Flotation-REST (Restricted Environmental Stimulation Technique) in the age of anxiety

Exploring the role and treatment applications of sensory isolation in the modern world

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DOCTORAL THESIS

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Flotation-REST (Restricted Environmental Stimulation Technique) in the age of anxiety: Exploring the role and treatment applications of sensory isolation in the modern world

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Abstract

Anxiety and the use of Complementary and Alternative Medicine (CAM), such as flotation-REST, have increased markedly during the last decades. Anxiety is reportedly a prevalent incentive for the use of CAMs, despite the present low state of knowledge about their safety and efficacy. Among the anxiety disorders, Generalized Anxiety Disorder (GAD) is currently the most treatment-resistant. There is reason to believe that non-responders to first-line anxiety treatments might be prone to turn to CAM as a solution to their ailments. Taken together, this highlights the importance of enhancing existing treatment protocols for treatment-resistant anxiety disorders, evaluation of CAMs as anxiety-treatments, as well as to investigate the information about CAM provided by private actors. In study 1, described effects relating to the use of flotation-REST were gathered from privately-owned flotation centers' websites on the Internet. Thematic analysis was used to characterize recurring patterns in the information, and subsequently the results were compared with scientific evidence. Study 2 evaluated flotation-REST as a treatment of GAD by conducting a randomized controlled trial using a GAD sample defined by well validated self-report measures. Study 3 used a phenomenological approach to characterize the experience of undergoing a flotation-REST treatment while having GAD, based on in-depth interviews with individuals that recently had completed treatment. In brief, the current thesis suggests: (1) that the advertised effects of flotation-REST, as provided by private actors, are not adequately in line with scientific evidence and thus could be misleading to consumers; (2) that flotation-REST is a promising complement to existing treatment of GAD; (3) that flotation-REST benefits individuals with GAD by continually providing a relaxing, safe and secluded setting that promotes self-awareness and contact with earlier negative experiences, physical sensations and emotions without the use of maladaptive strategies of avoidance.

Keywords: Flotation-REST, Sensory isolation, Sensory deprivation, Anxiety, Generalized anxiety disorder, Complementary and alternative medicin

Summary in Swedish - Sammanfattning

Ångesten och användningen av Komplementär och Alternativ Medicin (KAM), som exempelvis flyt-REST, har ökat markant under de senaste decennierna. Ångest har också rapporterats vara en vanlig orsak till att man använder sig av KAM, trots att det i dagsläget finns lite forskning om risker och effektivitet med dessa behandlingar. Generaliserat ångest syndrom (GAD) är i nuläget den typ av ångest-problematik som svarar sämst på rådande behandlingar. Det finns också skäl att tro att de patienter som inte svarar på rådande ångest-behandling inom sjukvården kan vara benägna att söka sig till KAM för att råda bot på sin problematik. Sammantaget så understryker detta vikten av att effektivisera vården av svår-behandlade ångestproblem, utvärdera KAM som används för att behandla ångest, samt att undersöka kvalitén av den information om KAM och dess effekter som tillhandahålls av privata aktörer. I studie 1 samlades beskrivna effekter relaterat till användning av flyt-REST in från hemsidor på Internet som användes av privata flyt-REST center. Tematisk analys användes för att finna återkommande mönster i datan, och resultatet jämfördes sedan med vetenskaplig evidens på området. Studie 2 utvärderar flyt-REST som en behandling av GAD genom att genomföra en randomiserad kontrollerad studie där urvalet bestod av individer med GAD såsom definierat av väl-validerade självskattningsskalor. Studie 3 använde sig av en fenomenologisk ansats med avsikt att karakterisera upplevelsen av att genomgå en flyt-REST behandling för GAD, baserat på djup-intervjuer som gjordes med individer som nyligen hade genomfört en flyt-REST behandling. I korthet kan fynden i denna avhandling summeras med att: (1) marknadsförda effekter av flyt-REST, som tillhandahålls av privata flyt-REST center på Internet, inte är i tillräcklig samklang med rådande vetenskaplig evidens och således kan vara missvisande för användare av metoden; (2) att flyt-REST är en lovande behandling av GAD som bör beforskas och utvärderas vidare då metoden har potential att förbättra rådande behandling; (3) att flyt-REST ger positiva behandlingseffekter för individer med GAD genom att kontinuerligt möjliggöra vistelse i en miljö som upplevs som avslappnande, trygg och avskild; samt vilket främjar själv-medvetenhet och kontakt med tidigare negativa livsepisoder, fysiska sensationer och emotioner utan att använda sig av maladaptiva undvikande strategier.

