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REVIEW ARTICLE

The foundations of mind-body medicine: Love, good relationships, and happiness modulate stress and promote health

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Abstract

Although stress is an everyday fact of life, it can lead to poor health outcomes, particularly when intense or prolonged. However, humans have unique cognitive abilities and thus may be able to combat stress by engaging critical psychological defence mechanisms. In this review, we discuss the field of mind-body medicine, which focuses on improving our understanding of the mechanisms underlying this response and developing interventions that might be used to limit the effects of chronic stress. We review the findings of past and current research in this field that has focused on the impact of psychological, emotional, and behavioural factors, including love, social connectedness, and happiness on human health and the amelioration of pain as well as other signs and symptoms of disease. While these studies have not yet led to confirmed, quantifiable conclusions, the overall weight of evidence suggests that happiness (defined as a personal sense of well-being) may be directly associated with improved health parameters and reductions in debilitating symptoms. Collectively, these findings suggest that interventions designed to promote stress mitigation, notably those that encourage social activity, may lead to significant improvements in human health.

KEYWORDS
medicine, mind-body interventions, motivation, neurobiology, positive psychology, resilience, reward, salutogenesis, social connections, stress

1 | INTRODUCTION

In this review, we discuss the foundations of mind-body medicine (MBM), specifically the contributions of love, good relationships, and happiness to mechanisms that combat stress and promote good health.

MBM has become widely implemented in general medical practice, particularly in the United States (US) (Dobos & Paul, 2019; Esch, 2020), and has taken on a particularly prominent place within the framework of behavioural medicine. MBM as a discipline combines numerous effective approaches that fall within the purview of individualised or personalised health care. Thus, MBM is conceptually and practically compatible with many current trends and disciplines in clinical medicine as well as psychological and behavioural therapy and basic research (Dobos & Paul, 2019; Esch, 2020). Among its many roles, the use of newly-devised MBM methods has expanded the field of general medicine, which until very recently focused primarily on

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somatic issues alone. Clinical practitioners now recognise and include behavioural and lifestyle-oriented aspects of health care, thereby strengthening personal health and well-being by addressing the need for self-care and self-healing skills (Esch, 2014, 2020; Esch & Stefano, 2022).

1.1 | Definitions

MBM is defined as a discipline that focuses on (i) interactions between the brain, the rest of the body, and those that link the mind with behaviour, and (ii) how emotional, mental, social, spiritual, experiential, and behavioural factors contribute directly to human health (Esch & Stefano, 2022; Komaroff, 2001). Furthermore, MBM techniques are identified as those in which (i) the mind is directed to have an impact on physical functioning and promote health, and (ii) each person's capacity for self-knowledge and self-care is thus enhanced (Esch & Stefano, 2022; Harrington, 2008).

MBM is based on the recognition of a central 'mind-body axis' that is, interactions between the brain and the rest of the body involving consciousness, cognition and behaviour (Esch, 2020; Esch et al., 2018). The central question addressed by MBM is whether and how factors associated with positive psychological and emotional states (e.g., those aligned with happiness, love, and social connectedness) and behavioural factors can influence health. Effective MBM techniques could then be identified as those that demonstrate significant support for appropriate self-regulatory behaviours.

1.2 | MBM and health

At this time, MBM is used predominantly to facilitate cognitive, behavioural, and psychological interventions, to promote primary prevention and general health, and to formulate treatments for lifestyle-related chronic diseases, notably those associated with stress, where stress is understood as a response to regular time constraints or reoccurring conflicts, as well as to major life events such as loss of income or death of a loved one (Esch, 2002, 2020). MBM techniques can be used to address many of the issues that present frequently in general medical practice (Laux et al., 2010), including musculoskeletal complaints (e.g., pain disorders and chronic inflammatory/rheumatic diseases), disorders of lipid metabolism associated with endocrine, metabolic, or nutrition-related issues (e.g., type 2 diabetes mellitus), hypertension, depressive and anxiety disorders, and gastrointestinal dysfunction (reviewed in Esch (2020)). MBM has also been used to support cancer therapy (Jeitler et al., 2017; Voiss et al., 2019) and addiction treatment (e.g., smoking cessation), as well as for the general strengthening of resilience and stress reduction (Esch, 2008).

Most MBM interventions are designed to support health-promoting attitudes and healthy behaviours in everyday life. These interventions typically focus on behaviours associated with positive social interactions, interpersonal support, love, and general happiness (Esch, 2022; Esch & Stefano, 2022). This approach is based on the concept of *salutogenesis*, which is a concept based on the assumption that there are specific and identifiable factors that support and promote health. Mediators that protect health and promote personal resistance (including those that aim to reduce stress) are thus known as *salutogenic factors* (Antonovsky, 1979, 1996).

In this manuscript, we will narratively review our current understanding of stress and its role in promoting both physiologic and pathophysiologic responses, notably those associated with acute and chronic disease. We will continue with an in-depth consideration of the concept of happiness and the numerous studies that attempted to define its contributions to positive health outcomes. We will conclude with a summary and a discussion of the future directions.

2 | PHYSIOLOGIC AND PATHOPHYSIOLOGIC RESPONSES TO STRESS

2.1 | Stress, allostasis, and motivation

Various strategies developed over the past 30 years were designed to reduce the negative impact of stress on human health, including cognitive-behavioural and relaxation methods, nutrition counselling, general health education, social support via network formation/strengthening, and various forms of exercise therapy (Esch & Stefano, 2022). These measures are also important components of MBM as discussed above (Dobos et al., 2006; Esch, 2008; Esch & Stefano, 2010; Komaroff, 2001).

