:

A significant interaction effect will be observed between treatment group and measurement time period for the combination of reported energy, stress, daily life satisfaction, and work capacity (Hypothesis 1). The intervention will have a significant effect on our primary outcome measures of reported energy (Hypothesis 2a) and stress (Hypothesis 2b), which will be demonstrated by i) a significant increase in reported energy and ii) a significant decrease in reported stress for the intervention group from Time Point 0 to Time Point 1 and for the control group from Time Point 1 to Time Point 2. In addition, the intervention will have a significant effect on our secondary outcome measures of daily life satisfaction (Hypothesis 3a) and work capacity (Hypothesis 3b). This will be demonstrated by significant increases in reported i) daily life satisfaction and ii) work capacity of the intervention group from Time Point 0 to Time Point 1 and for the control group from Time Point 1 to Time Point 2.

Furthermore, we explored whether self-efficacy to manage one’s work-life balance mediated the effects of the intervention on our primary outcome measures of energy and stress. The conceptual model of the proposed mediation is displayed in Fig. 1. Finally, we explored the acceptability of the intervention by examining participants’ subjective experiences of the vitality training method and its effects.

Methods

Participants

Participants were employees from three large organisations based in the Netherlands, who volunteered to take part in an intervention advertised as a Vitality Training. The sample size was determined on a pragmatic basis, including employees across participating organisations who elected to complete the training and participate in the study. A total of 84 employees (52 females, 32 males), with a mean age of 47.39 years (age range 29 to 62 years) enrolled and participated in the study. The types of organisations that participants worked for included research (n = 21), commercial (n = 43), and not-for-profit (n = 20).
The educational training of the participants was largely above higher vocational level. The average number of years worked in the organisation, i.e., tenure, was 13.36 years (SD = 9.84).

Design

A parallel group RCT design was used, with two phases, and with individual random assignment by the trainer to one of the two groups—an intervention group (n = 38) or a wait-list control group (n = 46). A flowchart of the study design is presented in Figure 2. The intervention group commenced the vitality training during Phase 1 and the control group was put on a waiting list for the training during this time. During Phase 2, the control group completed the vitality training and the intervention group was on a maintenance phase. The outcome measures were assessed at three time points during the trial (T₀–T₂ in Figure 2), each with a two-week data collection period, allowing changes in these measures to be assessed within and between the groups before and after the intervention, as well as at a three-months’ follow up for the intervention group. All measures were assessed in Dutch and were completed anonymously using Qualtrics.[1] The study was conducted in The Netherlands in full compliance with the applicable rules of the institutional review board (Ethics Committee Faculty of Social Sciences, Radboud University, the Netherlands) and informed consent was obtained from all participants in the form of implied consent. All ethical codes as maintained in the NIP (the Dutch Association of Psychologists), the American Psychological Association, and the British Psychological Society were followed.

Intervention: Vitality Training Employing Behaviour-change Techniques

The training was designed to include scientifically-tested behaviour-change techniques that allowed participants to identify their own areas of concern, to set a limited number of personally relevant and meaningful goals, and to develop personalised strategies for change. In terms of ease of implementation and to promote habit formation (i.e., requiring repetition over time, see (43)), the intervention was comprised of subsequent short sessions, whereby participants could practice and evaluate their behaviour-change process over time. The overall aim of the intervention was to increase reported levels of energy and to reduce reported levels of stress as proxies for burnout symptoms.

Techniques central to the training method. The vitality training employed a specially designed ‘method’, which required that participants worked through assignments employing evidence-based behaviour-change techniques, including self-persuasion, implementation intentions, and self-efficacy techniques (44). These techniques were selected to: i) increase commitment to the self-defined goals (self-persuasion); ii) increase the chance that these goals will be put into action (implementation intentions); and iii) increase the confidence participants have in themselves to execute these actions (self-efficacy). Each of these techniques is described in more detail below.

Self-persuasion. This technique requires that individuals provide their own reason for working on a specific goal or for changing their behaviour. Self-persuasion thus draws on individuals’ personal
motivations and has been shown to have greater effects on changing individuals’ behaviour than external forms of persuasion (45). For example, having people generate their own reasons for why they should not smoke led to less smoking directly following the experiment compared to providing individuals with high quality arguments that were generated by others (46). The effects of self-persuasion are thought to occur due to higher personal relevance and involvement in the behaviour-change process and less resistance towards the message source (e.g., see (45) for a review). Moreover, it has been reported that producing one to two self-generated arguments may have greater persuasive outcomes than ten (externally) provided arguments, even if the provided arguments are rated as being of better quality (47). This effect, however, only held when the number of self-generated arguments were low. That is, the effects of self-persuasion diminished if individuals generated many arguments for why they should or should not perform a particular response. Therefore, in the current intervention, participants had to write down one or two reasons why they should work on particular areas or perform particular actions they had defined earlier in the training.

Implementation intentions. After commitment to the self-set goals using self-persuasion, the next step was to implement these goals using concrete action plans, that is, implementation intentions (48). In line with the Theory of Planned Behaviour (48, 49), concrete action plans generate stronger intentions that are more likely to translate into observable changes in behaviour (cf. the intention-behaviour gap; (50)). Research into the intention-behaviour relationship and goal setting suggests that the more specific our goals, the more effective they are (i.e., larger and more sustainable behavioural changes). For instance, asking people to plan where, when, and how they will make an appointment increased cervical cancer screening (51). Similarly, reminding people of their higher-order (overarching) goal via implementation intentions has been shown to enhance their self-control in tempting situations for dieting behaviour (52). Further, a meta-analysis into the effects of implementation intentions revealed this technique to have a medium to large effect on goal achievement (53).

