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Exploring Surf Therapy as a Tool for Enhancing General Self-Efficacy and Well-Being

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Abstract

Serving in the military, being a veteran, or working as an emergency worker is associated with a higher risk of developing mental health problems, including symptoms related to PTSD and depression. In the present study, we explore the effect of a new intervention for such target groups, namely surf therapy, which combines group or individual therapy with surfing instruction. Specifically, this longitudinal study ($n = 10$) examined whether participation in surf therapy is associated with improved self-efficacy (both surfing-specific and general) and mental well-being, both at the short term and the long term (1–6 months later). A 2 (Language: English versus Dutch) $\times$ 3 (Time: T0 versus T1 versus T2) linear mixed model revealed a significant increase in both mental well-being and general self-efficacy over time, both short-term and long-term. Additionally, as expected, high correlations were observed between surfing-specific self-efficacy, general self-efficacy, and wellbeing. While these findings should be interpreted with caution due to the very small sample size, they nevertheless highlight the importance and potential benefits of surf therapy for these individuals.

Key words: Surf Therapy; Military; Emergency Workers; Mental Well-Being; Self-Efficacy.

Exploring Surf Therapy as a Tool for Enhancing General Self-Efficacy and Well-Being

When serving in the army or as an emergency worker, individuals are often exposed to traumatic experiences that may have lasting psychological effects. Extensive literature shows how these individuals often have to deal with symptoms related to Post-Traumatic Stress Disorder and depression, including (but not limited to) reduced cognitive attention, trauma-related thoughts and feelings, social isolation and loneliness, as well as weakened resilience and self-efficacy (e.g., Benninger et al., 2020; Blackburn & Owens, 2015; Caddick et al., 2014; Rogers, Mallinson, & Peppers, 2014; Walter et al., 2023). While many traditional interventions target the enhancement of mental well-being of military service and working as emergency workers, there is a significant stigma on needing and receiving professional help among these individuals (Caddick et al., 2014). Aside from this restriction, traditional interventions do not optimally meet the culture of athleticism, social structure/community, as well as the psychological, environmental, and physical challenges that are inherent to the occupations and lifestyles of these individuals (Benninger et al., 2020; Caddick et al., 2014; Ponting, 2021; Rogers et al., 2014). These factors combined highlight the need for alternative interventions that address these specific needs. One of the interventions that targets all of these needs is surf therapy (e.g., Benninger et al., 2020; Britton & Foley, 2021; Caddick et al., 2014; Drake et al., 2021; Gibbs et al., 2022; Godfrey et al., 2015; Marshall et al., 2023; Moreton et al., 2022; Ponting, 2021; Rogers et al., 2014; Rosa et al., 2023; Walter et al., 2023). Thus, this paper focuses on surf therapy as a promising intervention for veterans, active-duty military members, and emergency workers. It aims to examine how surf therapy may influence mental well-being, general self-efficacy, and surfing-specific self-efficacy. The following research question is posed: “What is the effect of surf therapy on surfing-specific and general self-efficacy, as well as individuals’ mental well-being?”

Surf Therapy and Mental Well-Being

The International Surf Therapy Organization (2024) defines surf therapy as “the use of surfing as a vehicle for delivering intentional, inclusive, population-specific, and evidence-based therapeutic structures to promote psychological, physical, and psychosocial well-being.” It is a relatively new intervention that integrates surfing with structured individual and/or group therapy to enhance physical, psychological, and psychosocial well-being (e.g., Benninger et al., 2020; Drake et al., 2021; Moreton et al., 2022; Ponting, 2021). Here, mental well-being is broadly defined as a combination of hedonic (happiness, life satisfaction) and eudaimonic well-being (personal development, purpose in life, psychological functioning; Tennant et al., 2007). A typical surf therapy session consists of a (group) discussion on current wellness, psychoeducation (thematic), a surfing lesson, and a (group) debrief. While the first-ever surf therapy organization initially focused on children with Autism in 1996 (Ponting, 2021), surf therapy today is used for a wide range of populations, including individuals with mental or physical disabilities (Benninger et al., 2020; Britton & Foley, 2021), youth struggling with mental health issues (Drake et al., 2021; Godfrey et al., 2015; Marshall et al., 2023), adults recovering from addiction (see Benninger et al., 2020), adults with brain injuries (Gibbs et al., 2022), as well as emergency workers, veterans, and active duty military personnel (Benninger et al., 2020; Caddick et al., 2014; Rogers et al., 2014). We will now explore the reasons why surf therapy is one of the interventions best used for our target group.

Surf therapy falls within several categories of interventions that have been shown to help enhance the self-efficacy and mental well-being of our target group, through addressing their needs for athleticism, similar social structure, and challenges. The first and broadest category is outdoor physical activity interventions conducted in natural environments (e.g., Benninger et al., 2020; Britton & Foley, 2021; Caddick et al., 2014; Gibbs et al., 2022; Kratzer et al., 2021; Rogers et al., 2014; Rosa et al., 2023; Walter et al., 2023; White et al.,

2024). This includes any physical activity carried out in a group setting, in an environment that is not too greatly altered by human interference (e.g., mountainous areas, forests, lakes/beaches; Rosa et al., 2023). Spending time in nature is associated with benefits such as increased concentration and attention, feelings of refreshment and vigour, reduced physical arousal after stress, increased resilience and self-efficacy, and better mental well-being (Caddick et al., 2014; Gibbs et al., 2022). With the notion that different forms of physical activity yield different results (White et al., 2024), adding in physical activity generally increases the beneficial effects of spending time in nature on enhanced self-efficacy and mental well-being (Caddick et al., 2014; Kratzer et al., 2021; Moreton et al., 2022; Rosa et al., 2023; White et al., 2024). For example, research from Kratzer et al. (2021) showed that participating in a bouldering psychotherapy program significantly enhanced self-efficacy and mental well-being in their sample consisting of participants suffering from depression. Their results also showed the bouldering intervention to be comparable in effect to regular cognitive behavioural therapy, and superior to physical activity by itself (Kratzer et al., 2021).