Stress is part of everyday life. The underlying physiology, that is, stress response, is ensuring survival in challenging or potentially life-threatening situations. Hence, stress is not bad per se, and the stress response is vital for life of the individual and the species, essential for evolution, that is, biodiversity (Esch, 2002; Stefano, Benson, et al., 2001). The specific consequences of stress, however, are due to its effective dose and duration, that is, concrete impact (Stefano, Benson, et al., 2001)—with a 'too much of it' being true for many individuals over their life span (Rentscher et al., 2020). Thus, it will be critical to integrate stress reduction techniques into modern strategies of salutogenesis. The importance of the concept of stress and its impact on society, medical practice, and science has increased steadily in recent years. Interestingly, the spread of industrialisation and modern globalisation has converted 'stress' into an international phenomenon that has been exported worldwide (Esch, 2002; Stefano, Benson, et al., 2001).

In Folkman and Lazarus' transactional model of stress (Lazarus & Folkman, 1984), the importance of primary and secondary appraisal, and coping, that is, the individuals' assessment of their own resources and coping abilities to determine if they can effectively deal with a stressor, is discussed. This concept no longer exclusively defines stress nowadays, that is, the modern concept of stress, as it is possible, for example, to be 'stressed' without necessarily feeling it; that is, although less common, one can be physiologically stressed and not necessarily perceiving or appraising it. Yet the subjective perception of a lack of

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sufficient coping abilities and resources to deal with challenges itself can be a stressor: it contributes to the allostatic perturbation, that is, eliciting a biological stress response (Esch, 2002). Hence, the modern, more integrative concept of stress is based on the fundamental work of Hans Selye (1973) and related researchers following, such as Bruce McEwen or George Chrousos, amongst others (Chrousos, 2009; McEwen, 2013) In these studies, 'stress' is used as a generic term that summarises the impact of psychosocial and environmental factors, including psychological, social, biological, physical, and chemical variables that can influence physical and mental well-being (Esch, 2002; Jones et al., 2001; Stefano, Benson, et al., 2001). A distinction is made between stressors and stress reactions and responses. Stressors are factors and events that lead to stress reactions; stress reactions require physiological, behavioural, and/or psychological responses that will increase an organism's capacity to cope with a given situation and ensure its survival (Lazarus & Folkman, 1984). On a physiological level, successful adaptation is based on an effective stimulus-response along this axis that will typically include some degree of coordinated and appropriate autoregulation (Lazarus & Folkman, 1984). Nonetheless, in some situations, stress reactions can follow a pathophysiological course.

The modern concept of stress focuses on an understanding of biological equilibrium. Organisms ensure their survival by maintaining physiological equilibrium, or homoeostasis, in response to ongoing challenges with internal or external stimuli, that is, stressors. This harmony is frequently under attack and must be defended with appropriate adjustments and accommodations (Chrousos & Gold, 1992; Lazarus & Folkman, 1984). Thus, all successful life forms have developed effective mechanisms designed to cope with acute stress. The best known of these mechanisms is the protective physiological stress response known as 'fight-or-flight'. This response includes a variety of physiological changes and mechanisms that are activated when an organism is faced with a challenging situation that requires it to prepare to fight or flee (Stefano, Benson, et al., 2001).

The concept of stress has been expanded to include the term '*allostasis*' (Esch & Stefano, 2010; McEwen, 1998; Sterling et al., 1988). Allostasis, which can be defined literally as the capacity to 'maintain stability through change' describes the capacity to undergo continuous adaptation and change so that its physiological parameters will permit an organism to fit optimally and stably into its new (and constantly changing) environment. The terms 'allostatic load' and 'allostatic charge' refer to the collective stress that an organism experiences due to repetitive cycles and/or continuous activation of stress responses (Lazarus & Folkman, 1984; McEwen, 1998; Sterling et al., 1988). An organism must be able to accommodate a significant allostatic load to maintain its autonomy and self-organization as well as its survival within a dynamic equilibrium. Accordingly, the allostatic load increases (and illness may ensue) when an organism is confronted with overwhelming acute or chronic stress and/or when it loses the capacity to deactivate its stress responses (Esch, Stefano, & Fricchione, 2003; Esch, Stefano, Fricchione, & Benson, 2003; Esch et al., 2002b; Lazarus & Folkman, 1984; Stefano, Benson, et al., 2001).

Stress represents a motivating compulsion and an unforeseen stimulus or event that requires a flexible reaction. Sometimes, even thoughts surrounding a concrete psychosocial conflict can trigger stress reactions. While these reactions may include significant emotional components such as fear and excitement, they may also lead to specific physiological activation patterns. For example, activation of the stress response may lead to elevated norepinephrine levels in the central nervous system. This response may increase the likelihood of identifying a solution by facilitating the distinction between relevant and irrelevant information (Stefano, Benson, et al., 2001). These controllable stress reactions are typically short-lived and must be distinguished from uncontrollable reactions that may be triggered if the problem is not solved or if the stress becomes overwhelming and thus pathological. The inability to control stress levels may result in an excess of stress hormones; in this situation, the initial neuronal plasticity (i.e., flexibility) may be reduced significantly or even in some cases reversed (Stefano, Benson, et al., 2001), leading to pathological neurodegenerative changes (Esch & Stefano, 2010; Krantz et al., 1996; Stefano, Benson, et al., 2001).

If these overreactive states (hyperreactivity, hyperarousal) are not controlled and/or terminated, the entire system may deteriorate, leading to an ineffective (i.e., hypoactive) stress response (McEwen, 2013). Numerous critical functions, including flexibility, memory, and learning may cease in the event of uncontrolled stress, leading to the development of both mental and somatic illnesses (Esch & Stefano, 2010; Esch et al., 2002c; Lazarus & Folkman, 1984; Stefano, Benson, et al., 2001). While many of these conclusions are based on largely subjective observations, effective stress management techniques can help to convert uncontrollable into controllable stress. Likewise, subjective adaptation processes may be activated to facilitate the critical termination of hyperactive stress responses (Esch & Stefano, 2010).