Nyckelord: Flyt-REST, sinnes-isolation, Sensorisk deprivation, Ångest, Generaliserat ångest syndrom, Komplementär och alternativ medicin

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Table of contents

List of publications

Study 1. Jonsson, K., & Kjellgren, A. (2014). Curing the sick and creating supermen: How relaxation in flotation tanks is advertised on the Internet. *European Journal of Integrative Medicine, 6,* 601-609.

Study 2. Jonsson, K., & Kjellgren, A. (2016) Promising effects of treatment with flotation-REST (Restricted Environmental Stimulation Technique) as an intervention for generalized anxiety disorder (GAD): A randomized controlled pilot trial. *BMC Journal of Complementary and Alternative Medicine, 16,* 108.

Study 3. Jonsson, K, & Kjellgren, A. (2017). Characterizing the experiences of flotation-REST (Restricted Environmental Stimulation Technique) treatment for Generalized Anxiety Disorder (GAD): A phenomenological study. *European Journal of Integrative Medicine, 12,* 53-59.

List of abbreviations

ABM	Acceptance-Based Model
AMW	Avoidance Model of Worry
APZ	Abnorme Psychische Zustände
ASC	Altered States of Consciousness
CAM	Complementary and Alternative Medicine
CBT	Cognitive Behavioral Therapy
DERS	Dysfunctional Emotion Regulation Scale
EDM	Emotion Dysregulation Model
EDN	Experienced Deviation from Normal state scale
fMRI	Functional Magnetic Resonance Imaging
GAD	Generalized Anxiety Disorder
GAD-Q-IV	Generalized Anxiety Disorder Questionnaire 4th ed.
HPT	Holistic Process Theory
IUM	Intolerance of Uncertainty Model
MAAS	Mindful Attention Awareness Scale
MADRS-S	Montgomery-Asberg Depression Rating Scale
MCM	Meta Cognitive Model
PD	Perceptual Deprivation
PSQI	Pittsburgh Sleep Quality Index
PSWQ	Penn State Worry Questionnaire

RAS	Reticular Activation System
REM	Rapid Eye Movement
REST	Restricted Environmental Stimulation Technique
RVS	Reported Visual Sensations
RR	Relaxation Response
SD	Sensory Deprivation
SSS	Sensation Seeking Scale
WHO	World Health Organization

1. Introduction

Although humans are social beings highly dependent on others for survival (Rokach, 2011), there are many examples throughout history where individuals voluntarily have sought out isolation. Many philosophers, artists and spiritual key figures have spent extensive periods in solitude, often in places with reduced variety of sensory input (such as caves, deserts or dim-lit rooms), as a way to facilitate introspection. The most prominent examples are Moses, Buddha, Muhammed and Jesus, who all allegedly received their religious insights during long periods of isolation (Storr, 1988). Among writers, Thoreau, Kafka, and Kipling have attested that extensive periods of isolation served as a crucial inspiration to some of their most important works (Storr, 1988). Within the ranks of the psychology tradition, Jung spent several years in solitude as a strategy for self-exploration, which later laid the foundation of his theories of the psyche (Jung & Jaffé, 1965). Similarly, nuns and monks from various religious traditions withdraw in solitude and meditation as part of their spiritual practices (France, 1996). In the light of this, and as proposed by Long and Averill (2003), solitude indeed seems to be a *"vital social phenomenon",* which at least to some degree has influenced society by contributing to philosophical, artistic and religious insights.

Amongst the public, individuals spend about a quarter of their waking time by themselves (Hawkley & Cacioppo, 2010). Although much psychological research has been focused on the deleterious effects of unwanted solitude (e. g. Ernst & Cacioppo, 1999), there has also been an interest in exploring the positive effects of self-chosen solitude (e. g. Larson, 1997; Long & Averill, 2003). Several clinical and social psychologists have also highlighted that solitude can be used for coping, emotional release as well as self-vitalization (Rubenstein & Shaver, 1982; Storr, 1988; Suedfeld, 1982). Sensory deprived environments and isolation have also been used with therapeutic intentions, and the first documented use allegedly extends several thousand years back (Suedfeld, 1983), starting with the oracles in Delphi and Trophonius,

