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How mobile mental health applications promote entrepreneurial ways of life: a multimodal critical discourse analysis of interface design

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ABSTRACT

This study uses multimodal critical discourse analysis to explore the growing market of mental health applications (MHapps), particularly those using sound and music to promote wellbeing. Focusing on NuCalm, Endel and BrainTap, it examines the design and functionalities of their interfaces, revealing the underlying assumptions, values and ideologies embedded in their structures. It finds that these apps are structured around a script of self-management and self-improvement, deeply embedded in an entrepreneurial discourse of self-optimisation. What initially appears as a focus on wellbeing, in fact, subtly pushes users to maximise productivity and competitiveness. The study also reveals paradoxes in presenting both technology and users as the problem and solution to mental health challenges. Overall, it provides new insights into how MHapps shape contemporary understandings of wellbeing, reinforcing neoliberal ideologies of self-care as individual responsibility and raising broader questions about whether these technologies help users or simply redefine personal struggles as failures.

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Mental health apps; wellbeing; entrepreneurial self; interface design; social semiotics; scientific discourse

Introduction

In recent years, there has been significant growth in the market for self-care applications, particularly *mental health apps* (MHapps), designed for the self-management of psychological distress (Goodings, Ellis, and Tucker 2024). MHapps have emerged within the context of under-resourced health systems and a developing “global mental health crisis” (Torous et al. 2018).¹ Currently, around 20,000 MHapps are available (Business Wire 2023), providing users with tools and techniques to manage their mental health and wellbeing (Lupton 2016).

This rapid growth is mirrored in significantly expanding research on MHapps, incorporating psychological, psychosocial, socio-material and posthuman perspectives (e.g. Cliffe et al. 2024; Goodings 2020; Goodings, Ellis, and Tucker 2024; Simmons, Goodings, and

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Tucker 2023; Simpson and Tucker 2024; Williams and Pykett 2022). Much of this work has focused on two key areas: self-tracking and the affective relationships that emerge between users and app interfaces. Findings suggest that MHapps, like other self-tracking apps, tend to promote a neoliberal self-care ideology and reinforce the notion of the “healthy subject” (cf. Fotopoulou and O’Riordan 2017; Lupton 2016). Both strands underscore the critical role of app designs and functionalities in shaping how users engage with the technology and how they can shape ideas about mental health. Although studies have begun to explore the functionalities of interface design and data visualisations, there is still limited understanding of how ideas about mental health are embedded within interface design features. Thus, little is known about how visual and textual elements – and the choices they can afford – carry notions about mental health and the actions that support wellbeing.

Using a case study design, this study addresses this lack of knowledge. It focuses specifically on the interface design of MHapps that use sound and music to stimulate “positive mental health” (Goodings, Ellis, and Tucker 2024, 5), a so-far underexplored category of MHapps. Based on the social semiotic theory (Kress 2010; Kress and van Leeuwen 1996, 2001) and using the analytical tools of multimodal critical discourse analysis (MCDA) (Ledin and Machin 2018, 2020; Machin 2013; Machin and Mayr 2023), we closely examine the interface design and promotion of three such MHapps: NuCalm, Endel and BrainTap. These apps provide similar mental and cognitive self-care tools to stimulate “positive mental health” (Goodings, Ellis, and Tucker 2024, 5), but their interface designs differ significantly. Inspired by the work of Stanfill (2015), the present study investigates these designs to reveal their underlying logics and discourses. Our analysis is guided by three questions: (1) How do music/sound therapy MHapps assign meaning to the self-care tools through their interface design? (2) What actions do they suggest, and how are these intended to affect users’ mental health and their daily lives? and (3) What underlying assumptions, values and ideas about mental wellbeing are embedded in their design and promotional materials? Seeking answers to these questions, the study is conducted in line with the now expanding research aiming to understand how contemporary meaning-making is shaped by the communicative options made available through digital interfaces (cf. Tagg, Eriksson, and Vasquez 2025).

Wellness, neoliberal self-care, and healthism

Health lies at the centre of mobile self-care technologies, but as Bacchi (2009, 128) notes, health is a “slippery concept” which tends to take on different meanings in different contexts. Sax (2021) contends that app providers seek to avoid a narrow, medicalised view of health by collapsing the concept into the broader and vaguer term “wellness.” This shift allows for a wider range of products and services on the market, all of which benefit from the *positive* connotations of health (cf. Cederström and Spicer 2015). Thus, under this paradigm, wellness possesses a “catch-all” quality, making it a powerful marketing tool for promoting the ideas of “doing well” or “feeling good.”

Cederström and Spicer (2015) argue that wellness has evolved into a “moral obligation,” where individuals are expected to curate lifestyles aimed at maximising their wellbeing. However, the demand for a wellbeing-oriented lifestyle also carries the responsibility of adopting and maintaining it. Viewed through a Foucauldian lens of

governmentality and biopolitics, self-care apps can be seen as part of a healthcare system aligned with neoliberal agendas that shift the responsibility for wellbeing onto individuals as governments reduce public welfare resources (Chen and Eriksson 2022). These apps, therefore, function as “sociocultural artefacts,” embedded with neoliberal values that promote preventive health as a strategy to mitigate healthcare costs, particularly in the context of an ageing population (Gaudet 2023). By enabling continuous health monitoring, these apps foster a culture of self-surveillance (Lupton 2016). This discourse not only encourages individuals to adopt healthy behaviours, such as proper nutrition and regular physical activity, but also pushes for an optimised, super-healthy lifestyle (Cederström and Spicer 2015).

In this view, maintaining a healthy lifestyle is not merely a personal goal but a marker of a responsible, virtuous citizen (Ayo 2012). Consequently, health is seen as something to be actively achieved through disciplined habits, while unhealthy behaviours are associated with weakness, laziness and a lack of moral character (Chen and Eriksson 2022). In this context, the idea of empowerment is prominent, convincing individuals that *they* can effect personal change through self-control, self-discipline and willpower (Crawford 2006).

MHapps promote the idea of empowerment by offering tools that encourage users to adopt healthy lifestyles, reinforcing the belief that individuals can control and enhance their health through personal choices (Lupton 2013). They can be seen as “pedagogic technologies” (Fotopoulou and O’Riordan 2017), generating knowledge that empowers users to become experts in their own health and wellbeing. Data visualisations, often presented in a playful and enjoyable manner without negative reinforcement or punishment, play a key role in this process of evaluation and knowledge production.