In the intervention applied in the current study, participants identified and wrote down how they would respond in a particular situation in line with their personal goals. Creating an ‘If-Then’ plan for action meant that participants’ responses in a given situation were already intended or planned and that a particular situation at work and/or at home served as a cue for the target response (i.e., less needed to be decided ‘on-the-spot’ or in the situation itself) (as per (51)).

Self-efficacy. Given that reduced self-efficacy may be an antecedent for burnout (54, 55) and that enhanced self-efficacy is associated with improved performance (e.g., (56, 57)), fostering participants’ self-efficacy was considered a crucial final step for all goal-setting assignments during the vitality training. At the end of all goal-setting assignments, participants were required to assess how confident they felt about their ability to achieve their developed goal or plan (using a scale of 1–10, from very low to very high). If participants indicated low self-efficacy for a specific goal or plan, they were asked to reflect on which aspect(s) were less achievable and to use insights from their reflection to formulate a goal they felt more capable of achieving. Thus, this self-assessment served two main purposes: i) to help ensure that participants developed personal goals and plans that were realistic and achievable (and
therefore more likely to be acted on) (58), and ii) to have participants evaluate their choices and goals at regular intervals during the intervention (i.e., increased self-monitoring). In so doing, participants could realise that they do have the capacity to change aspects of their work-life situation, and, in the context of this intervention, thus have some control over their energy levels (e.g., (59)).

**Training sessions and method.** The intervention consisted of five two-hour group sessions that were performed in-house, on the organisations’ premises, which were held fortnightly over a nine-week period. The sessions included the following topics: 1. Personal energy balance analysis; 2. Physical and mental energy; 3. Working from qualities, values, and goals; 4. Personal vitality strategy; and 5. Evaluation and maintenance. During the personal balance analysis, participants were introduced to different types of energy, and examined the activities in their daily life and the impact of these activities on their energy levels. During the session on physical and mental energy, participants were introduced to their mind-body interaction and examined the signals they received from their bodies that might indicate mental and physical fatigue. The third session introduced participants to the idea of ‘flow’ (see (60, 61)) and the benefits of aligning their daily lives with their qualities, values, and future goals. As such, participants examined their qualities, values, and goals and analysed the fit between these and the activities in their daily life. In the fourth session, participants analysed the various resistances or personal barriers that interfered with achieving their personal goals. In the final session, participants reviewed what they had learned, achieved, and what they would need to remember to maintain the effects of the training and to continue improving their energy balance. Within each of the training sessions, the intervention method consisted of an initial evaluation of the previous session using a gain frame (59), discovering relevant values and goals drawing upon the technique of self-persuasion (as per (46, 47)), developing personalised plans for change using implementation intentions (as per (51)), and ended with participants rating and reviewing their confidence in their ability to achieve their goals set during the session (self-efficacy, as described earlier in the method; also see the assessment of plan execution self-efficacy described in (62)). Where confidence was self-identified as low to moderate (versus moderate to high), participants were encouraged to revise their implementation intention, either by making the 'If' (situation) or the 'Then' (response) components less challenging or by aligning the goal more closely with the value(s) they identified in the self-persuasion exercise.

**Trainer**

The intervention was delivered by the (independent) developer of the training, who holds a PhD in clinical psychology and works as a researcher, university lecturer, and vitality trainer. Adherence to the intervention method was controlled for, across sessions and participant groups, using a checklist, which was reviewed following each session.

**Measures**
The Vitality Training Evaluation Scale (VTES) was developed for this study and contained 20 items that measured participants’ subjective experiences of energy, stress, daily life satisfaction, and work capacity, as well as their reported self-efficacy with respect to managing their work-life balance. The primary variables of interest were energy and stress, while secondary variables of interest were daily life satisfaction and work capacity. Self-efficacy with regard to managing one's work-life balance was included as a possible process measure (i.e., a possible mediator for the effects of the vitality training). Participants responded to all of the VTES items using visual analogue scales ranging from 0 to 100 (never to always). The internal consistencies for each of the factors is described below. A matrix of the correlations between each of the factors at baseline is provided in Table 1.

Primary outcomes: energy and stress. Three VTES energy items established participants’ subjective energy levels, which assessed the extent to which participants reported feeling i) energetic, ii) physically fit, and iii) mentally fit. The factor ‘energy’ was a mean of these three items, and had good internal consistency (Cronbach’s alpha: 0.88) (as per (63)). The grand mean for energy was 57.09 (SD = 22.57), where higher scores reflect higher levels of reported energy.

Two items established the extent to which participants felt stressed and overloaded. Participants responded to these items using visual analogue scales ranging from 0 to 100 (never to always). The factor ‘stress’ was a mean of these two items and was found to have good internal consistency (Cronbach’s alpha: .87), the grand mean being 38.82 (SD = 3.63).

Secondary outcomes: daily life satisfaction and work capacity. Four items measured participants’ subjective daily life satisfaction, including the extent to which they reported being i) satisfied with their daily life, ii) paying attention to the activities in their daily life, as well as being iii) motivated towards and iv) inspired by the activities in their daily life. A sample item used to assess daily life satisfaction is: “To what extent do you feel motivated for the activities in your daily life?” The factor ‘daily life satisfaction’ was a mean of these four items, which had good internal consistency (Cronbach’s alpha: .915) (as per (63)). Although Cronbach's alpha would increase to .92 if the attention item was removed, the internal consistency of the factor containing all four items was considered sufficient to retain this item. Therefore, to maintain construct validity, we decided to keep all items. The grand mean for daily life satisfaction was 63.49 (SD = 18.22), where higher scores reflect higher reported daily life satisfaction.