The influence of stress on health and the development of diseases has been recognized for quite some time (Chrousos, 2009; Esch, 2022; Jones et al., 2001). The cardiovascular system is particularly susceptible to the negative sequelae of stress (Chrousos & Gold, 1992; Esch et al., 2002a; Krantz et al., 1996; Rosengren et al., 2004; Sheps et al., 2002; Stuart et al., 1987; Yusuf et al., 2004). For example, increased pro-inflammatory activity, previously identified as an independent pathophysiological risk factor with numerous undesirable consequences, is now recognized as directly associated with stress (Esch & Stefano, 2002). Stress can also significantly influence the course, and in some cases, the development of immunological, neurological, neurodegenerative, psychological, and psychiatric diseases, among others (Stefano, Benson, et al., 2001). This is discussed further in Section 3.1 below.

2.2 | Love and stress

Although 'love' remains difficult to define, nearly everyone can relate to a state of being or falling in love. Love can manifest in various forms and contexts, including romantic love between partners, love

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for family and friends, love for pets, and even love for activities, places, or objects. The Oxford English Dictionary defines human 'love' as "a feeling or disposition of deep affection or fondness for someone, typically arising from a recognition of attractive qualities, from natural affinity, or sympathy and manifesting itself in concern for the other's welfare and pleasure in his or her presence" (OED Online, 2023a). Similarly, 'true love', or 'romantic love', is defined as an intense feeling of romantic attachment based on an attraction felt by one person for another, including intense liking and concern for another person typically combined with sexual passion (OED Online, 2023a, 2023b). Romantic love is an emotion often associated with consensual sexual activity with the willing and even eager participation of the individuals involved (Esch & Stefano, 2005; Stefano & Esch, 2005). Love is undoubtedly a complex neurobiological phenomenon. Factors contributing to feelings of love include trust, belief, pleasure, and reward activities within the brain, specifically those associated with limbic processes. These processes involve oxytocin, vasopressin, dopamine, and serotonergic signalling. Endorphin and endogenous morphinergic mechanisms that are coupled to nitric oxide autoregulatory pathways also contribute to this process (Esch & Stefano, 2005; Stefano & Esch, 2005).

Activities necessary for survival and motivation, notably those governing beneficial (indeed, critical) biological behaviours such as eating and sexual activity, are by their nature designed to be highly rewarding and pleasurable (Esch, 2022; Michaelsen & Esch, 2021). Many common signalling pathways and beneficial neurobiological features connect these beneficial behaviours to the concept of love. Thus, the physiological aspects of maternal, romantic, or sexual love and attachment are linked with other healthy activities and neurobiological states (Esch & Stefano, 2005; Stefano & Esch, 2005). It is not surprising to find that love, pleasure, and lust have stress-reducing and health-promoting potential. Collectively, these feelings can promote healing and facilitate beneficial motivations and behaviours (Esch, 2022). Integrative Medicine/MBM might make additional use of these observations, for example, by generally promoting pleasurable human interactions and enabling those activities that involve positive mood and motivating states of mind.

However, love itself can sometimes be stressful (Marazziti & Canale, 2004; Marazziti & Cassano, 2003; Stefano & Esch, 2005). This phenomenon has also been observed in response to various practices that include an initial stress component (i.e., relaxation and placebo responses) (Mantione et al., 2007; Marazziti & Cassano, 2003; Stefano, Murga, et al., 2001; Stefano, Prevot, et al., 2001; Stefano et al., 2008). The initial activation of this stress component in response to what may be a new situation is significant and represents a protective mechanism. Under these conditions, activation of the stress response may be followed by the individual's assessment of whether a given situation is safe before relaxing, then eliciting actual relaxation (i.e., the relaxation response) (Stefano et al., 2008). In addition, activation of the stress response may help an individual to overcome neophobia, which is a necessary component of every new encounter (Esch & Stefano, 2005; Stefano et al., 2008). Thus, it appears that the mechanism for relaxation incorporates a stress component as does love, at least initially (Marazziti & Canale, 2004; Marazziti & Cassano, 2003). Hence, in general, stress may be a crucial component of love and love behaviours, as engaging in such activities —which is necessary for survival of the species—includes stress (i.e., eliciting the stress response), even at the expense of the individuals' lives. However, the neurotransmitters released in and following the act of love, for example, prolactin or oxytocin (finally, endogenous morphine), downregulate the stress response (Esch & Stefano, 2005; Marazziti & Canale, 2004; Marazziti & Cassano, 2003; Stefano & Esch, 2005).

As described thus far, stress is critical for survival and a coping strategy that has led to the development of stress-relief mechanisms and processes. Relaxation may be an important secondary component that is needed to restore homoeostasis, as elicitation of the physiological relaxation response would theoretically decrease allostatic load (note: a purely psychological or subjective relaxation/wellness exercise would probably not). Specific relief mechanisms are needed to terminate physiologic activation resulting from acute stress, as this can otherwise result in organ damage if not appropriately terminated (Stefano, Benson, et al., 2001). These mechanisms may have a calming influence in non-cognitive animals that maintain economical and time-efficient processes that promote rapid termination of the stress response. Nitric oxide release may play a critical role in limiting stress responses and terminating excess adrenergic signalling (Stefano, Murga, et al., 2001).

The emergence of 'love' was important for the development of species with cognition because it provided a mechanism to override emotions that control 'logical' behaviour. In the absence of this quality, time-consuming rational thought might dominate behaviour to the point of inactivity (Esch & Stefano, 2005; Stefano & Esch, 2005).

In summary, because love can combat the impact of stress under appropriate circumstances, we identify this biological construct as a healthy response. As an aside, other biochemical messenger substrates, for example, endocannabinoids, morphine, opioid peptides, and nitric oxide, can all lead to the down-regulation of activated stress responses and can thus restore homoeostasis (Stefano, Bilfinger, et al., 2000; Stefano, Goumon, Bilfinger et al., 2000; Stefano, Goumon, Casares, et al., 2000). While there are other concerns regarding these substances, their role in reducing stress-induced activation might be considered healthy.