where people spent time in dim-lit caves to receive divination as well as guidance regarding psychological matters (Kouretas, 1976; Papageorgiou, 1975). When pioneering experimental research on isolation and sensory deprivation started in the 1950s, it was initially suggested as a therapeutic intervention (Suedfeld, 1983). Azima and Cramer-Azima (1956, 1957) early on reported that sensory deprivation had therapeutic potential for various psychiatric illnesses. However, these early findings disappeared in the face of researchers' and founders' strong request for clarification of how physiological and behavioral variables were affected by prolonged time spent in sensory deprived conditions. It would take decades before research attention turned towards evaluating the therapeutic effects of sensory deprivation. It is clear that isolation and sensory deprivation in its various forms can have beneficial as well as deleterious effects. The question of importance then is what factors transmute isolation and sensory deprivation into a beneficial condition for human beings.

The present thesis sets out to explore flotation-REST (Restricted Environmental Stimulation Technique), a modern sensory deprivation technique, which is increasingly used outside of the health care system, allegedly as a method for relaxation, self-development and performance-enhancement (Spencer, 2015). Although flotation-REST has evidence proven-effect and to some extent is used in the health care system, the method is more commonly used in the private sector where it is marketed as Complementary and Alternative Medicine (CAM). In brief, flotation-REST is a method that often is used with the intention to induce deep relaxation and introspection by reducing sensory input while floating comfortably in salt-saturated water high in buoyance, inside of an insulated flotation tank. In the following chapter a review of the research on flotation-REST, as well as more detailed description of the method, is provided.

The use of CAMs (Barnes, Bloom, & Nahin, 2008; Eisenberg et al., 1998; Kelner & Wellman, 1997) as well as the prevalence of anxiety (Halliwell, 2009; Kessler et al., 2005; Kawakami et al., 2004; WHO, 2004) have

increased substantially in industrialized countries worldwide during the last decades. The most common incentives to use CAMs as treatments of psychiatric ailments reportedly are issues of anxiety, insomnia and depression (Eisenberg et al., 1993; Eisenberg et al., 1998). Research has not kept pace with this development in regard to the scientific evaluation of the effectiveness and potential risk of many of the CAMs that are used. This is unfortunate because the lack of research information regarding CAMs leaves more room for the non-scientific information provided by private actors, who might have other interests than effective and safe care for all. Considering that CAMs are used for the purpose of mitigating anxiety, this also suggests that a scientific evaluation of CAMs' effectiveness as treatment of anxiety is warranted. In this context, the use of CAMs as treatments of anxiety disorders which indicate treatment-resistance is of special interest to evaluate, as failure to reach remission by conventional medicine might make individuals with these types of anxiety disorders prone to seek out CAM as a cure for their ailments. The rationale of evaluating CAMs for treatment-resistant anxiety disorders is twofold: besides generating research information regarding CAMs' efficacy and safety, it also constitutes a possibility to discover treatments that work, which then, potentially, can be usefully integrated in existing treatment protocols. To this end, the current work has a focus on evaluating flotation-REST as a treatment of Generalized Anxiety Disorder (GAD), as the disorder has been indicated as relatively treatment resistant compared with other types of anxiety disorders (Borkovec & Ruscio, 2001; Newman et al., 2013; Ninan, 2001; Yonkers et al., 2000). Treatment strategies of treatment-resistant GAD is, in addition, not well-established (e. g. Menezes, Fontenelle, Mululo, & Versiani, 2007), and despite the indication that psychopharmacological intervention strategies have been effective (e. g. Baldwin & Polkinghorn, 2005), both patients and clinicians generally prefer other forms of treatment (Tyrer & Baldwin, 2006), which underlines the importance of further developing non-pharmacological treatment strategies that are safe and effective. The choice to evaluate flotation-REST was foremost based on previous research indicating that the method could mitigate the symptoms and comorbidity associated with GAD (Ballard, 1993; Bood,

Kjellgren, & Norlander, 2009; Bood, Sundequist, Kjellgen, Nordström, & Norlander, 2007; Bood et al., 2006; Kjellgren, Sundequist, Sundholm, & Norlander, 2001; Kjellgren & Westman, 2014). In addition, the method is mainly used as a CAM outside of the healthcare system despite having evidence-proven effects (Spencer, 2015), which makes it a relevant CAM to evaluate as it potentially could enhance the existing treatment protocols of GAD.