As regards work capacity, six items ascertained the extent to which participants felt i) motivated, ii) productive, and iii) efficient at work, felt iv) inspired by their work, and the extent to which they felt capable of v) concentrating and vi) achieving their goals at work. A sample item used to assess work capacity is: “To what extent do you feel productive at work?” The factor ‘work capacity’ was a mean of these six items, which had good internal consistency (Cronbach’s alpha of .89) (as per (63)). The grand mean for the work capacity factor was 65.56 (SD = 16.86), where higher scores reflect higher reported work capacity.

Process measures: self-efficacy. Participants’ reported ability to manage their work-life balance was ascertained using five items: their perceived i) ability to change their work-life balance, ii) influence on
having a good work-life balance, iii) ability to make choices, and iv) set boundaries regarding their work-life balance, and the extent to which v) their goals regarding their work-life balance are achievable. A sample item used to assess self-efficacy is: “To what extent do you feel capable of setting boundaries with regard to your work-life balance?” Although reliable and valid measures of general self-efficacy already exist (e.g., (64)), we chose to develop and employ our own measure, which aligned more closely with the outcome of interest (i.e., self-efficacy regarding one's work-life balance). The factor ‘self-efficacy’ was the mean of the five aforementioned items and was found to have good internal consistency (Cronbach's alpha:.89) (63). The grand mean for self-efficacy was 67.96 (SD = 18.30), where higher scores reflect higher reported self-efficacy. The item referring to one's perceived influence on a good work-life balance had the greatest deviation from the factor mean (M = 77.35, SD = 20.87). Although Cronbach's alpha would increase to .91 if this item was deleted, we retained all five items in the factor as the reliability was deemed sufficient, and in order to protect construct validity.

Table 1. Correlation matrix showing bivariate correlations between the Vitality Training Evaluation Scale (VTES) factors at baseline.

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<td>.69***</td>
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<td>2. Stress</td>
<td>1</td>
<td>-.34**</td>
<td>-.38**</td>
<td>-.25*</td>
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<tr>
<td>3. Daily life satisfaction</td>
<td>1</td>
<td>.54***</td>
<td>.26*</td>
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<td>4. Work capacity</td>
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<td>5. Self-efficacy</td>
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* Significant at the .05 level.

** Significant at the .01 level.

*** Significant at the .001 level.

Participant evaluations of the intervention. The perceived effects and value of the vitality training were assessed at the completion of the intervention. Ten items measured the extent to which participants agreed that: i) the vitality training was helpful; ii) useful in their everyday life; iii) had an effect on them; and that iv) the training effects were lasting. Participants were also asked to rate the extent to which they agreed that they: v) reached their personal goals during the training; vi) that the training had an impact on their energy balance; and that vii) the training would be helpful for other employees in their organisation.
Moreover, they were also asked to rate the approach of the training, including the extent to which they agreed that: viii) the training method was of good quality; and ix) enjoyable; and that x) the atmosphere within the group was good. Responses were made using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), and a sample item is: “The training has had an effect on my energy balance.”

Data Cleaning, Screening, And Analysis Strategy

Participants were retained in the analysis to evaluate the intervention if they attended a minimum of three out of the five sessions (n = 65 after data cleaning). The retained participants attended a mean of 4.47 sessions, with over 50% of these participants attending all five sessions (52.8%). Of the retained participants, 52 completed all surveys and 51 had complete data for the variables of interest at all three time points (T₀–T₂) (n = 24 intervention group, n = 27 control group). The characteristics of the sample, post data cleaning, were as described in the participants’ section and are summarised for each treatment group in Table 2. Although the mean age and tenure were higher for the control group, these differences were not statistically significant. As a precaution, we also examined the correlations between age and tenure with each of the dependent variables at baseline (T₀): Significant relationships were not found across the larger part of the dependent variables[2], and so age and tenure were not included in our model when examining the effects of the training.

Before conducting the analyses, the data was screened for potential problems, and appeared to meet the assumptions for multivariate analysis of variance (MANOVA). Although no multivariate outliers were detected, one univariate outlier was detected for work capacity at Time Point 2 for a participant in the intervention group (z-score of -3.29). On visual inspection, the value did not appear to be an error, as the low mean for work capacity was consistent with the participant’s scores on the remaining variables, and so the value was retained. At baseline, one participant reported having taken a significant period of sick leave: We considered excluding this participant; however, the overall findings did not change whether the participant was included or excluded from the analysis, and so we decided to retain this participant to maximise statistical power. Although context appears important for the effects of organisational interventions (e.g., (65)), we did not stratify our analyses by the different organisations due to the small sample size.

Given that the VTES factors of energy, stress, daily life satisfaction and work capacity were significantly correlated at baseline (see Table 1), a doubly MANOVA examining the VTES factors was performed to assess changes across time (Time Points 0–2) within and between the treatment groups (control, intervention). Follow-up univariate analysis of variance (ANOVA) and simple effects tests were performed where appropriate. Given that the group sizes were approximately equal and the assumptions were met, we reported Wilks’s lambda, which may be more powerful (see (66)). SPSS 25.0 was used for all statistical analyses, and all significance tests were performed using two-tailed tests with alpha set at .05. Bonferroni adjustments were not applied for the subsequent ANOVA tests, as this was considered too
conservative (i.e., with four dependent variables). However, the simple effects tests applied a Bonferroni correction for multiple comparisons (as described in (67)).