2.3 | Social connections, stress, and health

Social connectedness refers to the extent to which individuals feel connected to and supported by others in their social networks, for example, family, friends, and the community at large. Social connectedness has been defined as the experience of belonging in social relationships or a network (Lee & Robbins, 1995). The health benefits of social connectedness are well-established, and include the following:

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- *Mental health*: Social connectedness is associated with improved mental health outcomes, including lower rates of depression, anxiety, and suicidal ideation. Social connectedness has also been linked to generally lower levels of stress and psychological distress (Cacioppo et al., 2015; Holt-Lunstad et al., 2015, 2017). Longitudinal studies focused on the elderly revealed that those who reported higher levels of social support had better mental health outcomes over time than those who reported lower levels (Seeman et al., 1995). Social support has also been identified as a protective factor against mental health disorders (Kawachi & Berkman, 2001).
- *Physical health*: Social connectedness has also been linked to superior physical health outcomes. For example, Case et al. (2005) studied adults with cardiovascular disease and found that those who reported greater social support exhibited reduced mortality rates over a period of 4 years. Results from another study revealed that social isolation was associated with a higher risk of mortality in both men and women (Holt-Lunstad et al., 2010). Similarly, Berkman and Glass (2000) reported that individuals who are socially connected are less likely to develop heart disease, hypertension, or diabetes.
- *Immune function*: Social connectedness may also have a substantial impact on immune system functioning and reduce systemic inflammation (Uchino, 2006). For example, Andersen et al. (1998) found that social support was associated with increased natural killer cell activity in breast cancer patients. Results from another study revealed that social isolation was associated with increased inflammation, which is a risk factor for a variety of chronic diseases (Slopen et al., 2015) and also led to increased adiposity. These authors suggested that a lack of appropriate social support in childhood may be associated with biologically-embedded disadvantages secondary to changes in an individual's epigenome (Loucks et al., 2016).
- *Cognitive function*: Social connectedness may also play a role in modulating cognitive function. The results of a study of older adults revealed that social isolation was associated with an increased risk of cognitive decline (Wilson et al., 2007). Another study reported that social engagement was associated with a reduced risk of developing Alzheimer's disease (Fratiglioni et al., 2000).
- *Ageing*: Social connectedness may be particularly important for older adults, as it may help to reduce the risk of cognitive decline and dementia (Holt-Lunstad et al., 2017; Malone et al., 2016; Vaillant et al., 2014). Additionally, social support can often provide older adults with a critical sense of purpose and meaning in life (Uchino, 2006; Wald et al., 2016).
- *Mortality*: Social connectedness has been identified as a strong predictor of mortality in general. Socially isolated individuals have a higher risk of mortality than those who are socially connected (Holt-Lunstad et al., 2015). Additionally, social support was found to reduce the risk of mortality in individuals with chronic diseases (Berkman & Glass, 2000).

Overall, the evidence suggests that social connectedness promotes health and well-being. This underscores the importance of building and maintaining social relationships throughout one's life. Healthy social relationships may be a critical feature of ongoing happiness. This will be discussed in depth in the section to follow.

3 | HAPPINESS AND HEALTH

We have reviewed the basic concepts underlying the practice of MBM and linked these strategies to the modern concept of stress. We have also discussed the relationships between stress, love, and social connectedness and the contributions of these factors to overall health and well-being. We now turn to the overarching concept of 'happiness'. In this section, we will combine the aforementioned topics into a comprehensive framework leading to positive health (MBM) interventions.

According to Esch (2022), happiness is not a cognitive construct, but an immediate positive emotional experience elicited by neurophysiological activation of the brain's reward system. With this in mind, we suggest that there are three specific types of motivation and happiness: (i) wanting, (ii) avoiding, and (iii) not-wanting. The dynamic changes underlying these different types of happiness range from the more youthful responses (anticipation, pleasure, and ecstasy) in category (i) followed by stress processing, escape, and relief in category (ii), which are accentuated in middle-age, to deep satisfaction, quiescence, and inner joy related to category (iii), which are particularly prominent among the elderly (Esch, 2022). This latter state of happiness is also described as altruistic or eudaimonic happiness (see below), feelings of deep affiliation and inner affection, which makes it almost synonymous to love, that is, 'platonic' love. (Note: The three types of happiness are also referred to as 'Types A-C' (Esch, 2022)).

Collectively, these findings highlight the relevance of the relationship between happiness and health and suggest that aiming to increase happiness, including positive psychology interventions, might be among the central pillars of MBM. In the sections to follow, we will provide a detailed overview of both current and past research on the relationship between happiness and health.

3.1 | The relationship between happiness and health

The earliest studies that examined the relationship between happiness, subjective well-being (SBW) and health were conducted during the middle of the 20th century. Without further defining or differentiating between happiness and SBW, the primary goal of these studies was to understand how positive emotions might be linked to physical health outcomes. Various indicators of physical health were explored, including mortality rates, cardiovascular disease, and immune function. Collectively, the results of these studies suggested

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that positive emotions were linked to better health outcomes across these specific domains (Amonoo et al., 2021; Howell et al., 2007; Kim, Hagan, et al., 2017; Krittanawong et al., 2022; Rozanski et al., 2019; Steptoe, 2019). However, early research in this area frequently analysed the relationship between health and supposed opposites of happiness, including stress (Esch, Benson, et al., 2002; Esch et al., 2002a, 2002b; Segerstrom & Miller, 2004), negative affect (Watson, 1988), and 'difficult' personality types (Blumenthal et al., 1978; M. Friedman & Rosenman, 1959; Williams et al., 1980), without uniform definitions of the relevant phenomena.