The main aim of the present thesis was to explore two primary questions: (1) is the information provided by privately owned flotation-REST centers regarding flotation-REST effects in line with existing scientific evidence? (2) Is flotation-REST a valid treatment option for individuals with GAD? An additional question was also explored: (3) if flotation-REST has beneficial effects for individuals with GAD, what are the mechanisms underlying these effects?

2. Isolation and sensory deprivation

2.1 Terminological considerations

The research on sensory deprivation and isolation currently lacks a consensus regarding standard terminology (see Brownfield, 1965 for a list of 25 words). This has resulted in a rather heterogeneous vocabulary referring to a similar area of research: techniques or conditions that influence the organism by reducing the meaningfulness and/or level of sensory input. The plethora of terms is closely related but sometimes underlines important distinctions. Against this background, it is important to make some initial reflections regarding the terminology that is used in the present thesis.

Firstly, the term *isolation* can refer to several possible situations. One can be isolated by free will, for example, out of a wish to experience the effects of spending time outside of civilization, as Thoreau did when he set out on an expedition into the wild (Storr, 1988). One can be isolated out of a professional necessity (e.g. astronaut) or a role given by the cultural context (e. g. shaman). Isolation can also be forced upon the individual by society (e.g. imprisonment), by accident (e. g. shipwrecked), or by natural occurring processes (e.g. aging). A crucial distinction can also be made between solitary isolation and groups in isolation. In addition, it is important to consider what the individual is isolated from when using the term. Most important for the present thesis is the distinction between social isolation and sensory isolation, although these different types of isolation often co-occur.

Brownfield (1965) has highlighted several terms related to isolation which provide information about the context in which the isolation takes place. *Confinement* refers to isolation within a restricted space (e.g. a submarine or space craft); *separation* refers to isolation from a specific object of importance (e.g. a loved one, one´s hometown); and *removal* refers to being removed from one´s environment on a more absolute level (e.g. socially or stimulus wise). Brownfield (1965), in addition, underlines that *monotonizing* external stimuli can be equated with a

reduction or removal of external input: *"…when a stimulus becomes monotonous, unchanging, invariable, and boring, that stimulus loses its ability to evoke a response – it is adapted to, and not consciously perceived – almost as if it did not exist"* (Brownfield, 1965, p. 9). Although this statement is debatable, monotonizing sensory input has extensively been used in research on sensory deprivation and has been shown to produce similar effects as sensory isolation techniques, foremost in non-therapeutic research (Zubeck, 1973). In the present thesis I refer to techniques aiming at monotonizing sensory input as Perceptual Deprivation (PD) and to techniques aiming to reduce sensory input as Sensory Isolation (SI). The term Sensory Deprivation (SD) is here used as a general reference to techniques or contexts which substantially reduce the variety or level of sensory input.

In the present thesis the focus is on effects resulting from self-chosen solitary SI taking place in a therapeutic context. The SI technique in focus is flotation-REST. The technique comprises short (e.g. 45 minutes) and repeated sessions of sensory isolation while floating comfortably in water inside of an insulation tank. According to the terms considered by Brownfield (1965), flotation-REST provides isolation through confinement (a flotation tank) and removal of sensory input (e.g. darkness, silence). Flotation-REST has also mainly been used within research evaluating the therapeutic potential of the method. However, because research on flotation-REST to date is quite limited, and because research on SD with non-therapeutic focus is relevant to the present thesis to a varying degree, selected parts of non-clinical research is also reviewed in this chapter. The selection of non-therapeutic research has primarily been based on to what degree it relates to therapeutic application of SD. Research studies on isolated groups in sensory deprived environments and the deleterious effects of undesired social isolation are not treated in this thesis.