MHapps in focus: from clinical tools to socio-material practices

To date, much of the research on MHapps has emerged from the fields of psychology and applied psychosociology, drawing on clinical research methods to evidence efficacy through various evaluation models. A significant body of research has explored the norm of self-tracking, often encapsulated in the concept of “the quantified self” (cf. Lupton 2016). Studies have been conducted, for example, on the management and treatment of mood disorders and emotional wellbeing, with a specific focus on depression and anxiety, especially in vulnerable and hard-to-reach populations (cf. Alqahtani and Orji 2020; Bakker et al. 2018). Specific apps, such as Headspace, Wysa, Replika, and Woebot, have also been the subject of clinical research (cf. Flett et al. 2019; Durden et al. 2023). Findings show that such apps can motivate behaviour change and provide insights into wellbeing (Goodings, Ellis, and Tucker 2024). However, as Simpson and Tucker (2024) observe, this sense of agency often clashes with a sense of duty imposed by the apps’ demands, amplifying feelings of personal responsibility.

More recently, scholars have begun to approach MHapps from a material and posthuman perspective, viewing them as part of a broader phenomenon influencing the production of new forms of subjectivity, rather than just tools for mental health (cf. Williams and Pykett 2022). Emerging work has shifted towards qualitative methods and socio-material approaches, examining the relationships between MHapps and bodies. Notable contributions to this shift include the work of Simmons, Goodings, and Tucker

(2023) and Goodings, Ellis, and Tucker (2024), which frames MHapps as part of a wider set of affective forces and practices. This perspective encourages a broader exploration of how individuals interact with MHapps, particularly in terms of how they move through the app interfaces and how these interactions influence their physical and emotional experiences.

In their socio-materialist study of MHapps, Simmons, Goodings, and Tucker (2023) identified three core benefits for users: facilitating an immediate release of emotion, incentivising engagement and providing a temporal space to externalise distress. The MHapps, thus, enable them to understand their emotional states and offer information about possible actions to maintain balance and move forward. Similarly, Cliffe et al. (2024) found that MHapps helped young people by providing comfort in familiar and friendly digital spaces, developing coping and support skills through digital peer support and fostering a sense of shared experience. However, they also identified limitations, such as invoking feelings of guilt or allowing users to express their emotions without providing a sense of resolution. More recently, through the lens of new materialism, Simpson and Tucker (2024) have expanded on Tucker and Goodings' (2017) concept of "digital atmospheres" to examine how MHapps create temporally and spatially bound attachments. These attachments involve the movement and repositioning of users' bodies in relation to the material forces and digital environments they engage with, entangled with both previous mental health experiences and the gamified elements of the apps. However, this relationship can be "contentious," leading to a perception that the app defines an *ideal* way to manage mental health, which is heavily shaped by the app's design and functionalities.

Overall, extensive research on MHapps, particularly within the fields of psychology and applied psychosociology, has demonstrated both the benefits and drawbacks of this technology. While much of this research concentrates on the use of the apps and evaluates their potential efficacy, there is now a growing interest in exploring the significance of their design. Building on the widely accepted idea that technology influences how we think and act in the world (Stanfill 2015), studies suggest that MHapps, through the way they are designed, can influence broader understandings of mental health and ideal ways to manage wellbeing (Goodings, Ellis, and Tucker 2024). However, very little is known about how the affordances of MHapp interface design can shape such notions and offer options for user interactions with this technology. This study, thus, aims to address this lack of knowledge by examining the subtle ways the interface designs carry ideas regarding mental health self-management.

Data and methodology

This study employs a case study design to explore MHapps that use music and sound as primary tools to promote relaxation, focus and sleep. To date, this category of MHapps is underexplored, despite music being recognised as an underutilised resource for health and wellbeing (Dingle et al. 2021). To identify suitable cases for analysis, we conducted a scoping review, which involved systematically searching major app stores (e.g. Google Play, Apple App Store) using relevant keywords (e.g. "music," "sound," "relaxation," "sleep," "focus," "mental health"). We reviewed app descriptions, user ratings, and download figures to assess popularity and relevance. This process resulted in the

identification of 15 widely used apps that explicitly integrate music or sound-based features to support mental health goals. After testing these apps and reviewing their websites, promotional materials, and social media pages, we narrowed our focus to three widely used apps: NuCalm, Endel, and BrainTap.

These apps all emerged as part of a second wave of MHapps, starting around the mid-2010s and characterised by an increased integration of wearables and AI. They build on earlier apps like Pzizz and Brain.fm, but push mental health audio tools into more scientific, personalised and immersive territory. NuCalm, developed in 2017 by Solace Lifesciences Inc. in the US, provides “neuroacoustic technology,” including “binaural beats” and “isochronic tones,” combined with guided relaxation techniques and physical accessories. Worldwide, NuCalm has more than 1.3 million minutes of daily recorded use. Endel, founded in 2018 by Endel Sound in Germany, uses AI to create “adaptive soundscapes” that adjust in real-time based on environmental and biometric data. Endel has more than 1 million monthly active users and over 1.5 million monthly listening hours. BrainTap, established in the early 2010s by BrainTap Technologies in the US, uses “brainwave entrainment techniques,” coupled with light theory through goggles. More than seven million of their therapeutic sessions have been played and the company claims to be trusted by over 2,600 healthcare professionals.

We both downloaded these apps to our mobile phones and used the apps for four weeks. During this period, we documented our activities by taking notes and screenshots while using the apps. In total, 411 screenshots were sampled. These include images of promotional material appearing in the apps and document the options and paths provided for users through the interface designs. Based on the analytical approach, these screenshots were analyzed through a close reading, initially separately by the two authors. We took notes and looked for more generic characteristics and critical details. Based on these observations, the two authors jointly went through the data to compare their notes regarding similarities/differences. This process resulted in the three themes presented in the next section.

The three apps represent what Flyvbjerg (2006) defines as “critical cases,” which are strategically important to the broader issue being explored and, as such, provide a basis for making logical deductions. Each promotes itself as scientifically grounded and offers various mental and cognitive self-care tools designed to help users reduce stress, improve sleep, enhance concentration or boost energy. Their joint goal is to improve overall health and support personal goals. All three apps allow users to set specific goals and choose from a menu of sessions tailored to help achieve those objectives. They also recommend using headphones for optimal results. Based on previous research, we anticipated that these apps would reflect comparable cultural norms, values and interests regarding mental wellbeing. However, despite making comparable claims, their designs and functionalities vary significantly.

As researchers with backgrounds in media and communication studies and established expertise in multimodal analysis, we bring a critical lens to the study of MH app interface design. Our interest in this topic stems from prior work on the cultural and ideological dimensions of digital health technologies. Building on this foundation, we draw on social semiotics and Stanfill’s (2015) discursive interface analysis, we examine the apps’ various interface elements (e.g., input controls, navigation components, buttons, sliders, and checkboxes) and the actions they enable for users. We treat these design

elements not only as meaning-making devices, but also as “sites of action” or “interactive signs” (Adami 2015, 236; cf. Andersson 2025). Our analysis explores the actions they afford, how they interact with users, and how they evaluate actions in terms of wellbeing. Our analysis is informed by the methodological toolkit of multimodal critical discourse analysis (MCDA) (Machin 2013; Ledin and Machin 2018, 2020; Machin and Mayr 2023). This helps us to identify the micro-details of design choices within the apps and to uncover their underlying ideas and values.