An early account of the relationship between happiness and health was presented in the 1950s by M. Friedman and Rosenman (1959) who performed a series of studies on individuals with 'Type A' personalities, which they defined as a pattern of competitive, driven, and impatient behaviours. Among their findings, they reported that individuals with 'Type A' personalities were more likely to develop coronary heart disease than those with more relaxed, easygoing personalities (M. Friedman & Rosenman, 1959). This finding was replicated in several subsequent studies (Blumenthal et al., 1978; Williams et al., 1980). Later work revealed that hostility was the main risk factor contributing to these observations (Carmelli & Swan, 1996; Carmody et al., 1989; Clark et al., 2001). Conversely, positive personality traits, for example, conscientiousness in childhood, optimism, extraversion, and agreeableness have all been linked to a decreased risk of mortality (H. S. Friedman et al., 1993; Hampson et al., 2006) and more rapid physical recovery from coronary bypass surgery (Scheier et al., 1989). However, it should be noted that cheerfulness was identified as a factor that increased mortality risk (H. S. Friedman et al., 1993), which may be due to an associated stronger tendency towards engaging in risky behaviour (Martin et al., 2002).

Laughter is another phenomenon that may also be closely related to happiness. In his 1978 book 'Anatomy of an Illness (as Perceived by the Patient)' (Cousins, 1978), author Norman Cousins describes his diagnosis of a painful and potentially fatal connective tissue disease and how he used laughter to help alleviate his symptoms. By engaging in activities that made him laugh, Cousins found that he was able to reduce his pain and discomfort. Although Cousins' experience was anecdotal, it generated a significant amount of interest among researchers and the general public. Based on these early accounts, laughter was subsequently found to be positively associated with a reduced risk of developing coronary or cardiovascular disease (Clark et al., 2001; Hayashi et al., 2016) as well as specific neuroimmune parameters (Bennett et al., 2003; Berk et al., 2001).

Before the 1990s, most research studies of this type did not consider happiness in any direct way but instead focused on correlations between affect and ambiguously-defined SWB with health measures. For example, Lubin et al. (1988) evaluated a national probability sample that included 1543 adults and reported a correlation between positive affect and self-rated health. Similarly, Watson (1988) reported a correlation that linked negative affect to physical complaints and perceived stress in a study of 80 psychology students; interestingly, no correlation was detected between positive affect and any of these health-related outcomes. Subsequent research has demonstrated repeatedly that positive and negative affect are independent parameters that correlate independently with specific health outcomes (Steptoe & Wardle, 2011).

In 1984, both Okun et al. (1984) and George & Landerman (1984) reported significant positive correlations between self-rated health and indicators of SWB. Interestingly, physician-provided health assessments exhibited weaker and less robust associations with SWB (George & Landerman, 1984). Furthermore, an analysis of findings reported in the World Database of Happiness revealed that correlations of happiness with self-rated health are somewhat stronger than the correlations between happiness and health ratings based on medical examinations (Veenhoven, 2008). These correlations vary between $r = +0.10$ and $+0.40$ and are largely independent of age, gender, socioeconomic status, and specific personality traits (Helliwell, 2003; Veenhoven, 2008). Additionally, the correlations tend to be higher among patients than among members of the public at large (Veenhoven, 2008).

Despite the methodological and conceptual limitations of early research on correlations between happiness and health, these studies provided the basis for subsequent research on this topic. Research on happiness and health performed at the turn of the century focused on the link between SWB indicators and physical health outcomes and included studies on causality and the potential mechanisms underlying the relationship. Most of these studies focused on SWB as a means to encompass several different phenomena related to happiness, positive affect, eudaimonia, and life satisfaction. No effort was made to differentiate between these phenomena although they exhibited different correlations with health outcomes (Howell et al., 2007; Steptoe, 2019).

3.2 | Subjective well-being

One prevalent hypothesis at the time this work was performed was that the relationship between SWB and physical health outcomes was bidirectional. In other words, greater SWB might result in better physical health and *vice versa*. However, as of 2008, only few studies had been conducted that explored the impact of early physical health on happiness in later years (Veenhoven, 2008). Three studies evaluated self-rated health outcomes from different groups of adults as part of a 12-year follow-up study on their impact on individual happiness. Of note, small or no correlations were detected between these parameters (Chiriboga, 1982; Hawkins & Booth, 2005; Palmore, 1982). Based on these findings, Veenhoven (2008) suggested a reverse causal relationship, meaning that happiness has a direct impact on health (but not *vice versa*).

Several recent reviews of this subject have provided a more comprehensive picture of this relationship. For example, Veenhoven (2008) reported that happiness did not appear to increase longevity in specific patient populations, for example, those with spinal cord injuries, but did seem to prolong life in healthy populations. According to Veenhoven (2008, p. 455), the estimated

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additional years were "… comparable to the effect of smoking or not" with effects manifested most profoundly over the long term. In a meta-analysis reported by Howell et al. (2007), SWB was associated with increased longevity ($r = 0.14$) and longer survival when afflicted with chronic illness ($r = 0.10$). Additionally, a meta-analysis that included 62 studies that enroled more than 1,250,000 participants from the general population revealed a pooled hazard ratio of 0.920 for those with higher SWB at baseline, compared to those with lower levels of well-being. This result indicates that SWB may be a protective force with respect to mortality of all causes (Martín-María et al., 2017). These findings are supported by the results of other studies conducted in several countries around the world with follow-up periods ranging from two to more than 20 years (Steptoe, 2019). While most studies assessed SWB on only a single occasion, individuals who reported a greater level of SWB on repeated measures over several years exhibited lower mortality rates than those who reported higher levels of SWB only once (Zaninotto et al., 2016). At this time, it is not clear whether SWB is associated with longevity only in healthy populations or also among patients with specific chronic illnesses (Diener & Chan, 2011; Pressman & Cohen, 2005; Steptoe, 2019).