2.2 Anecdotal reports from natural settings

Systematic research on subjective experiences resulting from SD in natural settings is rather scarce. Most information on this matter comes

from dramatic anecdotal reports such as experiences of being shipwrecked, imprisoned, trapped in mines, or part of polar expeditions gone wrong (Liederman & Stern, 1961; Spitzer, 1988). These reported experiences are characterized by unsettling changes in the perception of reality and oneself, as for example vivid hallucinations, emotional instability, bizarre ideation, and a feeling of losing contact with one´s identity (Spitzer, 1988). Reviews of anecdotal descriptions of solitary experiences of isolation in sensory deprived environments (e.g. Bombard, 1953; Byrd, 1938; Ritter, 1954;), paradoxically include accounts of spiritually toned experiences among all the deleterious effects described, such as perceiving oneself to be one with the universe (Byrd, 1938), seeing one´s past life in a vision (Ritter, 1954), and development of a strong sense of conviction of the meaningfulness of the situation experienced (Bombard, 1953). It is also important to bear in mind that many of the experiences of SD and isolation in natural settings have taken place under extreme conditions, and in addition often without a context giving meaning to the hardships endured. This in part might explain the high frequency of deleterious and negative effects reported. In contrast, more meaningful and sought after effects from isolation and SD seem to result when it is self-chosen out of a conviction that it will lead to positive and desired effects, as utilized by artists (Storr, 1988), for example, or within religious contexts (France, 1996).

2.3 Experimental research

In the 1950s there was a marked increase in the interest to experimentally explore how humans were affected by SD. More specifically, it involved how physiological and behavioral variables in human subjects were affected by a reduction in the level or variety of sensory information. The methods used to achieve this varied (see Rossi, 1969, for a review), but in general a distinction was made between SI techniques and PD techniques (Zubeck, 1973). This division is justified because the effects resulting from these experimental conditions, although similar, differ to some extent (Zubeck, 1964). In research utilizing SI techniques the aim was to reduce the level of sensory input as much as possible, for example, by letting subjects spend time in

soundproof and dark chambers with the instruction to lie still on a mattress. Cotton gloves, cardboard cuffs, and earplugs were often used to further minimize the level of sensory information. In research using PD techniques the aim was to keep the sensory input at a fixed level of intensity, while depriving the sensory information of as much meaning and variety as possible. This was achieved, for example, by letting the subjects lie or sit still in a chamber wearing cotton gloves, cardboard cuffs, and translucent googles that diffused and removed all patterning of the visual input. In addition, a masking sound (e.g. white noise, hum from a fan) was provided in both ears. It is also important to acknowledge that the duration of the conditions employed in the experiments varied from one hour to several days (Rossi, 1969; Zubeck, 1973).

2.3.1 The pioneering studies

The first initiative to investigate SD and isolation in experimental settings started in 1951 at McGill University of Montreal. Initially the research aimed to clarify mechanisms behind *"brainwashing"*, but there was also an increasing demand from the state and military to explore how individuals respond to spending extensive periods in monotonous and socially isolated environments, such as space-crafts, submarines and radar stations (Suedfeld, 1969a). In addition, the interest in studying the Reticular Activation System (RAS) and its function to maintain a general level of arousal in the organism (e.g. Moruzzi & Magoun, 1949), especially relating to the variety and levels of sensory input, also contributed to the increased interest to study SD techniques.

The early studies reported many peculiar and sometimes unpleasant effects resulting from both short (hours) and long (days) duration of SD conditions. These findings relied mostly on subjective accounts and self-report measures (e. g. Bexton, Heron, & Scott, 1954; Heron, Doane, & Scott, 1956). The most prominent effects reported were that SD resulted in restlessness, emotional instability, increased suggestibility, changes in body image, vivid autobiographical memories, hallucinations, and cognitive deficits (see Zuckerman, 1964, for a review).

2.3.2 Susceptibility to influence

The early studies reported that participants were more likely to accept information that did not correspond to their existing world view, such as propaganda and fringe facts (e.g. the existence of ghosts, telepathy, psychic research; Bexton, 1953; Scott, Bexton, Heron, & Doane, 1959) after a long period of PD conditions. Although subsequent studies both failed (Myers, Murphy, & Smith, 1963) and succeeded (Suedfeld, 1969b) to influence participants with propaganda after 1-2 days of SI, Donald Hebb, the head researcher at McGill, commented in a report (Hebb, 1958) early on that changes in attitudes after providing propaganda during or after PD seemed to be the only lasting effect from PD. Later on Zubeck concluded that *"Although it is clear from this review of the literature that SD-PD conditions can produce an increased susceptibility to influence, little is known about the variables that may affect its magnitude and nature"* (Zubeck, 1973, pp. 27-28).