Table 2. Participant demographic variables and reported work experience by treatment group.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control</th>
<th>Intervention</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>Age (years)</td>
<td>48.92 (9.04)</td>
<td>45.79 (8.18)</td>
<td>47.57 (8.76)</td>
</tr>
<tr>
<td>Industry</td>
<td>Research</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Commercial</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Semi-government</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Tenure (years)</td>
<td>14.99 (10.69)</td>
<td>10.93 (7.71)</td>
<td>13.24 (9.67)</td>
</tr>
<tr>
<td>Sessions attended (out of five)</td>
<td>4.41 (0.57)</td>
<td>4.54 (0.65)</td>
<td>4.47 (0.61)</td>
</tr>
</tbody>
</table>

[1] Note that as part of a larger project on workplace well-being, participants completed a number of additional measures regarding their work history, their current work environment, and broader measures of their well-being at each measurement time point. We have contained the measures reported in this study to those most directly related to assessing the effectiveness of the vitality training.

[2] In particular, age was positively related to daily life satisfaction \((r = .28, p = .026)\). Regarding tenure: A significant negative relationship was observed with stress \((r = -.30, p = .014)\) and a significant positive relationship was observed with work capacity \((r = .31, p = .013)\). All other correlations were non-significant.

**Results**

**Intervention effects**

The group means and standard deviations are provided in Table 3; the inter-correlations are presented in Table 4, with all correlations being in the expected directions. The doubly MANOVA assessing changes
Energy. An examination of the impact of the training on reported energy levels revealed a significant main effect for time point. Pairwise comparisons revealed that reported energy was significantly higher at Time Point 2 than at Time Point 1. However, the main effect can be better understood when examining the significant interaction effect between treatment group and time point, displayed in Fig. 3a. Pairwise comparisons revealed that the intervention group reported significantly lower levels of energy than the control group prior to the intervention (p = .036, 95% CI [-24.32, -0.83]); however, there was no significant difference between treatment groups immediately following the intervention (p = .510, 95% CI [-8.08, 16.07]) or at the three months’ follow-up (p = .190, 95% CI [-16.07, 3.28]). Pairwise comparisons examining the differences between time point for each group revealed that although the intervention group reported higher levels of energy following the intervention when compared to baseline, this improvement in reported energy did not reach statistical significance (p = .235, 95% CI [-3.18, 19.96]). For the control group, a significant improvement in reported energy levels was observed following exposure to the intervention (i.e., when comparing energy at Time Points 1 and 2), (p = .003, 95% CI [3.34, 20.18]). Thus, it appears that the significant main effect for time point is largely driven by the significant improvement in reported energy by the control group following training. No other differences were statistically significant.

Stress. The impact of the training on reported stress levels revealed a significant interaction between treatment group and time point (see Fig. 3b; all within and between-group effects are reported in Table 5). Pairwise comparisons revealed that the intervention group reported significantly higher levels of stress than the control group prior to the intervention (p = .032, 95% CI [1.39, 28.90]); however, the differences between treatment groups immediately following the intervention (p = .130, 95% CI [-24.46, 3.22]) and at follow-up (p = .857, 95% CI [-11.75, 14.08]) were not statistically significant. Pairwise comparisons between time points for each of the treatment groups revealed that there was a significant improvement in reported stress levels immediately following the training for the intervention group (i.e., from Time Point 0 to Time Point 1) (p = .017, 95% CI [-30.64, -2.32]). Although participants in the control group reported lower levels of stress following the training, this improvement in reported stress levels was not statistically significant (p > .99, 95% CI [-17.24, 8.10]). No other differences were statistically significant.
Table 3. Means and standard deviations of outcome variables for each treatment group at each time point.

<table>
<thead>
<tr>
<th></th>
<th>Baseline (T0)</th>
<th>Post-training (T1)</th>
<th>Follow-up (T2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>n = 27</td>
<td>n = 24</td>
<td>n = 27</td>
</tr>
<tr>
<td>Energy</td>
<td>62.01 (18.92)</td>
<td>49.72 (23.52)</td>
<td>54.81 (23.30)</td>
</tr>
<tr>
<td>Stress</td>
<td>32.44 (24.11)</td>
<td>46.77 (25.25)</td>
<td>39.93 (27.35)</td>
</tr>
</tbody>
</table>

Secondary outcome variables

<table>
<thead>
<tr>
<th></th>
<th>Baseline (T0)</th>
<th>Post-training (T1)</th>
<th>Follow-up (T2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>n = 27</td>
<td>n = 24</td>
<td>n = 27</td>
</tr>
<tr>
<td>Daily life satisfaction</td>
<td>66.48 (16.36)</td>
<td>59.80 (19.56)</td>
<td>60.19 (21.62)</td>
</tr>
<tr>
<td>Work capacity</td>
<td>67.25 (15.97)</td>
<td>59.86 (16.66)</td>
<td>62.09 (16.32)</td>
</tr>
</tbody>
</table>

Table 4. Matrix of bivariate correlations between treatment group and outcome variables at each time point.