Numerous longitudinal studies have examined the association between SWB and the development of disease over time. While the results of these studies consistently demonstrate that SWB predicts the onset of illness, the findings thus far have been more conclusive with respect to cardiovascular disease than other chronic illnesses (Esch, 2014). These findings suggest that maintaining a higher level of SWB when in good health may confer long-term benefits, albeit weaker when considering patients who are already experiencing disease (Diener & Chan, 2011). The extensive body of research that examined the longitudinal relationship between phenomena related to SWB and health and longevity and older age revealed that individuals with higher levels of SWB tend to enjoy better health and longer lifespans on average ($r = +0.18$) as previously described by Lyubomirsky et al. (2005). However, establishing causality remains challenging, as unmeasured states of health and resources may be among the underlying drivers of the relationship between SWB and health outcomes in later life, including mortality. Researchers have attempted to understand this relationship by analysing the mechanisms via which happiness might affect health outcomes. Recent reviews have summarised the most prominent mechanisms, which will be discussed in Section 3.3 to follow.

3.3 | Current research on happiness and health

In the years since the publication of the review by Lyubomirsky et al. (2005), numerous research studies have been performed that provide additional support for the positive association between happiness and mortality. However, several large studies did not confirm this relationship (Liu et al., 2016; Ortega et al., 2010). While the reasons for these inconsistencies remain unclear, there may be substantial problems associated with the measurement of happiness. To address this concern, Steptoe (2019) distinguished between three types of SWB, including (i) affective well-being, that is, positive feelings (Type A happiness) (Esch, 2022); (ii) eudaimonic well-being, that is, a sense of purpose (Type C happiness) (Esch, 2022), and evaluative well-being, that is, life satisfaction. Unfortunately, there are as yet no systematic overviews of the relationships between each type of SWB and individual health outcomes. Inconsistencies in SWB measurements may explain some of the differences in the published results. Publication bias may also be a problem; analyses that generate null results are less likely to be published. Confounding and reverse causation are also significant problems for those tasked with assessing the validity of this research area (Steptoe, 2019).

In recent years, numerous papers have been published that focus on potentially confounding factors associated with an individual's environment, for example, the role of social relationships, as described above. Most available evidence suggests that social connectedness serves as a potent protective factor against premature death (Case et al., 2005; Lee & Robbins, 1995), particularly those associated with cardiovascular pathology (Holt-Lunstad, 2021). Several plausible mechanisms have been identified to explain the impact of social connectedness on physical health outcomes; among these are psychological factors such as perceived stress and depression; behavioural factors, including sleep, physical activity, and smoking; and biological factors such as inflammation (Diener et al., 2018; Diener & Seligman, 2002; Kok et al., 2013). These pathways are interconnected and thus not entirely independent of one another. Nonetheless, several reviews outlined plausible biological mechanisms that explain how social connectedness may influence long-term health outcomes (Holt-Lunstad, 2021).

Current research has suggested numerous ways in which SWB can promote better health outcomes, including those associated with both behavioural and biological processes. Results from empirical studies of behavioural processes suggested that individuals with higher levels of SWB tend to engage in healthier behaviours, such as regular exercise (with correlation coefficients ranging from $r = +0.12$ to $+0.33$), not smoking ($r = -0.24$), and consuming less alcohol ($r = -0.22$). Because individuals with higher levels of SWB are generally healthier overall, they will most likely live longer on average (Diener et al., 2017; Fournier, 2020). Likewise, the relationship between physical activity and SWB has been explored extensively, with results suggesting positive associations between various indices of well-being in older adults engaging in light to moderate/vigorous physical activity (S. V. Black et al., 2015; Buman et al., 2010). Similarly, mental health was positively associated with leisure time and related physical activity, but negatively associated with occupational activity (Wang et al., 2012). Results of longitudinal studies also revealed that greater well-being predicts the likelihood of maintaining or increasing physical activity over time (Baruth et al., 2011; Kim, Kubzansky, et al., 2017) and that changes in leisure-time physical activity predict changes in happiness (White et al., 2017). Physical activity was also partially responsible for the association between positive affect and mortality (Hoen et al., 2013; Hoogwegt et al., 2013). However, a systematic review of these

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studies resulted in no firm conclusions regarding a potential causal relationship between physical activity and happiness (Zhang & Chen, 2019). Some evidence suggests that diet, particularly the consumption of fruits and vegetables, may be linked to SWB (Blanchflower et al., 2013; Mujcic & Oswald, 2016), which may be modulated via the gut microbiome (Ke et al., 2023; Martin et al., 2023). Other health behaviours, such as excessive alcohol consumption, smoking, and failure to use sunscreen, have uncertain associations with health outcomes (Grant et al., 2009; Steptoe, 2019).

Numerous studies have explored the relationship between SWB and biological processes, with particular emphasis on cardiovascular, immune, and endocrine function, as well as cortisol production and inflammation. Individuals reporting greater SWB exhibit consistently lower serum cortisol levels and a steeper decline in salivary levels over the course of a single day (Adam et al., 2017). However, findings linking happiness with lower levels of systemic inflammation have been less consistent, with associations varying across studies and becoming insignificant after controlling for confounding factors such as health behaviours and distress (Steptoe, 2019). Although the evidence in support of cardiovascular correlates of affective well-being is inconclusive, there are reports of specific associations between different aspects of SWB and metabolic parameters such as plasma cholesterol and glycated haemoglobin, as well as self-reported sleep (Steptoe, 2019). Similarly, while results from several prospective studies highlighted the relationship between emotional vitality, positive affect, and purpose in life with a lower risk of stroke, diabetes, cardiometabolic illness, hypertension, and arthritis, the overall effects are attenuated when health behaviours including smoking, physical activity, and alcohol consumption are taken into account (Steptoe, 2019). Positive affect also predicts a reduced vulnerability to upper respiratory illness, even when controlling for relevant covariates in experiments that involve the direct administration of virus pathogens (Steptoe, 2019). Results from other studies suggest that the function of the brain's reward system, which is responsible for pleasure and motivation, is closely linked to that of the immune system and plays a critical role in maintaining physical health (Esch & Stefano, 2004). The authors suggest that promoting positive behaviours, such as exercise and healthy eating habits, can activate the reward system and lead to improved health outcomes.