2.3.3 Effects on cognition

Early studies also claimed that PD (e. g. Scott et al., 1959) and SI (e. g. Suedfeld, Grissom, & Vernon, 1964) produced cognitive deficits based on cognitive testing. In this respect, SI seemed to produce less or no deficits in regard to structured and simple test of cognition (e.g. verbal fluency, numerical tasks, anagrams; Zubeck, Sansom, & Prysiazniuk, 1960; Weinstein, Richlin, Weisinger, & Fischer, 1967), but produced the same deficits as PD in regard to more complex and unstructured cognitive tasks (Suedfeld et al., 1964). In addition, positive effects on cognitive performance after SI were also reported, such as improved rote learning (Vernon & Hoffman, 1956), improvements in immediate memory span for digits (e.. g. Cohen et al., 1961), as well as enhanced memory of meaningful information (e.g. prose, drawings; e.g. Grisom, 1963; Suedfeld & Landon, 1970).

2.3.4 Reported visual sensations

The finding from the initial SD research that attracted most attention from the research community and public alike was the claim that PD

produced hallucinations. The majority of the participants in the early McGill studies, after spending several days in PD, reported experiences of hallucinatory-like visual phenomena's (Bexton et al., 1954). These hallucinatory-like experiences were subsequently labeled Reported Visual Sensations (RVS; Zubeck, 1973). The reason that the finding got so much attention was probably due to its unexpectedness, its relevance to neurophysiological and psychoanalytical research, and that it confirmed anecdotal reports of SD and isolation in natural settings (Zuckerman, 1969a). The finding also awoke interest in clinically oriented groups that wanted to research psychosis and drug-intoxication under controlled experimental conditions by using RVS induced by SD as analog states (Zubeck, 1973).

Although most RVS comprised simple visuals such as flashes of light or geometric shapes, more complex visuals were also reported, such as natural scenery, bizarre architecture, people and so forth (Zuckerman, 1969a). Perplexingly, subsequent studies, which tried to replicate the findings of McGill, reported mixed results. Most of the studies using long-duration of PD conditions (1-16 days) reported low frequency of RVS (e.g. Arnhoff, Leon, & Brownfield, 1962; Vernon, Marton & Peterson, 1961), while studies using short-duration of SI or PD (1-12 hours) reported RVS as fairly common (e.g. Davis, McCourt, & Solomon, 1960; Goldberger & Holt, 1958) although never as frequent as reported by the McGill studies.

In an attempt to resolve the conflicting results, several subsequent studies aimed to clarify what mediated the frequency and complexity of RVS during SD. Zuckerman (1969b) summarized the results from these studies and concluded that the method used (SI or PD), duration of the condition employed, demographic variables (sex, age, education level), personality type, participants level of arousal, and the method used for reporting experiences during the experiments, were all variables of potential importance. However, it is important to underline that no consensus was reached regarding the most important variables, due to conflicting results. For example, RVSs of both simple and complex type

were reported in both short-duration (1 – 12 h) and long duration (1-16 days) experiments regardless of method used (Zuckerman, 1969b). RVS were also most frequently reported within the first hours of SD (Zuckerman, 1969a). In addition, Zuckerman (1969a) concluded in his review that on average 20 % of participants in SD experiments will experience complex visuals and 50 % simple visual. In the light of the findings, Zuckerman (1969b) suggested that it is not surprising that many studies using small samples would fail to report occurrences of RVS.

Other studies focused on characterizing the RVS during SD by comparing it to the experiences of psychedelic drugs and psychosis. One study (Malitz, Wilkens, & Esecover, 1962) comparing experiences of psychosis to experiences of psychedelic drugs (e.g. LSD, Mescaline) concluded that the reported RVSs during SD were a distinct phenomenon, but resembled experiences resulting after ingestion of psychedelic drugs more than experiences of acute psychosis or schizophrenia. Another study (Bliss & Clarke, 1962), which qualitatively compared alterations in consciousness as induced by various circumstances (e.g. SD, schizophrenia, psychedelic drugs), claimed that the contents of RVS during SD (e.g. geometric forms, flashes, landscapes, humans, animal forms) were most similar to the hallucinatory-like experiences resulting from psychedelic substances, but pointed out that these drug-induced hallucinations were markedly more vivid, colorful, detailed and persistent (Bliss & Clark,1962). Based on Feinberg's (1962) comparison of drug-induced hallucinations and psychotic states, Zuckerman (1969a) concluded that a RVS during SD differs from psychotic hallucinations, primarily by being visual (seldom acoustic), experienced with closed eyes (not open), and by being manifested gradually (not suddenly) and separate from strong affect and delusion.