<table>
<thead>
<tr>
<th></th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
<th>11.</th>
<th>12.</th>
<th>13.</th>
<th>14.</th>
<th>15.</th>
<th>16.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Treatment group&lt;sup&gt;*&lt;/sup&gt;</td>
<td>.01</td>
<td>0.21</td>
<td>.06</td>
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<td>.07</td>
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<td>.28</td>
<td>.01</td>
<td>.03</td>
<td>.03</td>
<td>.10</td>
<td>.01</td>
</tr>
<tr>
<td>2. Energy T0</td>
<td>1</td>
<td>-.35 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.69 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.54 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.22</td>
<td>.50 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.12</td>
<td>.47 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.46 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.23</td>
<td>.42 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.25</td>
<td>.32 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.26</td>
<td>-.02</td>
</tr>
<tr>
<td>3. Stress T0</td>
<td>1</td>
<td>-.34 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.38 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.25</td>
<td>-.30</td>
<td>.31</td>
<td>-.23</td>
<td>-.28 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.12</td>
<td>-.25</td>
<td>.34 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.06</td>
<td>-.16</td>
<td>-.07</td>
<td></td>
</tr>
<tr>
<td>4. Daily life satisfaction T0</td>
<td>1</td>
<td>.54 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.26 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.43 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.22</td>
<td>.47 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.34 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>.47 &lt;sup&gt;**&lt;/sup&gt;</td>
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<tr>
<td>5. Work capacity T0</td>
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<td>.34 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.41 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.11</td>
<td>.40 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.64 &lt;sup&gt;**&lt;/sup&gt;</td>
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<tr>
<td>6. Self-efficacy T0</td>
<td>1</td>
<td>.29</td>
<td>-.42 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.56 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>.62 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.68 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>.28 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.45 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>-.43 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.45 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.41 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.31</td>
<td>.31</td>
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<td>.23</td>
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<td>.49 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.48 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>.63 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.52 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>10. Work capacity T1</td>
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<td>.41 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>-.38 &lt;sup&gt;**&lt;/sup&gt;</td>
<td>.44 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>.77&lt;sup&gt;**&lt;/sup&gt;</td>
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<td>15. Work capacity T2</td>
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<td>.27 &lt;sup&gt;**&lt;/sup&gt;</td>
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<td>16. Self-efficacy T2</td>
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</tbody>
</table>

<sup>*</sup>A positive correlation with treatment group reflects a higher score on the outcome variable of interest for the intervention group.

<sup>**</sup>Significant at the .05 level.

<sup>**</sup>Significant at the .01 level.
Table 5  
Between- and within-subject effects for univariate ANOVAs examining the effect of the vitality training.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome variables</td>
<td>Treatment group $F(1, 50) = 1.25, \ p = .269, \ \eta_p^2 = .024$</td>
</tr>
<tr>
<td></td>
<td>Time point $F(2, 100) = 3.47, \ p = .035, \ \eta_p^2 = .065$</td>
</tr>
<tr>
<td></td>
<td>Treatment group x time point $F(2, 100) = 4.16, \ p = .018, \ \eta_p^2 = .077$</td>
</tr>
<tr>
<td></td>
<td>Treatment group $F(1, 50) = .14, \ p = .712, \ \eta_p^2 = .003$</td>
</tr>
<tr>
<td></td>
<td>Time point $F(2, 100) = .46, \ p = .633, \ \eta_p^2 = .009$</td>
</tr>
<tr>
<td></td>
<td>Treatment group x time point $F(2, 100) = 5.76, \ p = .004, \ \eta_p^2 = .103$</td>
</tr>
<tr>
<td>Daily life satisfaction</td>
<td>Treatment group $F(1, 49) = .19, \ p = .664, \ \eta_p^2 = .004$</td>
</tr>
<tr>
<td></td>
<td>Time point $F(2, 98) = 2.46, \ p = .091, \ \eta_p^2 = .048$</td>
</tr>
<tr>
<td></td>
<td>Treatment group x time point $F(2, 98) = 3.28, \ p = .042, \ \eta_p^2 = .063$</td>
</tr>
<tr>
<td>Work capacity</td>
<td>Treatment group $F(1, 50) = 1.16, \ p = .287, \ \eta_p^2 = .023$</td>
</tr>
<tr>
<td></td>
<td>Time point $F(2, 100) = 4.35, \ p = .015, \ \eta_p^2 = .080$</td>
</tr>
<tr>
<td></td>
<td>Treatment group x time point $F(2, 100) = 2.77, \ p = .067, \ \eta_p^2 = .052$</td>
</tr>
</tbody>
</table>

Daily life satisfaction. Examining the effect of the training on reported daily life satisfaction revealed no main effects; however, a significant treatment group by time point interaction emerged (as displayed in Fig. 4a). Although the differences between treatment groups at each time point during the trial were in the expected direction, pairwise comparisons revealed that these differences did not reach statistical significance. When examining the differences across time point for each of the treatment groups, the improvement in reported daily life satisfaction for the intervention group from pre- to post- training was not statistically significant ($p = .394, \ 95\% \ CI \ [-3.48, 14.79]$). However, the improvement in reported daily life satisfaction for the control group following training (i.e., from Time Point 1 to Time Point 2) was statistically significant ($p = .004, \ 95\% \ CI \ [2.52, 16.14]$). No other differences were statistically significant.

Work capacity. Examining the impact of the training on reported work capacity revealed no main effect for treatment group, but a main effect for time point was revealed. Pairwise comparisons revealed that work capacity significantly improved from Time Point 1 to Time Point 2 ($p = .018, \ 95\% \ CI \ [0.76, 10.15]$).
Although the interaction effect between treatment group and time point was in the predicted direction (displayed in Fig. 4b), the interaction effect did not reach statistical significance.

**Self-efficacy as a mechanism for intervention effects**

To explore whether reported self-efficacy mediated the effect of the vitality training on our primary outcome measures of energy and stress, a bootstrapping approach (68) was performed using the PROCESS macro in SPSS. The conducted bootstrapping technique involved repeatedly sampling (10 000 times) on the dataset to estimate the indirect effect, and using bias-corrected confidence intervals. The (bias-corrected) 95% CIs were then examined to see whether they contained zero (i.e., where a confidence interval does not contain zero, this indicates statistical significance).