All in all, the confounding factors that potentially influence the relationship between happiness and health are numerous and a comprehensive synthesis is depicted in Figure 1.

3.4 | Interventions that promote happiness and health

Largely as a consequence of these findings, new happiness-promoting interventions have been implemented and evaluated. As a group, these interventions focus on promoting behavioural activities that may increase happiness. Different types of interventions could be used to promote happiness and health, including positive psychology interventions (e.g., gratitude interventions) that focus directly on happiness (Bolier et al., 2013) and interventions that foster positive health behaviours, including physical activity that may lead to happiness as a secondary outcome (Zhang & Chen, 2019; van Zyl & Rothmann, 2014). Positive psychology interventions have shown small but significant short-term effects on SWB, with some effects sustained for as long as 3.5 years with continued use (Steptoe, 2019). Many studies highlighted the potential benefits of interventions for reducing psychological distress, improving quality of life, and reducing depressive symptoms, although the results of these types of studies varied substantially (Steptoe, 2019; van Zyl & Rothmann, 2014). Interventions such as positive psychology exercises, mindfulness training, and meditation may also lead to improvements in physical health outcomes, such as improved immune function and cardiovascular health together with reduced inflammation (D. S. Black & Slavich, 2016; Crosswell et al., 2017; Sin & Lyubomirsky, 2009). These findings suggest that efforts to promote positive psychological states may be important components of preventive health care (Fredrickson, 2000), particularly considering the growing evidence suggesting a positive link between SWB indicators and physical health outcomes.

4 | DISCUSSION

4.1 | Summary

This review has yielded a clear understanding that love, social connectedness, and happiness are not only intricately interconnected phenomena but also serve as foundational principles within the framework of MBM. Drawing upon the bio-psycho-socio-spiritual-cultural dimensions of an individual's life, MBM leverages the profound influence of love, social connectedness, and happiness to enhance both the physical health and overall well-being of individuals. These interrelationships are visually depicted in Figure 2. Hence, typical MBM interventions that combine these aspects are, for example, meditation and mindfulness techniques that incorporate compassion, empathy, or altruism, such as dyads (Winter et al., 2021), or procedures to increase a sense of rootedness in oneself, and the connection to others (Esch, 2021), starting from cognitive behavioural or positive psychology interventions, to exercise, relaxation and meditation techniques, to nutrition and such elements that increase body awareness—the so-called BERN techniques (Esch, 2020; Esch & Stefano, 2022).

The relationship between happiness, indicators of SWB, and health outcomes has been the focus of intense research over the past several decades. The current state of research on this topic reflects a comprehensive and nuanced approach that focuses on contextual factors such as social connectedness and socioeconomic status. Recent studies have explored potential underlying mechanisms linking SWB and personal health, and have identified specific components of happiness that may be particularly relevant to health-related outcomes.

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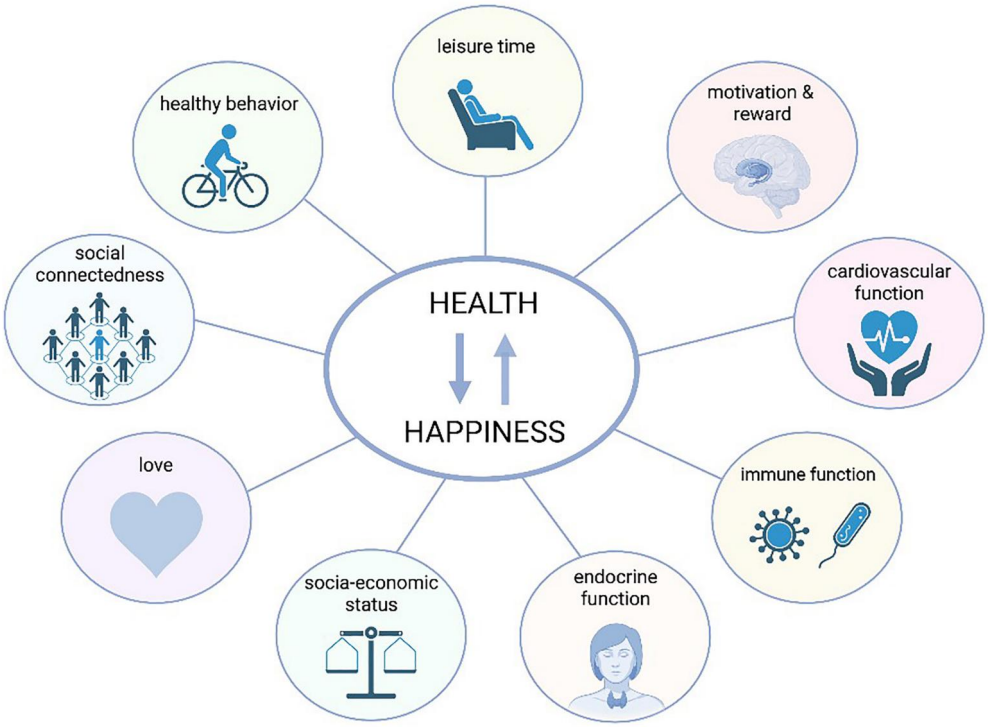

FIGURE 1 Factors associated with the relationship between happiness and health.