Second, surf therapy falls within the category of Nature-Based Adventure interventions (NBAs). A systematic review from Rosa et al. (2023) showed how NBAs can improve mental well-being through battling the inability to feel pleasure, hopelessness, negative mood, and poor sleep quality. NBAs are a combination of physical activity (strenuous or not), prolonged time spent in nature, and a form of therapy; which could be anything, as long as it is an intervention aimed at improving health (Rosa et al., 2023). They pose risky, novel, and uncertain adventures, where training and skill is needed to overcome certain obstacles along the way. Examples of these interventions include wildlife camping, rock climbing, skiing, and surfing (Rosa et al., 2023). Relating this to our target group, the risky, novel, and uncertain nature of these adventures seems to meet the needs of our target group (Rogers et al., 2014).

Third, surf therapy takes place in ‘blue spaces’; natural bodies of water (Britton & Foley; 2021; Caddick et al., 2014; Marshall et al., 2023; Ponting, 2021). Overall, research has shown that physical activity in blue spaces further enhances different indices of mental well-being, including mindfulness and flow, as well as resilience and self-efficacy (Benninger et al., 2020; Caddick et al., 2014; Gibbs et al., 2022; Marshall et al., 2023; Ponting, 2021; Rogers et al., 2014). With surfing fitting into all of these specific categories, it seems to be the best fitting intervention (e.g., Benninger et al., 2020; Britton & Foley, 2021; Caddick et al., 2014; Drake et al., 2021; Gibbs et al., 2022; Godfrey et al., 2015; Marshall et al., 2023; Moreton et al., 2022; Ponting, 2021; Rogers et al., 2014; Rosa et al., 2023; Walter et al., 2023).

The unique structure and nature of surf therapy has been found to help enhance veterans’ mental well-being through increasing their ability to cope with PTSD, through experiencing new achievements in surfing (Benninger et al., 2020; Caddick et al., 2014; Rogers et al., 2014), instilling a sense of community (Britton & Foley, 2021; Caddick et al., 2014), and offering a temporary respite from PTSD and depressive symptoms (Britton & Foley, 2021; Caddick et al., 2014). In their qualitative-design study, Caddick et al. (2014) found that many participants articulated experiencing a sense of respite from their daily struggles with PTSD. Respite is defined as “The temporary absence of trauma-related thoughts and feelings, bringing about a much-needed relief from suffering” (Caddick et al., 2014). Through mindfulness and the familiar banter with other veterans, these participants reported experiencing respite during the surfing intervention, as well as continually looking forward to the next moment they could experience this respite (Caddick et al., 2014).

However, it should be noted that the respite found in the paper of Caddick et al. (2014) was only present during surfing, with some participants noting experiencing significant difficulty between sessions, as they would have to wait until the next session to experience it

again. It was not known how these veterans coped with this after the intervention ended, and how this affected their mental well-being. This shows a limitation to current research in the effect of surf therapy, namely the unknown effects of surf therapy on the longer term due to the lack of longitudinal designs in current studies, with most studies keeping below the 30-day follow-up period (Benninger et al., 2020; Ponting, 2021). Due to this gap in existing literature, the current study aimed to examine the effect of surf therapy, using a questionnaire, which is administered in a pre-test, post-test, and follow-up design one to six months post-intervention, among a small group of veterans, emergency workers, and active-duty military personnel participating in surf therapy programs based in the Netherlands and the United States. Extending from this, as well as all previous findings supporting the enhancement of mental well-being through surf therapy, our first hypothesis (H1) is as follows: “Compared to baseline (T0), surf therapy will lead to a positive change in mental well-being, both in the short term (T1) and in the long term (T2)”.

Self-Efficacy

As indicated by Marschall et al (2023), researchers are yet to find the specific pathways through which surf therapy might positively affect mental well-being. however, multiple studies on surf therapy have found increases in both well-being and self-efficacy in their samples (e.g., Blackburn & Owens, 2015; Marshall et al., 2023), some reporting effects on processes inherent to self-efficacy (Caddick et al., 2014; Gibbs et al., 2022), and White et al. (2024) even finding strong evidence for self-efficacy being a mediator between the positive relationship between physical activity and mental health. As suggested by Blackburn and Owens (2015), enhancing self-efficacy could also be a crucial factor in both the preparation and the aftermath of deployment for military personnel. For these reasons, we will now be investigating the role of self-efficacy in the relationship between surf therapy and mental well-being.

Self-efficacy is broadly defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). It reflects one's confidence in their ability to reach the goals they have set for themselves. The four key antecedents of self-efficacy, as posed by Bandura's social cognitive theory (1997), are mastery experiences, verbal persuasion, physiological states, and vicarious learning. Mastery experiences refer to past successes in the domain; verbal persuasion involves motivation and feedback from others; physiological states are related to the desired physical condition; and vicarious learning occurs through observing others succeed (Bandura, 1997; Drake et al., 2021; Gibbs et al., 2022; Jackson et al., 2020). Aside from these key antecedents, there are also components with which one can discover the nature of one's self-efficacy. Summarized by both Chen et al. (2001) and Jackson et al. (2020), they are: level (straightforward to burdensome tasks), strength (no/low to full confidence in ability), and generality (applicable/experienced in one or multiple domains; Bandura, 1997). With these inherent variations in generality of self-efficacy in mind, we will be differentiating between two types of self-efficacy: (surfing-)specific self-efficacy, and general self-efficacy (Chen et al., 2001; Jackson et al., 2020).