We examined whether increases in self-efficacy regarding managing one's work-life balance mediated increases in reported energy levels in the training group (the conceptual model is displayed in Fig. 1). Specifically, we examined the extent to which increases in self-efficacy from baseline to post-intervention mediated the increase in energy observed in the intervention group. To model changes in energy, baseline scores were entered into the bootstrap analysis as a covariate, and post-intervention scores were entered as the dependent variable; similarly, to model changes in self-efficacy, baseline scores were entered as a covariate, and post-intervention scores were entered as a mediator. Treatment group (control, intervention) was entered as the independent variable. The indirect effect of treatment group on reported energy levels following the training through self-efficacy was significant (see Table 6).

A similar procedure was performed for reported stress levels, and the results of these analyses are displayed in Table 6. The indirect effect of treatment group on reported stress levels following training through self-efficacy was not statistically significant, suggesting that self-efficacy did not mediate the effects of the training on reported stress.
## Table 6
Bootstrap analyses for detecting the indirect effect of the vitality training on primary outcome variables.

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Mediator variable</th>
<th>Bootstrap estimate</th>
<th>BC 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Estimate</td>
<td>SE</td>
</tr>
<tr>
<td>Energy</td>
<td>Self-efficacy</td>
<td>3.49</td>
<td>2.38</td>
</tr>
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<td>$T_0- T_1$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress</td>
<td>Self-efficacy</td>
<td>-2.26</td>
<td>2.10</td>
</tr>
<tr>
<td>$T_0- T_1$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b BC = Bias-corrected confidence intervals (i.e., corrected for the median). Confidence intervals containing zero represent non-significant effects at the .05 level of significance; 10,000 bootstrap samples.

c Positive estimates for energy reflect that increases in energy are predicted for the intervention group.

d Negative estimates for stress reflect that reductions in stress are predicted for the intervention group.

### Participant Evaluations

A self-reported evaluation of the intervention by the participants (using a 5-point Likert scale) revealed that they believed that the vitality training was helpful ($M = 3.96$, $SD = 0.52$), useful in their everyday life ($M = 3.91$, $SD = 0.49$), had an effect on them ($M = 4.04$, $SD = 0.44$), and had lasting effects ($M = 3.45$, $SD = 0.61$). In particular, participants moderately agreed that they reached their personal goals made during the training ($M = 3.28$, $SD = 0.60$) and that the vitality training had an impact on their energy levels ($M = 3.55$, $SD = 0.64$). In terms of the approach of the training, participants reported that the method was of good quality ($M = 4.06$, $SD = 0.56$), and enjoyable ($M = 3.81$, $SD = 0.65$), and that the atmosphere within the group was good ($M = 4.38$, $SD = 0.56$). Finally, participants thought that the vitality training would be helpful for other employees in their organisation ($M = 3.92$, $SD = 0.62$).

### Discussion

The current research sought to empirically examine the effects of a nine-week intervention in the form of a vitality training employing behaviour-change techniques on reported levels of energy, stress, daily life satisfaction, and work capacity using an RCT. In addition, we sought to examine whether any immediate effects of the intervention were maintained three months later for those in the intervention group, and whether the effects of the intervention were replicated in the control group over this time period. Finally,
we were interested in exploring whether self-efficacy to manage one's work-life balance mediated the effects of the intervention on reported energy and stress, and explored the acceptability of the training as reported by participants.

**The Effects Of The Intervention**

A key finding of the RCT evaluation was the significant interaction effect between treatment group and measurement time point for the combination of reported energy, stress, daily life satisfaction, and work capacity, thereby supporting Hypothesis 1. Follow-up analyses revealed significant interaction effects between treatment group and measurement time point for reported energy, stress, and daily life satisfaction, but not for work capacity. Reported energy levels increased for both groups after they respectively completed the vitality training; however, only the observed increase in reported energy for the control group reached statistical significance, herewith providing partial support for Hypothesis 2a. Similarly, reported stress levels improved for both groups following completion of the training; however, only the reduction in reported stress levels for the intervention group reached statistical significance, thereby providing partial support for Hypothesis 2b. Partial support was found for Hypothesis 3a regarding the secondary outcome measure of daily life satisfaction: Reported daily life satisfaction increased for both groups after respectively completing the vitality training; however, only the increase for the control group reached statistical significance. Although the differences in reported work capacity within groups across time were in the predicted direction, the interaction did not reach statistical significance, and thus Hypothesis 3b was not supported by our data.

Taken together, the findings of the current evaluation suggest that a vitality training grounded in evidence-based behaviour-change techniques shows some promise as an approach for improving indicators associated with burnout, as measured at the completion of the vitality training. It is also important to note that significant decrements were not observed in the intervention group at three months following their completion of the training, suggesting that the effects of the training were sustained over this time period. This evidence is encouraging for the potential benefits of a vitality training employing the behaviour-change techniques of self-persuasion (see [45–47]), implementation intentions (see [48, 51, 52]), and self-efficacy to target indicators associated with burnout. Although preliminary, this evidence is particularly encouraging since the vitality training was a relatively short intervention and the participants did not score extremely high on reported symptomology prior to intervention; that is, greater changes or effects might have been observed immediately following training, had participants’ reported symptoms that were more severe prior to the intervention (cf. [30]). The implications of these findings are valuable from a workplace well-being and sustainable career ([34, 35]) perspective, given the reported incidence and prevalence of work-related stress and burnout and its association with increased mental and physical symptoms for individuals ([69, 70]) and increased absenteeism and commitment for organisations ([71]).