We view apps – particularly their interface design and associated functions – as offering options that resonate with users’ interests (Kress 2010). App designers employ a variety of textual, visual and interactive elements to create aesthetically pleasing and user-friendly multimodal interfaces. Semiotic resources, such as language, images, colours and symbols, are carefully crafted to communicate the apps’ functions in a meaningful way. Interface design reflects expectations about what a user will do, “which becomes a normative claim about what users should do when incorporated within the interface” (Stanfill 2015, 1061; cf. Tagg, Eriksson, and Vasquez 2025). This allows design to be seen as a deliberate means of transforming ideas into textual, visual and interactive components. The analysis focuses on how these semiotic resources work together to make meaning. For this purpose, the concept of affordances – originating from Gibson (1979) – is crucial, but here used in line with Stanfill’s (2015, 1062) definition, which extends beyond functions to consider “what is foregrounded, how it is explained, and how technically possible uses become more or less normative through productive constraint.”

Additional key concepts for our analysis are scripts (van Leeuwen and Wodak 1999) and modality (Hodge and Kress 1979). Scripts describe the “doings of a discourse” (Machin and Mayr 2023, 30) and encompass elements such as participants, actions, settings, causalities, aims, solutions, priorities, evaluations, and resolutions. In this context, scripts reveal the actions users take and the effects or solutions these actions produce, shedding light on the underlying assumptions, identities, and values present in the apps. Modality, on the other hand, refers to the status, authority, and reliability of a message, offering a way to analyse what is constructed as true and revealing the communicator’s commitment to that truth (Machin and Mayr 2023). Applied here, modality helps to examine how knowledge is constructed as reliable and scientific, and how the apps’ alignment with their promises is portrayed. It should be noted here that we do not have any intention to analyse the apps’ actual capacity to affect mental wellbeing.

Specifically, we employ a model developed by Ledin and Machin (2018, 2020) to differentiate various semiotic resources – such as language, symbols, colours and fonts – while examining how these resources combine to engage users. Essential to this framework is “integrated design” (ibid), which emphasises the multimodality of objects and how visual designs become meaningful through the interplay of semiotic resources. For example, causal relationships may be represented by arrows or spatial orientations, categories may be indicated by different types of framing and coherence can be achieved through colour and colour coordination (Ledin and Machin 2020). Moreover, digital texts like apps afford interactivity. Interface elements, such as buttons and cards, not only convey meanings through textual, visual and interactive modalities but also empower users to take actions that lead to specific outcomes (Adami 2015). In what follows, we examine the semiotic resources and interface elements used, how they are applied and what actions they enable.

Analysis

Our analysis reveals three scripts that emerge consistently across the three MHapps. These scripts, presented through illustrative examples, can be summarised as follows:

- (1) A stressful high-tech life demands high-tech solutions
- (2) Sound and music as scientific remedies
- (3) A stress-free world for the optimised, entrepreneurial subject

While these three scripts emerge in all three MHapps, each app articulates them differently, making use of the unique semiotic affordances of its interface design. Below, we will explore each script in detail, drawing on pivotal examples from our dataset to unpack their underlying discourses. We will examine how semiotic resources are mobilised multimodally to construct and reinforce these scripts, highlighting the interplay between textual, visual, and interactive elements into integrated designs.

A stressful high-tech life demands high-tech solutions

The three MHapps under study justify their necessity by portraying contemporary life as an era of complexity, stress and the pervasive influence of advanced technology – a strategy van Leeuwen (2017) refers to as “theoretical rationalisation.” Among these, Endel adopts the most extreme, even fearmongering, approach. Characterised by high modality, its introductory screen claims in bold, white text that “We live in an over-stimulating world. It makes us tired, stressed, and unable to sleep.” According to Kirby (2019, 40), such language conceptualises everyday life as scary and stress as “potentially overwhelming, as something which need[s] to be ‘outwitted’ or ‘safeguarded’ against, and which require[s] vigilance and self-control.” This assertive message and its modality is reinforced visually by a side-profile silhouette which, when experienced in real time, animates the frantic activity of the brain through moving wave patterns, a swinging crescent moon, swirling circles and overloaded data files (Figure 1). Their “kinetic rhythms” (van Leeuwen 2021, 98) convey a sense of constant motion, signifying an inability to switch off. The stark monochrome aesthetic further heightens the atmosphere of pressure, presenting the mind as both technologically intelligible and mysteriously powerful. This visual style is also reminiscent of popular neuroscientific imagery, in which luminous, line-based representations of the brain are frequently set against dark backgrounds to communicate scientific sophistication while simultaneously evoking the brain’s latent mystery and potential. Thus, by blending futurist and quasi-mystical semiotic cues, the app positions itself as a tool capable of unlocking or harmonising hidden cognitive potential, encouraging users to engage with it out of urgency and anxiety.

In contrast, the other two apps offer a more inviting introduction, providing users with an idealised vision of life with reduced stress. BrainTap shows a serene sunset over the sea, encouraging users to “get comfortable,” while NuCalm displays a woman reclining on a sofa with the caption “Own the Day.”

Despite these differing engagement strategies, all three apps share a core premise: the high demands of modern life require technologically advanced solutions, which they provide through their science-based and tested content. With high modality statements,