2.4 Early clinical studies

The initial McGill studies (e.g. Bexton et al., 1954; Heron, Bexton, & Hebb, 1953) sparked interest in some small research teams to explore if SD techniques could be used therapeutically. Studies also emerged that

highlighted the importance of individual differences and settings in promoting positive experiences of SD (Ruff, Levy, & Thaler, 1961; Vernon et al., 1961). Defined time limits, control, voluntariness, and the intention surrounding the employment of SD were primarily underlined as variables of importance in reducing previously observed negative effects such as anxiety and restlessness (Ruff et al., 1961).

Azima and collegues (Azima & Cramer, 1956, 1957; Azima, Vispo, & Azima, 1961) were first to report that SD had therapeutic benefits for clinical populations comprising depressed, borderline and obsessive patients. The patients spent between two to six days in a SI condition (M = 4 days), with intermittent interviews conducted by a therapist (1-3 times a day), and the intervention had the explicit intention to help the patients. Their findings indicated increase in self-esteem and substantial reduction in symptom severity for depressed and borderline patients, while none or negative effects (e.g. anxiety, restlessness) were reported for obsessive patients (Azima & Cramer, 1956, 1957; Azima et al., 1961). Studies also employed short duration SI or PD (Cohen et al., 1959; Luby et al., 1962), without pronounced therapeutic intention, in mixed clinical samples comprising schizophrenics, sociopaths, neurotics and healthy individuals. In general, the schizophrenic patients and sociopaths reported symptom reduction and stress-relief while the healthy and neurotic individuals tended to report anxiety and restlessness, especially during PD. Another study (Harris, 1959) similarly reported that schizophrenic patients tolerated short-duration (1 h) of SI to a higher degree than healthy individuals, and in addition found that the schizophrenics experienced symptom reduction, especially if they were hallucinating pre-treatment. Later studies substantiated Harris (1959) findings by demonstrating that manifest hallucinations in healthy individuals, as induced by a psychedelic drug (PCP), could be mitigated by SD (Lawes, 1963; Luisada and Brown, 1976; Luisada, 1978).

Although these early findings should be seen as initial exploration of the therapeutic potential of SD techniques, the conclusions drawn at the time were that certain patient groups seemed to benefit from SD (e. g.

15

Azima et al., 1961), that SI had more potential as a therapeutic intervention than PD (Cohen et al., 1959; Luby et al., 1962), and that short duration treatment seemed sufficient to induce positive treatment effects while at the same time reducing the risk of negative experiences (Brownfield, 1965).

2.4.1 Individual differences predicting treatment response

Subsequent studies focused on clarifying how to optimize therapeutic application of SD for predictable therapeutic effects. Several studies found support for the important part that individual difference played in determining the degree of positive changes following SD in both patient groups (e. g. Cooper, Adams, & Gibby, 1962; Cooper, Adams, & Cohen, 1965) and healthy individuals (Goldberger, 1961, 1962). More specifically, studies using patient samples indicated high symptom severity (Adams, Cooper, & Carrera, 1972), low prognostic rating for psychotherapy (Cooper et al., 1962) and the use of dysfunctional coping strategies (e.g. repression, acting out aggression; Cooper et al., 1965) as predicting positive treatment effects of SD. While high prognostic rating for psychotherapy (Cooper et al., 1962), high social competence, and use of coping strategies that tended to be complex (e. g. intellectualization, projection) and externally focused (e. g. attributing short-comings to others) predicted negative or no treatment effects from SD (Cooper et al., 1965). In sum these findings led researchers to suggest that SD seemed to work best for those who were the least suitable for psychotherapeutic interventions (Brownfield, 1965). Regarding healthy individuals Goldberger (1961, 1962) found that openness towards emotions as well as flexibility in emotional responses were the factors of most importance in predicting positive change from SD, while inflexible emotional response and overly analytical coping strategies predicted none or negative change.