Surfing-Specific Self-Efficacy

Task-specific self-efficacy refers to a self-efficacy belief that pertains to a particular domain or task (Beattie et al., 2014; Chen et al., 2001; George, 1994). Applied to surfing and surf therapy, an example would be the confidence one has in their ability to 'stand up on a surfboard'. The task-specific self-efficacy in this context will now be referred to as 'surfing-specific self-efficacy'. There are different pathways through which one's surfing-specific self-efficacy may be enhanced, one of which is through mastery experiences (Benninger et al., 2020; Drake et al., 2021; Jackson et al., 2020; White et al., 2024). As participants in a surf therapy programme learn new techniques and practice their surfing skills, they can experience

a sense of achievement when attaining goals they have set for themselves (Caddick et al., 2014). Given that surfing is a challenging sport with many attainable yet demanding goals, it offers an ideal context for developing surfing-specific self-efficacy through structured goal-setting and skill progression (Beattie et al., 2014; Jackson et al., 2020; Marshall et al., 2023).

A second domain of self-efficacy that is often mentioned in both the literature of physical activity interventions and surf therapy, is the combination of social learning and social persuasion (Britton & Foley, 2021; Drake et al., 2021; Gibbs et al., 2022; Kratzer et al., 2021; White et al., 2024). For example, Kratzer et al. (2021) found that the vicarious experiences within their bouldering intervention contributed to participants' self-efficacy, as therapists and participants helped other participants achieve their goals through (verbal) persuasion. Returning to the topic of surf therapy, Gibbs et al. (2022) poses that, as seen in their participants, seeing other group members with similar difficulties succeed in their goals by sustained effort enhanced their own self-efficacy through social learning. In support of this, Drake et al. (2021) show how, in their sample of youth at risk of mental health issues, self-efficacy was enhanced through both mastery experiences and social persuasion.

In conclusion, these studies show us how learning to surf enhanced the task-specific self-efficacy in their participants. As we expect to find similar results to other studies showing an enhancement in (task-specific) self-efficacy, with our refinement of surfing-specific self-efficacy, we formulate the following hypothesis, H2a: "Compared to baseline (T0), surf therapy will lead to a positive change in surfing-specific self-efficacy, both in the short term (T1) and in the long term (T2)". As research has additionally shown the found positive effect of self-efficacy on mental well-being (e.g., Blackburn & Owens, 2015; White et al., 2024), our next hypothesis is H2b: "Surfing-specific self-efficacy is positively associated with mental well-being". Since surf therapy literature also supports the notion that self-efficacy and

related constructs may generalise to other domains (Caddick et al., 2014; Gibbs et al., 2022; Marshall et al., 2023), we now turn to this potential generalisation.

General Self-Efficacy

As mentioned before, one of the components for identifying the nature of one's self-efficacy is generality, the extent to which one's self-efficacy is experienced in one or more domains (Bandura, 1997). Where the proposed surfing-specific self-efficacy is only applicable to surfing, we will also be discussing general self-efficacy. General self-efficacy refers to the extent to which individuals are confident in their ability to achieve goals they have set for themselves in general, across a variety of domains (Chen et al., 2001). As Chen et al. (2001) noted, general self-efficacy has the same antecedents and components as task-specific self-efficacy, with the additional antecedent of the amount of previous experiences (both positive and negative).

Where Chen et al. (2001) pose that general self-efficacy can spill over into specific self-efficacy, other studies on physical activity interventions indicate the relationship to be the other way around (Kratzer et al., 2021; Marshall et al., 2023). In this study, we will follow this second notion. That is, we expect surfing-specific self-efficacy to spill over into general self-efficacy through surf therapy. In their research, Marshall et al. (2023) showed that their youth participants indicated that learning to surf enhanced their specific self-efficacy, after which they managed to generalise this self-efficacy to other life domains as well (Marshall et al., 2023). A possible pathway in which surf therapy can help participants generalise this task-specific self-efficacy is posed by Kratzer et al. (2021). In their research on a bouldering intervention, they underscore the importance of therapeutic guidance and its role in helping participants relate their own task-specific accomplishments to their own general abilities and competencies, thus fostering general self-efficacy (Kratzer et al., 2021). Where these papers explicitly mention the generalisation of self-efficacy from surf therapy to other life domains,

other studies implicitly support this notion (Blackburn & Owens, 2015; Caddick et al., 2014; Gibbs et al., 2022). These studies were united in their view that the self-efficacy developed during surf therapy can help participants cope with different issues: their personal problems (Caddick et al., 2014); stressful situations that arose through traumatic events in combat (Blackburn & Owens, 2015); and difficult experiences and emotions outside of surf therapy (Gibbs et al., 2022). In addition to this, Blackburn and Owens (2015) specifically mention how enhancing combat-related self-efficacy can help military members prepare for the combat experiences, as well as help them better cope with the aftermath of such experiences. This supports the notion that enhancing specific self-efficacy can help enhance general self-efficacy and coping (Blackburn & Owens, 2015). As we expect the same relationship between surfing-specific self-efficacy and general self-efficacy, we pose the following hypotheses: “H3a: Compared to baseline (T0), surf therapy will lead to a positive change in general self-efficacy, both in the short term (T1) and in the long term (T2)”; and “H3b: Surfing-specific self-efficacy is positively associated with general self-efficacy”. As previous studies show, this general sense of self-efficacy is also generally associated with positive mental health outcomes (Marshall et al., 2023; Jackson et al., 2020; White et al., 2024). This leads us to the third hypothesis related to general self-efficacy, H3c: “General self-efficacy is positively associated with mental well-being”.

Method

Sample and Design

The total sample consisted of 26 participants, including veterans, active-duty military personnel, and emergency workers enrolled in surf therapy programs in the Netherlands (34.6%), Charleston, USA (38.5%), or California, USA (26.9%). Of these, 76.9% identified as male, 19.2% as female, and 3.8% either as other, or chose not to disclose their gender.

After filtering for incomplete time-series (only completing T0, not T1 and/or T2) and incorrect use of personal codes, 10 participants remained, which all completed all questionnaires. These participants enrolled in surf therapy programs either in the Netherlands (50%) or the United States (50%). Of this subsample, 80% identified as male and 20% as female.