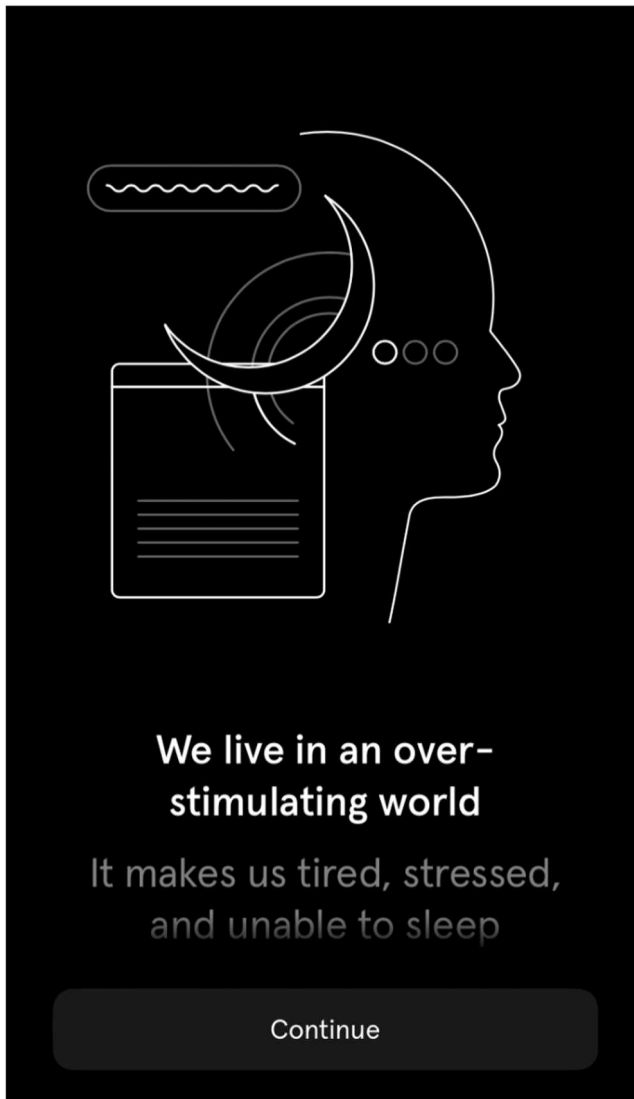


Figure 1. Endel's introductory screen.

their promotional materials emphasise the apps' capabilities to help individuals regain control over their lives. BrainTap, for example, describes itself as a "revolutionary brainwave technology" that helps users "escape the chaos of everyday life," while NuCalm promotes itself as "stress relief for the way we live today – technology to help you disconnect." Endel, on the other hand, presents itself as "an antidote to a distracting world." In this way, these apps propose that the very challenges posed by our high-tech era can be overcome through the seemingly paradoxical path of adding even more technology. Goodings, Ellis, and Tucker (2024, 9) make a similar observation in their study of MHapps, noting that they present users as both the source of and solution to their mental health distress. Implicit in this message is the idea that the difficulty of coping with modern life does not arise from systemic problems but from a personal failure to adapt.

While each app aims to foster a sense of user empowerment, the experience of this empowerment is shaped by their distinct interface designs. In NuCalm, users are prompted to select from a menu of colourful cards labelled “journeys” (Figure 2) – a term that suggests a process of transformation, reinforced by the app’s promise to “change your mental state.” These journeys make strong use of colour and imagery to visually connote their focus. For instance, the *Flow State* option features a light blue colour associated with calmness and a ripple-like pattern that evokes water in a swimming pool. In contrast, *Ignite* is set against a dark red and black background with flames, symbolising energy and vitality. These options, thus, span a wide range of mental states, with colour serving as a continuum that visually links each journey to its specific goal and emotional tone.

BrainTap also describes its session as “journeys,” but these are framed instead within a sports discourse as “*brain fitness journeys*.” Users are encouraged to navigate the options presented under five headings (*New In, Recommended, Founder’s Choice, Spotlight and Bundles*), swiping left to select up to 21 sessions, each geared towards self-improvement (e.g. *Life Mastery, Weight Wellness, Optimal Health, Stress-Free Me*). Unlike NuCalm, which relies on colour symbolism, these option cards use romanticised images to illustrate the journeys. A case in point is *Stress-Free Me*, which features a photograph of two pairs of legs

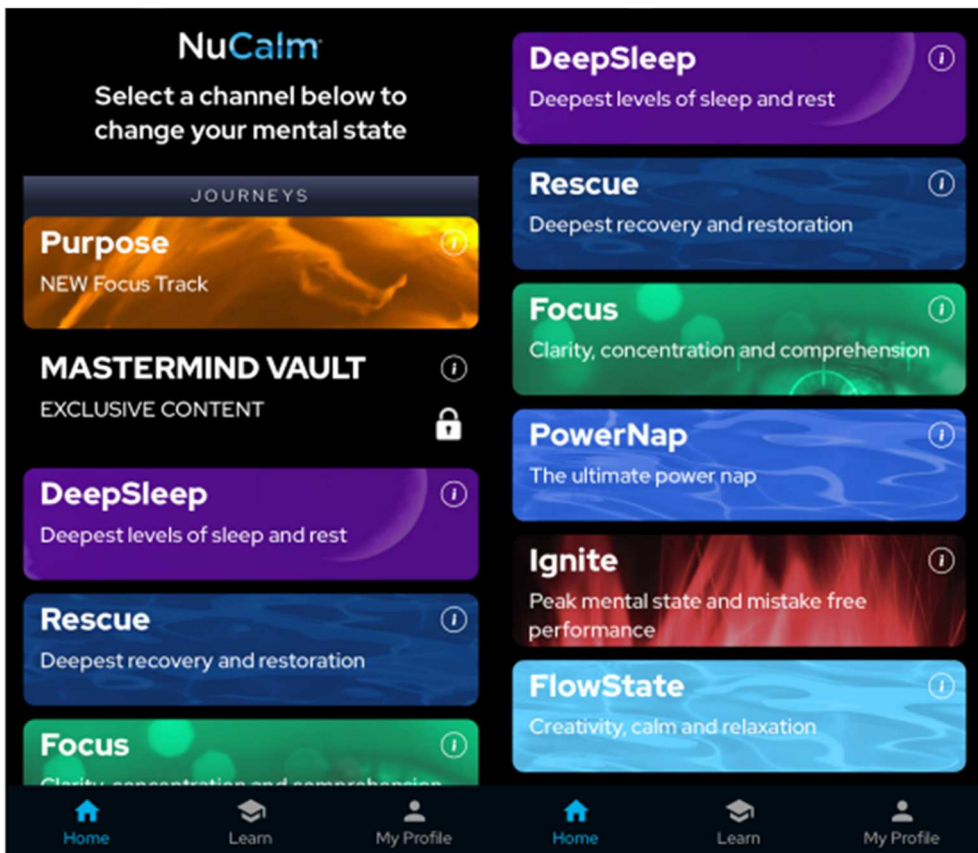


Figure 2. The journeys provided by NuCalm.

on a beach at sunset – an image reminiscent of aspirational holiday photographs on social media – thereby reinforcing a relatable, down-to-earth tone of relaxation.

Endel instead boasts a more futuristic, scientific-driven aesthetic. Its home screen presents users with minimalist, monochrome symbols – arrows, a moon and stars, and grids – under the heading “Endless Soundscapes,” which offer visual shortcuts to categories like *Move*, *Sleep* and *Focus*, respectively. Users also have the option to choose specific everyday “scenarios,” such as *Read*, *Chores* and *Power Nap*. According to Ledin and Machin (2020, 105), monochrome carries “much symbolic power,” conveying seriousness and authenticity. Used here, this aesthetic evokes a sense of professionalism and authority, reinforcing Endel as a scientifically grounded and credible app. Further enhancing this perception, Endel’s adaptive audio soundtrack responds to variables, such as users’ location, weather, heartrate, and time of day, tapping into the “vitalities” of affective bodily performances (cf. Lupton 2019). Further details on the specific functionalities of these three apps will be provided later in this paper.