It is interesting that the improvements observed following training did not reach statistical significance for both groups across all of the variables. It is plausible that the lack of consistent effects observed
across treatment groups are attributable to insufficient statistical power, but could also be explained by the differences observed between these groups prior to intervention. For instance, at baseline, the overall pattern of scores across the measures suggested that participants in the intervention group had worse symptoms overall than participants in the control group (i.e., lower levels of energy, daily life satisfaction, and work capacity, and higher levels of stress), and the significant improvement observed for this group following intervention was for the outcome of stress. On the other hand, for the control group – whose overall pattern of scores across the measures was more favourable – significant improvements were observed for reported levels of energy and daily life satisfaction. It could be that baseline stress levels moderate the effects of the training, whereby the effect of the training on stress is stronger for those with higher baseline stress levels, while the effect on energy is stronger for those with lower baseline stress levels. Accordingly, it could be that participants prioritise and tailor the focus of the training to these baseline needs. The possible moderating effects of baseline energy and stress could be empirically tested, and it is recommended that subsequent evaluations also record and explore the role of a participant’s focus during the training on its effects.

In addition, the finding that training did not have a significant effect on participants’ reported work capacity could be explained by insufficient power; however, this could also be explained by the relatively short intervention and assessment periods. That is, it may take substantially longer to see significant improvements in the aspects of work capacity assessed – particularly for concentration, productivity, and effectiveness, which are indicators of work performance. That we obtained preliminary evidence for improvements to reported energy following training may mean that flow-on effects could be observed for work capacity over a longer time period, and this should be examined in a subsequent evaluation.

The Role Of Self-efficacy

Exploring the indirect effect of the intervention on reported energy and stress provided preliminary support for a mediating role of self-efficacy in the effects of the intervention on reported energy; however, this effect was not found for reported stress. That self-efficacy was found to mediate the relationship between the effects of the intervention and reported energy provides preliminary evidence for the value of interventions targeting self-efficacy regarding managing one’s work-life balance to increase energy levels. However, since self-efficacy was not directly manipulated and was measured at the same time point as energy in this study, it is recommended that future work in this area establishes the causal ordering of the effect – particularly as increasing evidence is emerging for reciprocal relationships involving self-efficacy (e.g., see (72, 73)).

That self-efficacy was not found to mediate the effect of the training on stress may be an artefact of the measurements used (e.g., if stress evokes greater affective evaluations, rather than cognitive evaluations), or it may be that the reported effects may be underestimated since other factors may influence stress. The explanation that we offer, however, is that the vitality training topics and activities did not focus on stress directly – rather, the focus was on adaptive responses that could increase energy
(i.e., topics included: energy balance analysis; physical and mental energy). Thus, while the vitality training may have a positive effect on stress, it is plausible that this does not occur via enhanced self-efficacy about managing one's work-life balance.

**Participants’ Evaluation Of The Intervention**

Participants evaluated the vitality training favourably, with the average ratings suggesting that they liked the training method and the atmosphere, and that they saw value in the training for themselves and other employees in their organisation. Importantly, on average, they agreed that the training had had a positive and lasting effect on them, and that their energy balance was improved. What is less clear from the quantitative ratings, is what specific improvements to the intervention participants would recommend in order to strengthen their experience and the perceived effectiveness of the training. Overall, however, the vitality training appears to be an acceptable intervention from the perspective of participants.

**Strengths And Limitations Of The Current Research**

The vitality training evaluated in the current research has many strengths, including its scientific basis, and its relatively short duration and ease of implementation. Importantly, the intervention may have moderate effects on reported energy, stress, and daily life satisfaction, with these effects maintained three months after the intervention. Regarding the methodology of the current research, the main strengths are in the design (using an RCT), and the congruence between the targets of the intervention and the outcome measures of interest. Previous meta-analyses of the effects of burnout interventions have acknowledged a lack of control conditions and random allocation of participants to treatment groups, herewith limiting the validity and reliability of the findings of such evaluations (cf. (30)). As such, the use of an RCT in the current research makes a significant contribution to the literature in this area. Similarly, experts in this field have called for more tailored interventions, which consider the diverse range of experiences and problems that individuals may experience when confronted with burnout symptoms. Drawing upon the behaviour-change techniques of self-persuasion (see (45–47)) and implementation intentions (see (48, 51, 52)) – where participants self-generated their reasons and strategies for change – ensured an evidence-based approach, while providing sufficient flexibility for participants to tailor the intervention to their personal work-life situation. This approach, combined with the recruitment of participants across three distinct organisations, likely increases the external validity of the findings with respect to other work-life situations. Thus, the current intervention makes a significant contribution by targeting behaviour in the form of establishing adaptive responses to the work-life situation – rather than targeting coping strategies, which have been criticised previously (cf. (74)) – and by allowing a more tailored approach to changing the precursors to burnout.

Despite the aforementioned strengths, there are also limitations to the current research that must be acknowledged. An apparent limitation is the relatively small number of participants who were recruited and retained, and who completed all measures throughout the study, which increases the chance of
failing to detect an effect of the training where there is one. In addition, the participants did not report high symptomology prior to the intervention. This has been noted elsewhere as a limitation of burnout intervention evaluations more broadly (cf. (30)), and in our case could have led to an under-assessment of the real effect of the vitality training.