Procedure

For data collection, various surf therapy organisations were approached and invited to distribute the questionnaire and study information to participants of their upcoming surf therapy programme. The questionnaires were distributed to the organisations, and each organisation received detailed instructions on when and how to distribute the questionnaires. It was emphasized that the study was anonymous and participation was voluntary. Before completing the questionnaire respondents were asked to create a completely random code they would use for all three data collection points, allowing the different collection points to be linked without compromising anonymity. Respondents completed the questionnaire independently. Prior to the start of data collection, ethical approval was obtained from the Ethics Committee of the Department of Psychology, University of Groningen (reference number: PSY-2324-S-0201). All participants provided informed consent. Data collection took place from March 2024 until early March 2025.

This study has a longitudinal design with three data collection points: before the start of the surf therapy intervention (T0); right at the end of the intervention (T1), and 4 weeks to six months after the second collection point (T2). The online questionnaire was identical across all three time points but distributed via unique links per organization and measurement point.

Measurement

The study was conducted using Qualtrics. The questionnaire was designed in both Dutch and English, giving the participants the option to choose their preferred language (for the full questionnaire, see Appendix A). For each dependent variable, questionnaire scores were calculated by summing the item scores within a component and dividing this total by the number of items, resulting in an average score per variable.

Mental wellbeing was examined using the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) from Tennant et al. (2007). The scale ($\alpha = .93$ at T0; $\alpha = .92$ at T1; and $\alpha = .94$ at T2) consisted of 7 items, answerable using a seven-point Likert scale ranging from *never* (1) to *always* (7). A sample item is: “I feel optimistic about the future”.

General self-efficacy is a questionnaire developed by Chen et al. (2021). The scale ($\alpha = .98$ at T0, T1 and T2) consisted of 8 items, which could be answered on a seven-point Likert scale ranging from *strongly disagree* (1), to *strongly agree* (7). A sample item is: “Compared to other people, I can do most tasks very well”.

Surfing-specific self-efficacy. This measure was a modified version of the General Self-Efficacy Scale from Chen et al. (2021), where questions were modified to resemble surfing-specific examples of self-efficacy. The scale originally consisted of 8 items as well, with the same Likert scale as General Self-Efficacy. A sample item is: “When facing difficult surfing exercises, I am certain that I can do them”. A reliability analysis of the measures revealed that one item from the surfing-specific self-efficacy scale (item 8) negatively impacted internal consistency. The revised scale (excluding item 8) was used in all further analyses. The Cronbach’s Alpha was $\alpha = .94$ at T0, $\alpha = .90$ at T1, and $\alpha = .92$ at T2.

Results

Descriptive data

The correlations for all 26 participants between the variables are shown in Table 1. Correlations between the variables on T0, T1, and T2, for all 10 participants that completed

the questionnaires, are shown in Table 2. As expected, significant positive relations were found between surfing-specific self-efficacy and general self-efficacy ($ps > .85$), between surfing-specific self-efficacy and mental well-being ($ps > .53$), and between general self-efficacy and mental well-being ($ps > .61$).

Assumptions

All variables met assumptions of normality and linearity as assessed through visual inspection of Q-Q plots and histograms, with the total combined mean being slightly positively skewed at the higher end, but still meeting normality assumptions. No significant outliers were detected.

Hypothesis Testing

Hypothesis 1 was: “Compared to baseline (T0), surf therapy will lead to a positive change in mental well-being, both in the short term (T1) and in the long term (T2)”. To test this hypotheses, a 2 (Language: English versus Dutch) $\times$ 3 (Time: T0 versus T1 versus T2) linear mixed model for repeated measures was conducted using IBM SPSS Statistics Version 28.0. This analysis revealed a significant change over time, $F(2, 12775) = 6.42, p = .01$. Bonferroni-corrected pairwise comparisons indicated a significant increase from T0 ($M = 4.04, SE = .24$) to T1 ($M = 4.55, SE = .26; M_{diff} = .51, p = .02$), followed by no increase from T1 to T2 ($M = 4.64, SE = .26; M_{diff} = .09, p = .63$). There was also a significant increase from T0 to T2 ($M_{diff} = .60, p = .01$). This suggests an increase in mental well-being through time, with the biggest difference from T0 to T1, as well as a stability in the longer term, thus supporting Hypothesis 1.

Unexpectedly, language differences were also significant, $F(1, 8345) = 16.24, p < .01$, with English participants ($M = 5.33, SE = .32$) reporting higher well-being scores than Dutch participants ($M = 3.49, SE = .32$), representing a mean difference of 1.84 points, 95% CI [.79,

2.88]. The interaction between measurement occasion and language was not significant, $F(2, 12775) = .62, p = .56$.

Hypothesis 2a was: “Compared to baseline (T0), surf therapy will lead to a positive change in surfing-specific self-efficacy, both in the short term (T1) and in the long term (T2)”. The same linear mixed model for repeated measures with surfing-specific self-efficacy as the dependent variable revealed no significant main effect of measurement occasion, $F(2, 14202) = .55, p = .59$. This suggests that participants' confidence in their surfing abilities remained relatively constant throughout the program, see also Table 2. These results did thus not provide empirical support for Hypothesis 2a.

Again, an unexpected significant language effect was found, $F(1, 7924) = 35.90, p < .01$, with English participants ($M = 5.95, SE = .26$) reporting significantly higher surfing-specific self-efficacy than Dutch participants ($M = 3.77, SE = .26$), representing a mean difference of 2.17 points, 95% CI [1.34, 3.01]. The interaction between measurement point and language was not significant, $F(2, 14198) = .19, p = .83$.

Hypothesis 2b was “Surfing-specific self-efficacy is positively associated with mental well-being”. As can be seen in Table 2, a significant correlation was observed between surfing-specific self-efficacy and mental well-being, providing empirical support for Hypothesis 2b.