Empowerment is also conveyed across the apps through incentivising and motivating users, though each app achieves this in different ways. In Nu Calm, for example, each session concludes by displaying the user’s current streak and statistics, such as their longest streak, similar to the reward system seen in popular social media platforms like Snapchat. Endel, on the other hand, incorporates a more interactive, gamified element called the “Shake Tree,” where users are prompted to physically shake their phone to reveal fallen fruits that unlock discounts for premium features. The tree’s bright green colour stands out against the app’s otherwise monochrome aesthetic, reinforcing its ties to a “back-to-basics” way of living (cf. Ledin and Machin 2020, 106). These features – points, rewards, feedback and challenges – tap into the “gamification” of health apps, designed to sustain user engagement (Simmons, Goodings, and Tucker 2023).

Overall, despite their different functionalities, all three apps are designed to empower users to transition from, as Goodings, Ellis, and Tucker (2024, 9) put it, a state of “brokenness” to one of being “fixed.” This transformation is facilitated through self-tracking features and activities designed to regulate mental states, whether by providing stress relief, enhancing sleep quality, or boosting concentration. A striking commonality among them is how they promote themselves as technologies with quasi-magical powers, grounding their effectiveness in neuroscience, as we will explore further in the next section.

Sound and music as scientific remedies

Within psychology, the effects of music on mental well-being are widely discussed (McCaffrey 2016). There are some clinical studies providing support for music as a form of treatment for mental health issues, although the long-term effects are disputable (see e.g. Lee and Thyer 2013). The key selling point for all three MHapps is the belief that sound and music can serve as remedies to transform users’ mental states. This is based on scientific studies on affective transmission, which suggest that music can facilitate a “voluntary, self-controlled, learned change of self-consciousness” (Kennaway 2011, 284). The apps harness this idea, embedding themselves deeply within scientific discourse. Overall, the presentation of them as scientific and credible tools improving users’ wellbeing is characterised by high modality.

Sessions on NuCalm and BrainTap rely on binaural beats and isochronic tones to encourage shifts in mental state. Binaural beats work by playing two different frequencies in each ear, causing the brain to perceive a third beat that shifts brainwave activity, while isochronic tones use rhythmic patterns to synchronise with the brain's natural frequency (Jiao 2025). A more immersive, multi-sensory experience can be obtained with physical accessories, such as LED visors, specialised headphones and biosignal processing discs, although studies have suggested that their effects may be placebo (cf. Demopoulos 2023). Before NuCalm sessions begin, users are presented with a list of "Do Use" and "Don't Use" bullet points. These lists function similarly to medical instructions on a prescription leaflet, outlining various scenarios where this type of relaxation programme is recommended, as well as the specific times of day or situations when the programme should be avoided. For example, the *Rescue* programme must be used "to resolve stress at the midbrain" and "optimize cellular restoration." Although the technical language may be difficult for the average person to understand, hindering their ability to grasp how the programme works or its specific benefits, Ledin and Machin (2018, 165) note that bullet lists convey a sense of technical precision and logic, thereby creating an aura of scientific credibility and trust, thus visually supporting the truth of these claims.

Endel's use of sound and music is more sophisticated, with the soundscape activating automatically as soon as the user enters the app and adapting to real-time inputs. By clicking on the top-left corner of the home screen, users can check their "current energy level," which is visualised in a line graph that suggests a quantitative comparison between variables over time (Figure 3). According to Ledin and Machin (2020), such visual tools help present complex scientific concepts in a more accessible format for lay audiences, but they can be misleading. In this case, the X-axis of the graph features numbers that are presumed to represent the time of day, but there is no Y-axis, leaving unclear what the data is being measured against. The graph displays noticeable rises and falls, with arrows prominently featured to indicate "causality" and guide users visually through fluctuations in their energy. Text beneath the graph provides further details, noting the estimated time in minutes until energy levels will "fade," "recharge," "rise" and "peak," though there is a lack of transparency about how these energy levels are being measured (e.g., by calories, metabolic rate, heart rate variability, brainwave patterns). When these moments of change occur, users are prompted to adjust their current soundscape, with clear instructions provided within the app. For example, when an energy "peak" is reached, users are guided to switch to *Focus* mode, where the music's rhythmic patterns are said to sync with the user's heartrate. Alternatively, when the energy "fades," users are encouraged to switch to *Relax* mode with no beats or complex sound textures. Directing users to evaluate and modify their energy based on sonic cues not only problematises rest and turns it into a performance-driven task, but may also lead to reliance on external signals to manage internal states (cf. Goodings, Ellis, and Tucker 2024). This risks creating a dependency on technology for self-regulation rather than users trusting their own instincts and natural rhythms.

Each app has a designated area where users can learn more about the scientific research behind the technology through articles or podcasts. This information relies on strategic lexical choices and visual presentations characterised by high modality to assign scientific credibility to the apps' tools (cf. Chen and Eriksson 2022). In "The Science Behind BrainTap," BrainTap claims that its technology is "proven in 12 studies