Another aspect of the research that limits its internal validity is that participants developed and worked on different personal goals during the intervention. Although this was the objective of the current intervention (i.e., to allow individual tailoring), this makes it difficult to make any conclusions about the specific outcomes or target behaviours that contributed to the effectiveness of the intervention. Similarly, as several behaviour-change techniques were implemented in the vitality training, it is hard to isolate which specific technique(s) contributed to the observed effects of the intervention, lowering the internal validity of the current research and restricting the suggestions that can be made about which elements should be harnessed in future interventions. Finally, while a wait-list control group was employed in the current research, no alternative active control or intervention group was included, herewith limiting the internal validity of the study. This makes it difficult to establish whether just participating in any intervention was superior to being on a wait-list control group (e.g., see quantifications of the Hawthorne effect using placebo-controlled trials; (75)), rather than establishing that the behaviour-change elements – in particular – were effective. In addition, it would be useful to examine changes to the outcome measures at an even greater latency following the intervention: If it is the case that employees learn how to make changes over time, it is plausible that greater improvements to energy levels may be seen at a later stage. Another limitation of the current research is that observable behaviour was not measured. The reliance on self-reported measures only, instead of including observable behaviour, can be seen as a limitation that has been acknowledged previously (e.g., see a review of the intention-behaviour gap, (50)). On the other hand, as work-related stress tends to be conceptualised as an individual's experience of the work situation (e.g., see (76)), it could be argued that the omission of objective measures may not be hugely limiting in this case. However, future extensions of this work could include gathering objective data on the behaviour(s) that participants select to work on during the vitality training, as well as objective measures of productivity and absenteeism.

**Conclusions**

The present study extended previous investigations into interventions for vitality, by evaluating a vitality training that employed behaviour-change techniques using an RCT. The results of the current research provide preliminary evidence for the benefits of employing the behaviour-change techniques of self-persuasion, implementation intentions, and self-efficacy in a vitality training for reported energy, stress, and daily life satisfaction levels, without significant decrements to these indicators three months after the completion of training. However, the effects of the training on work capacity were less clear and may need to be assessed over longer time periods with a larger sample. The current evaluation identified self-efficacy to manage one's work-life balance as playing a possible mediating role in the effects of the intervention on reported energy; however, an indirect effect of the training through self-efficacy was not observed for changes to reported stress. Future extensions of this work should focus on examining the
relative role that each of the behaviour-change techniques and training elements play in producing these effects, and in testing the causal ordering of the role of self-efficacy. Such research could make significant contributions to developing much needed effective interventions to addressing symptoms associated with burnout.

**Abbreviations**

ANOVA
Analysis of variance.

BC
Bias corrected.

CI
Confidence interval.

CBT
Cognitive behaviour therapy.

MBI
Maslach Burnout Inventory.

MANOVA
Multivariate analysis of variance.

RCT
Randomised controlled trial.

SF–36
RAND 36-Item Health Survey.

SVS
Subjective Vitality Scale.

T₀
Time Point 0 (i.e., baseline data collection period).

T₁
Time Point 1 (i.e., post-intervention data collection period).

T₂
Time Point 2 (i.e., follow-up data collection period).

UWES
Utrecht Work Engagement Scale.

VTES
Vitality Training Evaluation Scale.

**Declarations**

Ethics approval and consent to participate
The study was conducted in The Netherlands in full compliance with the institutional review board (Ethics Committee Faculty of Social Sciences [ECSS], Radboud University, the Netherlands) and in accordance with the ethical codes as maintained in the NIP (the Dutch Association of Psychologists), the American Psychological Association and the British Psychological Society. Informed consent to participate in this study was obtained from all participants in the form of implied consent.

**Consent for publication**

Not applicable.

**Availability of data and materials**

The data that support the findings of this study are available from the corresponding author on reasonable request. Permission to use the measures and techniques listed for scientific purposes is granted by contacting the authors; however, use of these materials for commercial purposes is not permitted. Please contact the authors for specific guidance and to explore possibilities for collaboration.

**Competing interests**

In accordance with BioMed Central policy and our ethical obligations as researchers, we are reporting that the second author, Dr Mattheis L. Van Leeuwen, is a consultant (teaches the underlying theory) for a company that may be affected by the research reported in the enclosed paper. We have disclosed those interests fully to BioMed Central. The authors Dr Bernice R. C. Plant, Professor Pascale Peters and Professor Beatrice I. J. M. Van der Heijden have no competing interests to declare.

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**Authors’ contributions**

Dr Bernice R. C. Plant: Conceptualisation, Formal analysis, Data Curation, Writing – original draft preparation, Writing – review and editing, Visualisation. Dr Mattheis L. Van Leeuwen: Conceptualisation, Methodology, Investigation, Resources, Writing – review and editing, Project Administration. Professor Pascale Peters: Conceptualisation, Methodology, Investigation, Resources, Writing – review and editing, Project Administration. Professor Beatrice I. J. M. Van der Heijden: Conceptualisation, Methodology, Investigation, Resources, Writing – review and editing, Project Administration.

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Authors’ information

Not applicable.

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Figures

![Conceptual model of the vitality training designed to improve reported energy and stress levels, indicating the direct (path c’) and indirect pathways (paths a and b) for the impact of the intervention on primary outcome measures (energy and stress) after statistically controlling for reported levels of self-efficacy and the relevant primary outcome measure prior to the intervention.](image_url)

**Figure 1**

Conceptual model of the vitality training designed to improve reported energy and stress levels, indicating the direct (path c’) and indirect pathways (paths a and b) for the impact of the intervention on primary outcome measures (energy and stress) after statistically controlling for reported levels of self-efficacy and the relevant primary outcome measure prior to the intervention.
Figure 2

Overview of the design of the vitality training evaluation study.
Figure 3

3a and 3b. Mean reported energy (a) and stress (b) levels for the control (waiting list) and intervention (vitality training) groups at baseline (T_0), immediately following (T_1), and at three months’ following the intervention (T_2).

* Significant at the .05 level.
**Significant at the .01 level.

Figure 4

4a and 4b. Mean reported daily life satisfaction (a) and work capacity (b) for the control (waiting list) and intervention (vitality training) groups at baseline (T₀), immediately following (T₁), and at three months’ following the intervention (T₂).
** Significant at the .01 level.