Hypothesis 3a was: “Compared to baseline (T0), surf therapy will lead to a positive change in general self-efficacy, both in the short term (T1) and in the long term (T2)”. The analysis of general self-efficacy showed significant changes over time, $F(2, 13491) = 6.41, p = .01$. Bonferroni-corrected pairwise comparisons revealed significant increases from T0 ($M = 4.68, SE = .27$) to T1 ($M = 5.22, SE = .28; M_{diff} = .54, p = .01$), from T0 to T2 ($M = 5.31, SE = .29; M_{diff} = .64, p < .01$), and non-significant changes from T1 to T2 ($M_{diff} = .10, p = .64$). These results support Hypothesis 3b.

A significant language effect was also observed, $F(1, 8214) = 33.69, p < .01$, with English participants ($M = 6.56, SE = .37$) scoring significantly higher than Dutch participants ($M = 3.58, SE = .36$), yielding a mean difference of 2.98 points, 95% CI [1.80, 4.16]. The interaction between measurement point and language remained non-significant, $F(2, 13491) = 1.30, p = .30$.

Hypothesis 3b was: “Surfing-specific self-efficacy is positively associated with general self-efficacy”. As shown in Table 2, a significant correlation was observed between surfing-specific self-efficacy and general self-efficacy, supporting Hypothesis 3b.

Hypothesis 3c was: “General self-efficacy is positively associated with mental well-being”. as shown in Table 2, a significant correlation was observed between general self-efficacy and mental well-being, supporting Hypothesis 3c.

Discussion

With many veterans, active-duty military personnel and emergency workers suffering from poor mental well-being (Blackburn & Owens, 2015), as well as difficulty for these groups to feel comfortable in typical clinical settings to help overcome this (Caddick et al., 2014), there is a great need for alternative treatments targeting the enhancement of mental well-being. This paper explored surf therapy, one of the most studied water-based physical activity interventions aimed at improving well-being (Britton & Foley, 2021). It explored how participation in surf therapy may influence one’s mental well-being, general self-efficacy, and surfing-specific self-efficacy, using the following research question: “What is the effect of surf therapy on surfing-specific and general self-efficacy, as well as individuals’ mental well-being?”

The current small sample ($n = 10$) consisted of veterans, active-duty military members, and emergency workers engaging in surf therapy to enhance their mental well-being. This possible enhancement was explored through a questionnaire on surfing-specific self-efficacy,

general self-efficacy, and mental well-being, which was filled out at three time points: pre-intervention (T0), post-intervention (T1), and up to six months post-intervention (T2). The results showed significant increases in general self-efficacy and mental well-being from T0 to T1 and a stabilisation into T2, while surfing-specific self-efficacy remained stable. Although constrained by a small sample size and limited statistical power, the observation of significant effects suggests that surf therapy contributed to improvements in mental well-being and general self-efficacy, with these gains maintained at follow-up. Remarkably, there were no significant changes for surfing-specific self-efficacy throughout the intervention.

Furthermore, all variables significantly correlated with each other (see Table 2), which will be elaborated upon in a later section. Unexpected significant differences in means of all outcome variables between the Dutch and American samples, as well as its implications, will be elaborated upon as well.

Interpretation of Results

Mental Well-Being

Perhaps the most important result is that surf therapy contributed to improvements in mental well-being, at both the short- (post-intervention) and the longer term (up to six months). These findings are in accordance with former studies on the effects of surf therapy, as well as other (nature-based) physical activity interventions on mental well-being. For instance, former studies on surf therapy all found positive results for mental well-being in both participants similar to ours (Benninger et al., 2020; Caddick et al., 2014; Rogers et al., 2014), and other participant groups, such as youth (Drake et al., 2021; Godfrey et al., 2015; Marshall et al., 2023), and those suffering from all different kinds of poor (mental) health (e.g., Benninger et al., 2020; Britton & Foley, 2021; Gibbs et al., 2022; Ponting, 2021; Rosa et al., 2023; Walter et al., 2023). The findings also align with the ‘blue space’ literature,

which links being in contact with natural bodies of water to enhanced mental well-being (Caddick et al., 2014).

Looking beyond surf therapy alone, studies of similarly structured interventions using different physical activities also show positive effects on mental well-being. For example, Kratzer et al. (2021) reported significant increases in mental well-being in their study using bouldering as a therapeutic intervention, with effects comparable to their group following only cognitive-behavioural therapy (CBT). In addition, Rosa et al. (2023) found that specifically mountain-based adventure- and surfing interventions were associated with increases in mental well-being.

Where most former studies only focused on the short-term effects of surf therapy, this study was among the first to investigate long-term outcomes up to six months. Our results indicated that mental well-being gains observed post-intervention (T1) were maintained at follow-up (T2), suggesting sustained benefits. Only a few studies have explored long-term effects, and those that did found no maintenance of improvements in youth samples (McKenzie et al., 2021; Olive et al., 2023), highlighting potential differences related to sample characteristics or intervention design. Given the scarcity of longitudinal research, more studies are needed to explain these discrepancies (Marshall et al., 2023).

General Self-Efficacy

The significant increase in general self-efficacy from T0 to T1 is consistent with multiple papers on surf therapy, where general self-efficacy was either explicitly mentioned or implied. For example, several papers found an increase in general self-efficacy in their samples of veterans participating in a surf therapy intervention (Benninger et al., 2020; Crawford et al., 2016; Rogers et al., 2014). In addition, Marshall et al. (2023) explain that in their youth sample, participants indicated feeling a sense of generalisation of their mastery experiences in surfing to their everyday life.

As an example of implicit mentions of general self-efficacy, Gibbs et al. (2022) reported that participants developed greater ability to manage difficult emotions and experiences outside of surf therapy, suggesting that coping skills generalized beyond the intervention. As found by several studies, and explained by Kratzer et al. (2021), the initiation and persistence of coping skills are influenced by perceived self-efficacy, meaning that studies discussing increased coping behaviours indirectly reflect growth in general self-efficacy (Caddick et al., 2014; Gibbs et al., 2022; Jackson et al., 2020; MachEachron & Gustavsson, 2012).