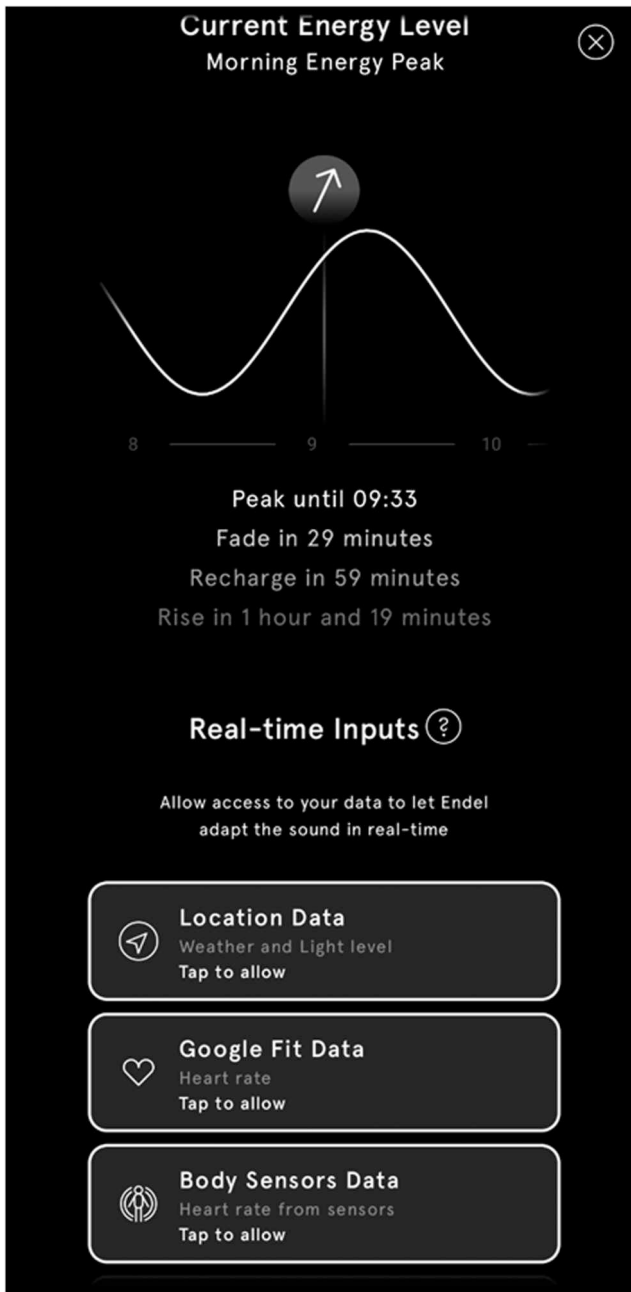


Figure 3. Endel’s real-time inputs.

to enhance brain fitness and wellness” and “validated through clinical studies and trusted by thousands of health providers.” It also employs bullet lists to outline the study’s findings, with the list titled “In a single session” suggesting measurable results after just one use. Although a specific journal reference is provided for the findings (*Global Advances in Health and Medicine*, vol. 9, 2020), no papers from this issue seem to be

related to BrainTap, raising questions about the veracity of the information presented. While correct references are provided for three other studies, the links lead to abstracts of poster presentations from the same 2020 conference, all co-authored by BrainTap's founders. Furthermore, one of these studies, claiming to improve sleep, was conducted on just seven students, which undermines its reliability. Nonetheless, the strategic presentation of information creates an illusion of credibility that is likely to strengthen user trust and confidence in the app.

Scientific rigour is also conveyed across apps with infographics and diagrams, with NuCalm relying most heavily on this semiotic strategy. "The Neuroscience of NuCalm" article includes a diagram entitled "Human Brain Waves and Associated Mental States," which features a medical-style side profile of a man with a visible brain (Figure 4). Four coloured lines, each representing a different type of brainwave, intersect the brain, accompanied by information detailing the brainwave type, frequency, meaning, and recommended "journey" (e.g. Gamma 39-41 Hz, High Intensity, *Ignite*). These elements are framed as quantifiable and measurable, though the causal relationships, classifications and processes are never clearly specified (cf. O'Hagan 2021 for similar findings). Nonetheless, the integrated design allows the information to be presented as a technical process, breaking it down into its core elements, which enhances clarity. For Pantzar and Ruckenstein (2015, 94), such visualisations are a "vital aspect of knowledge production" in apps as "seeing" makes knowledge more credible and easier to act upon. They also reflect the demands of neoliberal ideology, promoting self-management, self-improvement and peak performance as taken-for-granted goals.

In addition to the neuroacoustic experiences offered by the apps and their supporting scientific rationale, each app has a dedicated section presenting its company mission in a unique way. Endel, for example, frames its mission as a "Manifesto" – a term historically associated with political declarations of intent. By clicking on "Find Out" under the subtitle

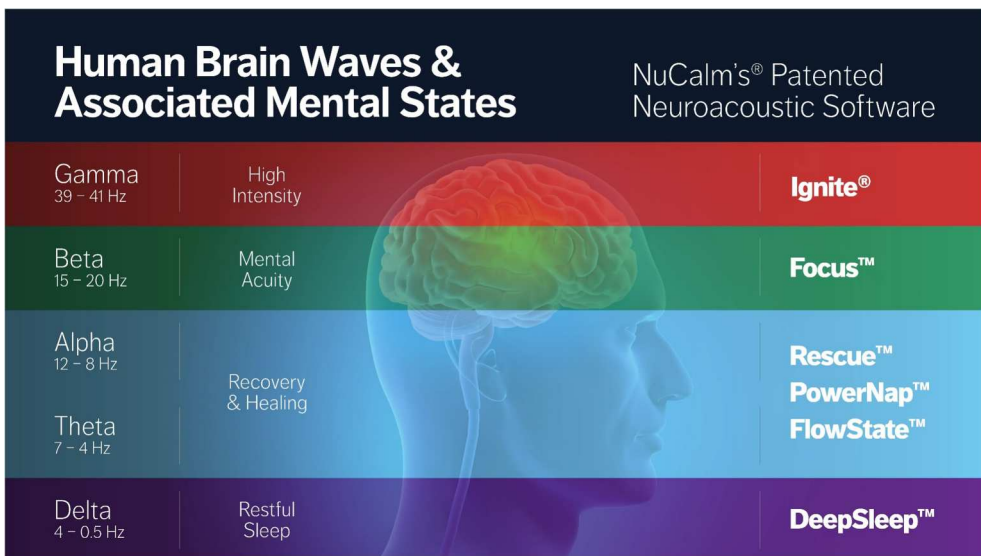


Figure 4. A scientific diagram on NuCalm.

"How Endel will reshape our collective future," users are invited into an interactive space where a bold statement appears in large white font: "We're not evolving fast enough. Our bodies and minds are not fit for the new world we live in." This direct and somewhat unsettling statement evokes ideas of (social) Darwinism, suggesting that those who are more adaptable or resilient to modern challenges are somehow more deserving of success or survival (cf. O'Connell and Ruse 2021). As with the introductory screen, the positioning on top of a black background amplifies this unsettling tone. The page also features an animated illustration of a nodding head surrounded by intense movement – flashing lights, spinning shapes and moving lines – all seemingly penetrating into the brain. A line of text warns that "information overload is destroying our psyche," accompanied by alarming mental health statistics. However, hope is presented in the form of Endel's technology, which can "help our bodies and brains adapt to the new world." The animation then shifts to a more serene image: the head now still with calm, steady brainwaves running through. Finally, Endel is put forward as what Bhavnani and Harzand (2018) refer to as "human evolution through technology," implying a form of "technological Darwinism" where technological advancements are seen as the driving force behind human progress.

In sum, all three apps position their audio technologies as scientifically grounded tools for cognitive enhancement, drawing on high-modality claims, technical terminology, infographics, graphs, diagrams and corporate storytelling to project credibility, albeit in slightly different ways. These strategies align with neoliberal values, positioning technology as a necessary tool for personal success in a competitive, achievement-driven society, as will be examined further below.