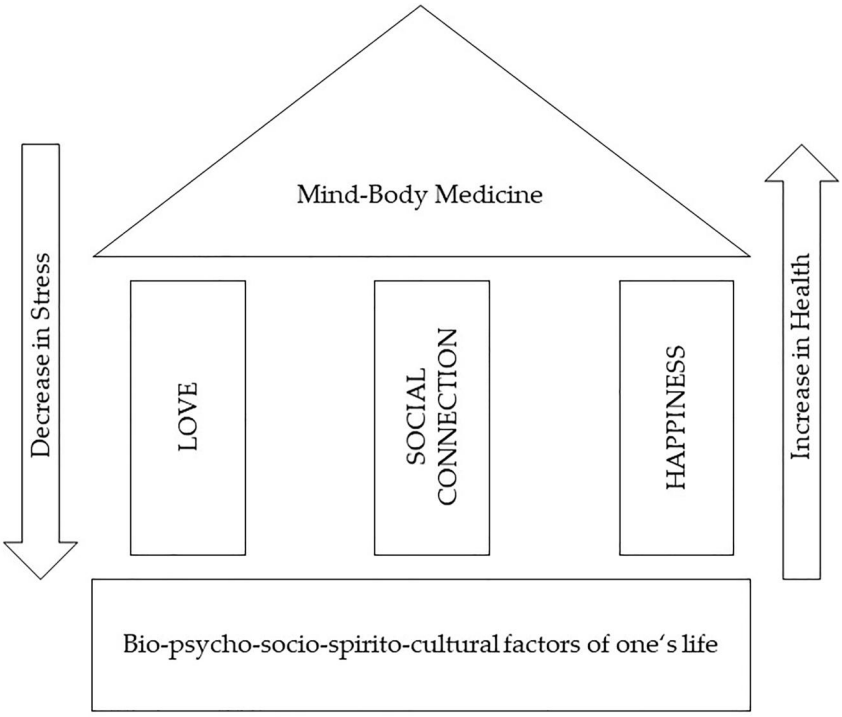

FIGURE 2 The foundations of mind-body medicine: love, social connection and happiness.

4.2 | Future research

Despite these advances, the heterogeneity of results presented by these studies suggests that more evidence will be needed before any definitive conclusions can be drawn. Future research might focus on aspects of SWB and health that will deepen our understanding of the relationship between these phenomena. With respect to future directions, it will be very important to differentiate between the various phenomena related to happiness, including both short- and long-term states, and to consider carefully the specific components of SWB that are most relevant to health outcomes. For example, some studies have found that life satisfaction may be a more reliable

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predictor of health outcomes than positive affect, especially among older adults (Karwetzky et al., 2002).

We also need to delve more deeply into the mechanisms that link SWB indicators to different health outcomes. This will require a careful analysis of neurobiological (i.e., motivation and reward mechanisms (Esch, 2022; Michaelsen & Esch, 2022)), neuroendocrine, and cardiovascular processes as previously discussed by Steptoe et al. (2005).

Interventions designed to promote health will need to consider which techniques are most effective in promoting happiness. A cut-off point could be established that might be used to identify interventions that effectively enhance happiness. These might be developed further for use as MBM, happiness, or mindfulness interventions (Michaelsen et al., 2023). Researchers might refer to the growing literature on intervention theory which might help them to generate successful interventions (Michaelsen & Esch, 2021, 2022).

Social connection has become increasingly important in research, not only in response to the COVID-19 pandemic but also in recent times. However, the studies presented in this review only provide a surface-level understanding of how social networks and human connections can influence health. It is crucial to conduct more in-depth analyses to uncover the underlying mechanisms behind these relationships. While there has been slightly more research on the impact of love, further exploration is still necessary. This is particularly important for developing future interventions in positive psychology and MBM that can enhance both health and happiness for individuals.

Finally, it will be critically important to consider aspects of spirituality (defined as a sense of meaning and higher connectedness), culture, and social connectedness as determinants of happiness, love, social connection, and health. This requires one to look beyond the traditional bio-psycho-social factors related to health and disease (Listopad, Esch, et al., 2021; Listopad, Michaelsen, et al., 2021) to generate a broader perspective of the factors that contribute to SWB and positive health outcomes.

4.3 | Limitations

This narrative review has some limitations. First, the review does only provide limited information about the methodologies employed in the studies referenced. In particular, readers may want know how the research was conducted to evaluate the validity of the findings and their applicability to different populations or situations. A systematic review may provide such analysis in the future in order to demonstrate in more detail the exact relationships between love, happiness and social connection to health outcomes. Second, in this review, we critically evaluate the quality of the included studies or discuss potential limitations in the research methodology only to a limited extend. Third, the review primarily focuses on the potential benefits of happiness and social activity in mitigating stress and improving health. In this endeavour, we do not address other important factors related to stress and health, such as genetics, lifestyle, or environmental influences. Finally, the discussion about happiness and health is flawed by a lack of uniform definition of the concepts of happiness and SWB. We have structured Chapter 3 according to the way literature about relationships between health measures and happiness/SWB has developed over time. Concepts regarding to happiness and SWB, therefore, have been used in accordance with the literature cited rather than based on most recent definitions.

5 | CONCLUSIONS

In this review, we introduced the basic principles of MBM, which is a clinical discipline that focuses on the identification and development of psychological, emotional, and spiritual interventions that might be used to prevent harmful responses to stress. Many published research studies in this field focused on the impact of love, social connectedness, and happiness as major contributors to improved human health and well-being. However, we will need to develop clear and more consistent definitions of these and related parameters to confirm their impact on human health, explore their role in disease prevention, and develop new tools for clinical use.

AUTHOR CONTRIBUTIONS

Conceptualization, *Supervision and Writing—review and editing*: Tobias Esch and George B. Stefano. *Investigation*: Maren M. Michaelsen. *Writing—original draft preparation*: Maren M. Michaelsen and Tobias Esch. *Visualization*: Maren M. Michaelsen. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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