The found stabilisation of general self-efficacy from T1 to T2 is more difficult to compare to other studies on the same topics, as there is a substantial lack of longitudinal studies on the effect of surf therapy on general self-efficacy. However, in their therapeutic bouldering intervention, Kratzer et al. (2021) reported a similar stabilisation in a therapeutic bouldering intervention, with results comparable to their CBT group. However, future research is clearly needed to establish this stabilisation through a longitudinal design.

Surfing-Specific Self-Efficacy

While the term surfing-specific self-efficacy is first introduced in this paper, a related construct was discussed by Marshall et al. (2023). In their youth sample with poor mental well-being, they reported an increase in mastery experiences within surfing. In our study however, participants showed no such increase, but rather a stable level of surfing-specific self-efficacy. One interesting possible explanation for this stable sense of surfing-specific self-efficacy is miscalibration of self-efficacy at the start of the intervention. Calibration is the re-evaluation of one's competency throughout learning a specific task, affecting the task-specific self-efficacy (Glenberg et al., 1987; Pennings et al., 2025; Talsma et al., 2018; Zimmerman & Goins, 2015). Adults often overestimate their abilities before learning a new skill, then recalibrate as they gain experience, and end up with a more accurate sense of self-

efficacy (Pennings et al., 2025; Zimmerman & Goins, 2015). This could apply to our participants, particularly in line with research on miscalibration in military samples (Pennings et al., 2025). This recalibration could also explain why correlations between surfing-specific self-efficacy and mental well-being dipped from T0 to T1 and recovered at T2. Future studies should include objective measures of actual surfing performance alongside surfing-specific self-efficacy to test this explanation (Glenberg et al., 1987; Talsma et al., 2018).

Variable Correlations

As shown in Table 2, all variables correlated significantly with each other. Mental well-being positively correlated with both general self-efficacy and surfing-specific self-efficacy, and there was a significant positive correlation between general self-efficacy and surfing-specific self-efficacy. First, the high correlation between mental well-being and general self-efficacy aligns with prior research and is well-established in surf therapy and physical activity literature (Blackburn & Owens, 2015; Britton & Foley, 2021; Gibbs et al., 2022; Marshall et al., 2023; White et al., 2024). In addition, Marshall et al. (2023) established self-efficacy as a mediator between surf therapy and mental well-being in their youth sample.

Second, the significant correlation between mental well-being and surfing-specific self-efficacy is also in accordance with Marshall et al. (2023), who found that increases in surfing-specific mastery experiences positively influenced mental well-being. However, since surfing-specific self-efficacy is first introduced in this paper, differences in construct and operationalization exist between our study and Marshall et al. (2023), indicating a need for future research on this relationship.

Third, the high correlation between surfing-specific self-efficacy and general self-efficacy is an interesting finding, especially considering the difference in trajectory of these self-efficacies over time. Surfing-specific self-efficacy did not significantly change over time, while general self-efficacy did increase from T0 to T1, with a stabilisation into T2. This

shows us that the different questionnaires do not measure a too-similar construct, but simply correlate strongly, with an increase in correlation from T0, to T1, to T2 (see Table 2). The calibration of surfing-specific self-efficacy mentioned before could be one of the possible explanations explaining this phenomenon. Through learning to surf, surfing-specific self-efficacy becomes recalibrated and more accurate (Zimmerman & Groins, 2015). Meanwhile, sources of general self-efficacy such as mastery experiences, verbal persuasion, and vicarious influences occur throughout the intervention, allowing it to gradually increase, thus showing significant results (Jackson et al., 2020). This interplay between surfing-specific self-efficacy and general self-efficacy may also explain the growing correlation between the two. However, further research is needed to confirm or deny this relationship.

Alternative Explanations

Aside from our proposed theory of surf therapy enhancing mental well-being through self-efficacy mentioned after this section, there are plenty more possible explanations of why surf therapy can increase one's mental well-being. Some of the most researched and supported explanations within the field of physical activity interventions include respite, mindfulness, and socialising (Benninger et al., 2020; Britton & Foley, 2021; Caddick et al., 2014; Gibbs et al., 2022; Marshall et al., 2023; Ponting, 2021; Walter et al., 2023; White et al., 2024). Respite can be defined as a temporary absence of trauma-related thoughts, or as an interruption in rumination, shifting attention away from everyday thought patterns towards the act of surfing (Caddick et al., 2014; Gibbs et al., 2022).

The possibility of experiencing respite in surfing is partly due to the nature of surfing itself. During surfing, one has to be fully focused on the ocean and where one is within it, as well as the specific movements and planning needed to stand up and surf a wave (Caddick et al., 2014). This demand for present-focused attention reflects aspects of mindfulness, which has been found to mediate the relationship between physical activity and mental well-being

(White et al., 2024), and is consistently supported in surf therapy literature (Britton & Foley, 2021; Gibbs et al., 2022).

The social aspect of surf therapy also facilitates well-being: building a community within a surf therapy group instils a sense of belonging, decreases isolation, and strengthens support networks (Caddick et al., 2014; Gibbs et al., 2022). White et al. (2024) even found strong evidence for social support and social connection as mediators in the relationship between physical activity and well-being. Importantly, this sense of community has also been shown to enhance the ability to experience respite (Caddick et al., 2014).

An interesting finding is that our results showed significant differences in means across all outcome variables between the Dutch and American samples. There are many possible explanations for this, including differences in the intervention format, cultural factors, and individual differences amplified by the small sample size. As described by Carneiro et al. (2024), differences in the format of a surf therapy intervention can have significant effects on its participants and the effectiveness of the intervention. They also describe how geographical, cultural, and country differences may influence the effectiveness of surf therapy, as well as explain individual differences (Carneiro et al., 2024). The current study did not account for these factors. We therefore strongly recommend that future research provide detailed descriptions of the surf therapy interventions used and consider these variables when exploring differences between effectiveness, as well as the differences between language or cultural groups.