A stress-free world for the optimised, entrepreneurial subject

A core aspect of all three MHapps is the script of self-management and self-improvement, which aligns closely with the principles of neoliberalism. It is no longer simply about being healthy; there is now an expectation to continually enhance and optimise both mind and body (cf. Eriksson 2022). This shift towards biomedicalisation has fostered new connections between the body, technology and science, with MHapps as just one example of promising a better life, maximising one's potential and increasing competitiveness. Ultimately, these apps appeal to the "entrepreneurial self" (Bröckling 2015), addressing individuals who seek to unlock their inner potential, improve performance and become the "best versions" of themselves.

Through strategic linguistic choices, all three apps suggest that users have untapped potential that can be unlocked to improve their lives. However, they also subtly imply that failing to engage in self-improvement is a form of laziness, hindering one from realising their full potential (cf. O'Hagan 2021). As BrainTap's slogan states, "Think Better. Sleep Better. Perform Better," which implies a causal relationship between these three daily functions. This notion is echoed across apps, with repeated phrases such as "Unlock the path to the life you've always envisioned" (BrainTap), "Maximize your peak performance with your brain and body" (NuCalm) and "Tools to unlock your brain's potential" (Endel). These messages reinforce a moral imperative to remain active, productive and competitive, cultivating the pressure to continually perform. As a result, even in moments of relaxation, the expectation to be working persists.

These arguments are particularly explicit in NuCalm's series of tutorials, designed to help users become "the best version of yourself." "Take Back Your Morning and Conquer the Day," for example, features a striking image of a dark blue brain, its neural pathways forming a labyrinth with a single successful path illuminated by a flashing electric blue brainwave. This visual reinforces the idea of a journey of self-discovery, with NuCalm as the solution for achieving mental clarity and focus. The text below the visual suggests that NuCalm will help users "reclaim ownership and control over your morning routine," implying that many people are struggling with a lack of control. This sets up a cautionary narrative (cf. van Leeuwen 2017), warning that without NuCalm, individuals will fail to maintain a productive and organised morning, resulting in an unproductive day. The tutorial outlines nine steps – goal achievement, positive mindset, productive habits, resilience, self-care, optimising time, gratitude, continuous improvement and ownership – each designed to help users "unlock [their] potential" and embrace an entrepreneurial lifestyle that positions personal optimisation as the key to thriving in a competitive world. However, as Sax (2021) points out, such apps primarily aim to optimise *user engagement*, not necessarily *health*, making them potentially manipulative. The very conditions that are presented as empowering – like self-control and productivity – often overlap with the tactics used to sustain user attention and encourage continued use, thus blurring the lines between empowerment and manipulation.

Across all three apps, visuals of the body and brain play a crucial role in this process, though they vary in style. NuCalm and BrainTap, for example, tend to rely on stock images of healthy people in active, often sunny, settings, subtly evoking a sense of wellness (Figure 5). Despite claims that such images are clichéd and inauthentic, Kennedy et al. (2025) have found that users are, in fact, able to derive personal meaning from them, drawing on their own experiences and emotions. In the case of these apps, such images are often accompanied by direct prompts for users (e.g. "Choose up to 2 outcomes you are looking for"), which can enhance their emotional resonance and potentially foster a direct connection between users and the apps' promises of transformation and well-being. In some cases, BrainTap amplifies this imagery by adding visual elements of brainwaves, presenting an idealised image of a scientifically improved, efficient, and high-performing individual. Both NuCalm and BrainTap also feature photographs of people using wearable technology (e.g. visors, headphones) as they engage with the apps, thereby promoting a "mechanomorphic" view of the human body (cf. Cullather 2007). This blurs the boundary between the human and the technological, suggesting that their integration is essential for enhancing performance and capabilities.

Endel, by contrast, focuses more on what Hight (2008, 19) calls the "invasive surveillance" mode, directing attention to the interior of the human body, particularly the brain. This type of computer-generated imagery has been criticised for creating a false sense of romanticised reality. Applied here, it presents an idealised brain, reducing humanity to highly functionalised and technologised brain activity. The underlying message suggests that optimal cognitive function is crucial for success in modern society, thus normalising the enterprise notion of managing oneself as a competitive entity and framing the human body as a machine that must perform and produce at its optimal level (cf. Chen and Eriksson 2022).

The customisation features in each app also tap into the entrepreneurial subject, creating a strong sense of active control and building motivation to perform health behaviours.

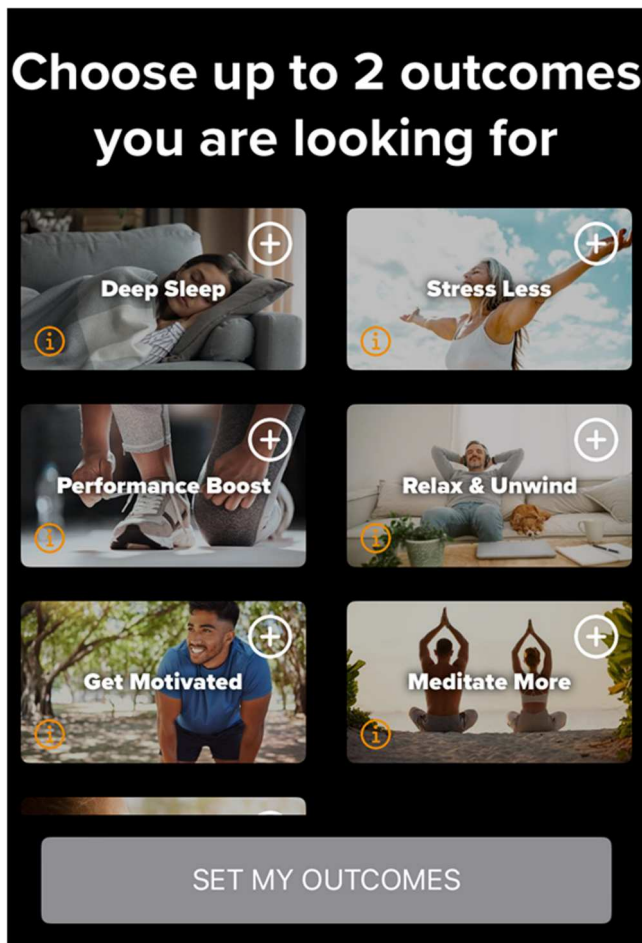


Figure 5. BrainTap's use of stock images.