Strengths, Limitations, and Future Directions

This study demonstrated several notable methodological and conceptual strengths. First, although this study included a notably small sample size, it still yielded significant results. This underlines the robustness of the concepts studied and the methodology applied. One methodological strength is the validity of the questionnaires used. While the surfing-

specific self-efficacy scale was developed specifically for this study and needs to be validated in further research, it is based on the well-established General Self-Efficacy scale by Chen et al. (2021). The WEMWBS by Tennant et al. (2007) is also a well-established scale for determining one's mental well-being. As shown in the results section, all scales demonstrated high internal consistency (Cronbach's alpha), indicating that they measured their respective concepts reliably. In addition, the current study was one of the first studies to include a follow-up assessment, as well as the first to find that the found increases in mental well-being and general self-efficacy remained stable throughout this follow-up period. While there is still a great need for more longitudinal studies on surf therapy and physical activity interventions as a whole, our research does substantially add to the existing literature by showing the possible positive short- and long-term effects of surf therapy.

Furthermore, our sample consisted of organisations based in both The Netherlands and the USA. Significant effects were found across both groups, suggesting that surf therapy may show benefits across different cultural contexts. Including organisations from different countries also provides an overview of general findings across varying intervention set-ups, thereby strengthening the relevance of our results beyond a single national and interventional context.

Unfortunately, this study also dealt with multiple limitations of substantial note. Returning to the earlier strength of including an international sample, one limitation lies in the inability to control for national differences. Since we did not anticipate significant differences in means between the samples, we did not include variables that could have explained such differences, such as cultural, individual, or intervention-related factors. As a result, it is unclear whether the differences we observed reflect the effectiveness of surf therapy itself or rather broader cultural and contextual influences. Our findings should therefore be interpreted with caution when generalising to other countries and populations. We strongly recommend

that future studies account for these factors when comparing different intervention- and cultural groups.

Second, the sample size is notably small, consisting of only 10 participants completing all questionnaires. This greatly impacts the ability to come to reliable conclusions, as well as impacting the generalisability of the findings. Aside from these consequences, it also made it impossible to perform a robust mediation analysis on the relationship between surfing-specific self-efficacy, general self-efficacy, and mental well-being, as was initially planned. While Marshall et al. (2023) first found self-efficacy to mediate the relationship between surf therapy and mental well-being, more research is needed to further establish or counter this relationship. One sophisticated option for this mediation analysis would be the Hayes (2022) approach, which uses regression-based models to estimate direct and indirect effects, applies bootstrapping for robust confidence intervals, and can handle complex models including moderators and conditional processes. Further research is also needed to establish whether surfing-specific self-efficacy might increase the sense of general self-efficacy, or if this relationship might be the other way around, as there is a discourse on the relationship between similar constructs (see Chen et al., 2021; Kratzer et al., 2021; Marshall et al., 2023).

Third, while originally planned, there is no control group, which makes it impossible to compare surf therapy to different/no treatment groups. In addition to this, we do not know if the participants received additional treatment in addition to surf therapy, and could thus not control for this in our analysis. As reported in the scoping review by Benninger et al. (2020), additional treatment can greatly impact the effect surf therapy can have on one's mental well-being outcomes. This also impacts the ability to establish surf therapy as a stand-alone intervention, or if additional treatment is necessary to see benefits in mental health outcomes (Benninger et al., 2020; Walter et al., 2023). As found by Rosa et al. (2023), surf therapy was most effective in its effects on depressive symptoms when coupled with additional treatments.

In addition, the lack of a control group makes it impossible to determine whether surf therapy helps treat the causes of poor mental well-being, or only helps treat its symptoms. As mentioned before, surf therapy did help individuals develop better coping strategies (Caddick et al., 2014; Gibbs et al., 2022; Jackson et al., 2020; Kratzer et al., 2021; MachEachron & Gustavsson, 2012), but there is still a need for future research to establish whether surf therapy can be a stand-alone intervention. Future research could therefore focus on comparing surf therapy as a stand-alone intervention, to surf therapy in combination with different forms of mental healthcare.

Fourth, surf therapy is not a protected term, and can be carried out by anyone in whatever form they prefer. This causes difficulties in determining whether different or conflicting results within surf therapy literature are due to study differences, differences in participants, or simply due to differences in the intervention itself. While the International Surf Therapy Organization (2024) did establish borders within which surf therapy operates, defining it as “the use of surfing as a vehicle for delivering intentional, inclusive, population-specific, and evidence-based therapeutic structures to promote psychological, physical, and psychosocial well-being”, individual organisations can make adjustments within its borders, and not all surf therapy programmes work with this overarching organisation. Because of this, we advise further research to detail exactly how their intervention of study operated, so that different interventions/organisations can be compared in their results.

Lastly, as mentioned by Gibbs et al. (2022), a general limitation for surf therapy is its availability for the public. Not all countries have access to beaches, and not all individuals can travel there. Further research could focus on similar interventions using different sports, to see if there can be an intervention for everyone needing similar structures and communities. Examples can already be found in bouldering (Kratzer et al., 2021), swimming (Britton &

Foley, 2021), and the previously mentioned nature-based adventure interventions (Rosa et al., 2023), specifically the mountain-based interventions, as they showed the most promise.

Conclusion

The current study explored the effects of surf therapy on veterans', active-duty military personnel's, and emergency workers' self-efficacy and mental well-being. While our sample was notably small ($n = 10$), we did find significant increases in general self-efficacy and mental well-being over time. We encourage further research to study both surf therapy and comparable interventions, so all target groups that could benefit from these interventions may discover new ways to enhance their mental well-being.

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Table 1: Means, Standard Deviations, and Correlations for T0 (n = 26)

Variable	<i>M</i>	<i>SD</i>	GSE	SSSE
GSE	5.12	1.45	-	
SSSE	4.89	1.09	.86**	-
MWB	4.12	1.13	.62**	.54**

Note. GSE, SSSE and MWB are used for General Self-Efficacy, Surfing-Specific Self-

Efficacy, and Mental Well-Being respectively. * indicates correlation is significant on the .05

level (2-tailed). ** indicates correlation is significant on the .01 level (2-tailed).

Table 2: Means, Standard Deviations, and Correlations for T0, T1, and T2 (n = 10)

Time	Variable	<i>M</i>	<i>SD</i>	GSE	SSSE
T0	GSE	4.68	1.85	-	
	SSSE	4.84	1.46	.94**	-
	MWB	4.04	1.43	.83**	.82**
T1	GSE	5.01	1.74	-	
	SSSE	4.76	1.25	.90**	-
	MWB	4.52	1.21	.78*	.71*
T2	GSE	5.25	1.75	-	
	SSSE	4.88	1.21	.93**	-
	MWB	4.61	1.24	.76*	.80*

Note. GSE, SSSE and MWB are used for General Self-Efficacy, Surfing-Specific Self-

Efficacy, and Mental Well-Being respectively. * indicates correlation is significant on the .05

level (2-tailed). ** indicates correlation is significant on the .01 level (2-tailed).

Appendix A: Questionnaire items

Nr.	NL	EN-GB
	Demografische gegevens	Demographics
A	Geslacht • Man • Vrouw • Anders • Zeg ik liever niet	Gender • Male • Female • Other • I'd rather not say
B	Identificatiecode: Verzin een code van minimaal 5 en maximaal 10 tekens die uniek is voor jou. Cijfers, letters en leestekens mogen allemaal worden gebruikt. Voorbeelden zijn de naam van een ouder en je lievelingsgetal, en je favoriete eten + je geboortjaar. <u>Vergeet de code niet ergens voor jezelf te noteren</u>	Identification code: The code can be anything, as long as it's between 5 and 10 characters, and is unique to you. Beside letters, you can use numbers, and punctuation marks if you want to. Examples are a parent's name + your favourite number, your favourite food + something random, etc. <u>Make sure you remember the code (by writing it down somewhere)</u>
	Surfspecifieke zelfeffectiviteit	Surfing-Specific Self-Efficacy
	Schaal: Sterk mee oneens – mee oneens – enigszins mee oneens - niet mee eens,	Scale: Strongly disagree – disagree – slightly disagree - neither agree nor disagree – slightly agree - agree – strongly agree

	niet mee oneens – enigszins mee eens – mee eens - sterk mee eens	
1	Ik heb het vermogen om de meeste surfdoelen die ik stel voor mezelf, te halen.	I will be able to achieve most of my surfing goals that I set for myself.
2	Als ik moeilijke surfoefeningen ga doen, weet ik zeker dat het me gaat lukken.	When facing difficult surfing exercises, I am certain that I can do them.
3	Ik heb de overtuiging dat ik de meeste surfmanoeuvres waar ik me toe zet, succesvol kan volbrengen.	I believe I can succeed at most any surfing endeavours to which I set my mind.
4	Ik kan fysiek goed omgaan met lastige surfcondities.	I will be physically able to successfully overcome tough surfing conditions.
5	Ik heb er vertrouwen in dat ik effectief kan omgaan met de meeste mentale uitdagingen tijdens het surfen.	I am confident that I can perform effectively on many different mental aspects of surfing.
6	In vergelijking met anderen kan ik goed surfen.	Compared to other people, I can surf well.
7	Ik kan me goed herpakken na een vervelende situatie in het surfen.	I can recover well after an unpleasant situation in surfing.
8	Als ik eerlijk ben, dan denk ik dat ik de lastige onderdelen van het surfen <i>niet</i> goed beheers.	I'm afraid I <i>cannot</i> deal with the difficulties of surfing.
	Algemene zelfeffectiviteit	General Self-Efficacy

	Schaal:	Scale:
	Sterk mee oneens – mee oneens – enigszins mee oneens - niet mee eens, niet mee oneens – enigszins mee eens – mee eens - sterk mee eens	Strongly disagree – disagree – slightly disagree - neither agree nor disagree – slightly agree - agree – strongly agree
1	Ik heb het vermogen om de meeste doelen die ik stel voor mezelf, te halen.	I will be able to achieve most of the goals that I set for myself
2	Als ik moeilijke taken ga doen, weet ik zeker dat het me gaat lukken.	When facing difficult tasks, I am certain that I will accomplish them.
3	In het algemeen doelen kan ik de resultaten boeken die voor mij belangrijk zijn.	In general, I think that I can obtain outcomes that are important to me.
4	Ik heb de overtuiging dat ik kan slagen in bijna alles waar ik mijn zinnen op zet.	I believe I can succeed at most any endeavor to which I set my mind.
5	Ik kan goed omgaan met lastige situaties.	I will be able to successfully overcome many challenges.
6	Ik heb er vertrouwen in dat ik veel verschillende taken effectief kan uitvoeren.	I am confident that I can perform effectively on many different tasks.
7	In vergelijking met anderen kan ik de meeste taken goed uitvoeren.	Compared to other people, I can do most tasks very well.
8	Ook als het moeilijk wordt, kan ik goed presteren.	Even when things are tough, I can perform quite well.

	Welbevinden	Mental Well-Being
	Schaal: Nooit – zelden – soms – regelmatig - vaak – erg vaak - altijd	Scale: Never – rarely – sometimes - regularly – often – very often - always
1	Ik voel me optimistisch over de toekomst.	I feel optimistic about the future.
2	Ik voel me nuttig.	I feel useful.
3	Ik voel me ontspannen.	I feel relaxed.
4	Ik ga goed met mijn problemen om.	I deal with my problems well.
5	Ik denk helder.	I think clearly.
6	Ik voel me verbonden met andere mensen.	I feel close to other people.
7	Ik kan mijn eigen mening over dingen vormen.	I am able to make up my own mind about things.