In NuCalm, for example, users can add their vitals and goals on the “My Profile” page, which the app then uses to tailor settings and suggest specific “journeys” to optimise their relaxation. By encouraging users to track vitals, set goals and adjust relaxation techniques, NuCalm turns everyday activities – like sleep and movement – into tasks that need to be monitored and optimised, thus transforming self-care into a structured, quantifiable process. Endel enhances customisation further by enabling users to adjust the energy and feel of their chosen soundscape by interacting with a square grid (Figure 6). The grid has four adjectives on its sides, and users are encouraged to swipe in their desired direction to modify the music’s pace and rhythm (e.g. “intense,” “structured,” “easy” or “fluid” in the *Focus* programme). Although no descriptions of these words in relation to the music are provided, as Vincent (2014, 246) notes, such words are effective because they offer “interpretative flexibility” while remaining familiar enough for consumers to adapt to their own needs. As the music plays, stimulating specific brainwave frequencies, it generates shapes and patterns on the screen that move in sync with the beat, providing a quasi-hypnotic multisensorial experience. These geometric visuals are, as pointed out by Chen

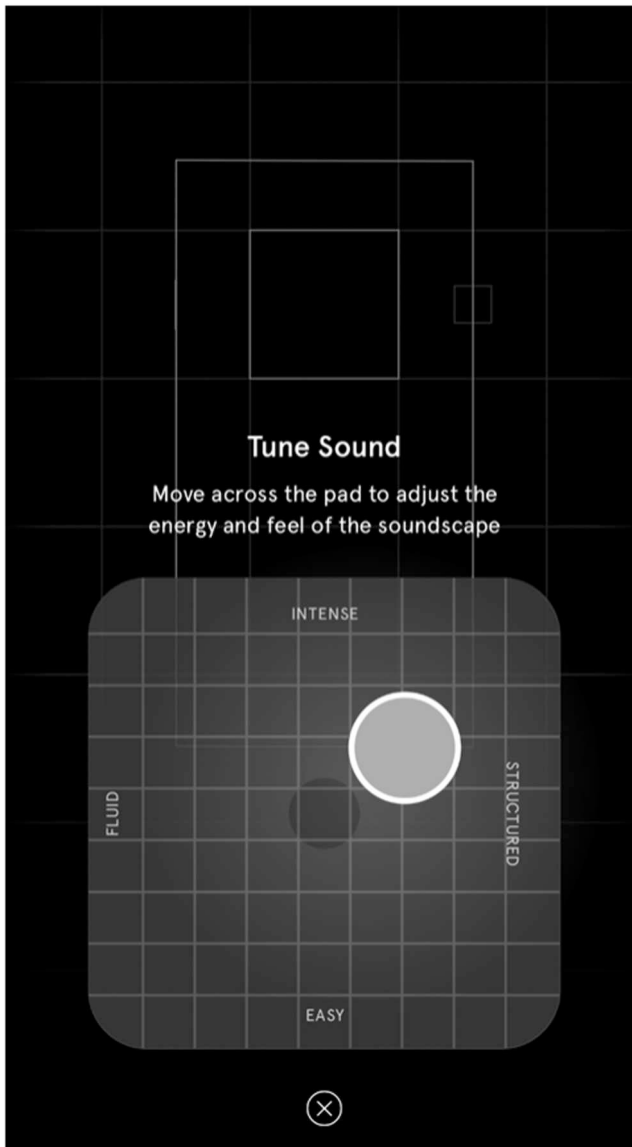


Figure 6. Endel's adjustable soundscape.

and Eriksson (2022), strongly associated with science and technology discourse, contributing to the app's overarching narrative of optimising cognitive performance and well-being. Thus, the interaction between music, brainwave stimulation and dynamic visuals enhances the app's focus on self-optimisation, encouraging users to take an active role in shaping their mental states and cognitive performance.

Overall, all three apps promote continuous self-optimisation, aligning with neoliberal values of enhancing mind and body and tapping into the entrepreneurial self. Through strategic visuals, testimonials and language, they create a vision of success and productivity, suggesting that failure to optimise oneself is laziness. This reinforces the

pressure to constantly perform, positioning self-optimisation as not just a goal, but a moral imperative for success in a competitive, productivity-driven society.

Conclusions

The three MHapps (NuCalm, Endel, and BrainTap) promote their self-care tools by offering techniques to help users reduce stress, improve sleep, enhance concentration, or boost energy, ultimately aiming to enhance psychological health and well-being. While the apps' interface designs differ significantly, they share a common strategy: presenting themselves as altruistic, seemingly aiming to help humankind. Yet, beneath this humanistic veneer lies a more mechanistic view of human nature and brain function. Design elements such as brain/brainwave imagery, kinetic rhythms, shapes, arrows, infographics, grids, bullet lists, colours, and technical jargon are used to communicate a discourse around mental health as a problem solvable through technological intervention.

In this context, the apps present a paradox: they propose that the challenges of the high-tech era can be overcome with more technology. In other words, we must connect to *disconnect*, reinforcing the idea that our reliance on technology is both the problem and the solution. However, MHapps also imply that failure to engage in self-improvement is a matter of personal willpower, framing stress, sleep, concentration or even mental illness as individual shortcomings in coping with the modern world. By this logic, users become paradoxically both the problem and solution to their own mental health challenges (cf. Goodings, Ellis, and Tucker 2024, 9). This framing promotes a utopian vision of mobile self-care, where users are encouraged to continually strive to become the best version of themselves. This discourse rests on the premise that individuals must take personal responsibility for managing the challenges and demands posed by the complexities of our high-tech world, suggesting that self-control and self-management will unlock their inherent psychological powers.

The three MHapps stand as clear examples of how health and wellbeing are commodified through new technologies. They foster the idea that we can transform our mental capacities – and ultimately our lives – through more technology, despite the lack of clear evidence supporting their effectiveness. In the context of under-resourced health systems and the global mental health crisis, their questionable efficacy makes these apps problematic tools. Rather than keeping an undisputable focus on users' health and offering genuine solutions, these apps, structured around a script of self-management and self-improvement, simply reinforce neoliberal, entrepreneurial ideologies (cf. Bröckling 2015). Deeply embedded in an underlying entrepreneurial discourse of self-optimisation, they frame health and self-care as individual responsibilities. In this way, what initially appears as a focus on wellbeing, in fact, subtly pushes users to maximise productivity and competitiveness, positioning wellbeing as a tool for success (cf. Bröckling 2015).

These findings prompt critical questions about the ethics of promoting such apps as viable solutions to mental health struggles in a time when accessible and adequate healthcare is in short supply, urging health professionals and policymakers to critically assess the potential risks and harms these apps pose. It also opens broader conversations about how digital tools not only influence individual practices but also reshape cultural norms surrounding health and wellbeing, ultimately questioning whether these technologies are truly helping us or simply redefining our struggles as personal failures. Finally,

the commodification of mental health through these apps raises concerns about exploitation, the reinforcement of mental health stigma and the long-term impact on user well-being, particularly in the absence of proper regulation and accountability.

Note

1. According to the World Health Organization (WHO), in 2019, 970 million people globally were living with a mental disorder, with anxiety and depression the most common.

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