2.5 Flotation-REST (Restricted Environmental Stimulation Technique)

During flotation-REST an individual is lying in a supine position inside of a sound and light isolated tank filled with salt saturated water maintained at skin temperature (35 º C). Earplugs are used to further minimize acoustic input. The salt is gentle to the skin (Magnesium sulphate; Epsom Salt), and the water salinity gives high buoyancy which, when combined with a low water level (about 30 cm), entails maximum security. The water is filtered and processed between each use to ensure that the water is clean and hygienic. Flotation-REST treatment comprises a strong reduction of sensory input while inducing an experience of near weightlessness through floating in the saline-dense water. Contrary to most SD conditions employed in research, flotation-REST has mostly been used in therapeutic settings, where the method often has been applied repeatedly (on separate days) for a short duration (1-2 h). In addition, the method has extensively been used in the private sector where it has been promoted as an alternative therapy for stress management, self-development, as well as performance enhancement (Spencer, 2015). No adverse reactions to flotation-REST have been documented in the research literature, possible because the method has mainly been used in treatment- and performance enhancing contexts, and there applied for short durations. Very few participants terminate flotation-REST treatment before its completion (less than 5 %; Borrie, 1999). Generally, flotation-REST is experienced as relaxing and pleasant, and the majority of those who try it are prone to repeat the experience (Borrie, 1999). In addition, one study (Norlander et al., 2001) reported that participants experienced low level of fear and discomfort during the flotation-REST based on post-treatment self-rating.

Flotation- REST as we know it today was invented 1954 by the medical doctor, neuroscientist, and psychoanalyst John C. Lilly (1972, 1977). Although Lilly was mainly interested in doing basic research on the effects of SD on the brain and mind, he and his colleges were the first to discover that flotation-REST could produce therapeutic effects. Lilly and his research team tested flotation-REST on themselves and found it to be

relaxing when applied for shorter durations, and reported that it mitigated stress, anxiety, pain, and sleep difficulties (Spencer, 2015). These observations were at the time not relevant for their research, and therefore did not receive much attention. However, the observed positive effects leaked out from the laboratory. As a consequence, flotation tanks were eventually manufactured for commercial use, and during the 1980s flotation-REST became available through privately owned flotation tank centers in a dozen countries (Spencer, 2015).

2.5.1 Early observations

Flotation-REST initially became popular as a method to enhance performance in sports. Sport psychologists observed that flotation-REST could be applied to increase the control of stress, speed up recovery from hard physical training and matches, as well as to increase the effectiveness of mental training (Hutchison, 1984; Lee & Hewitt, 1987; Stanley, Mahoney, & Reppert, 1987; Suedfeld & Bruno, 1990). Support that flotation-REST enhances restoration from challenging sports training regimes (elite athletes) has also been replicated in contemporary research (Driller & Argus, 2016). Parallel with the early observations in the field of sport psychology several researcher reported other positive effects of flotation-REST, such as mild euphoria (Schultz & Kaspar, 1994), well-being and relaxation (Mahoney, 1990), increased originality (Forgays & Forgays, 1992), increased sleep quality (Ballard, 1993), lowered blood pressure (Fine & Turner, 1982), as well as reduction of stress and anxiety (Fine & Turner, 1982; Suedfeld, 1983; Schultz & Kaspar, 1994). In addition, flotation-REST was found to be a promising complementary intervention alongside psychotherapy (Jessen, 1990; Mahoney, 1990). Despite the fact that the pioneering research on the potential therapeutic effects of flotation-REST often had methodological shortcomings (e.g. small sample size, lack of control condition), and varied in how the method was applied (e.g. number and duration of sessions), a subsequent meta-analysis including this research (van Dierendonck & te Nijenhuis, 2005) concluded that flotation-REST was an effective method for reducing stress, increase well-being and enhance performance.

2.5.2 The second wave of flotation-REST research

The second wave of flotation-REST research was initiated 1998 by a small project collaboration with the Olympic Support Center in Örebro, Sweden. Some years later the Human Performance Laboratory at Karlstad University was established, utilizing three flotation-tanks in a controlled setting. One of the main goals of the research initiative was to establish methodological principles for therapeutic research on flotation-REST, to enable a more systematic investigation. A treatment program consisting of two flotation sessions (a 45 minutes) a week for three weeks, followed by one week without flotation, and an additional subsequent three-week treatment period (i.e. a total of 12 flotation treatments in 7 weeks) was established. The treatment, in addition, comprised a safe setting surrounding the flotation sessions, which made it possible to relax before and after the float session in a secluded environment. In addition, staff was always present and could be called upon, even from inside of the tank by the click of a button. This so called *"12-float program"* was demonstrated to be sufficient in effectively inducing relaxation and relief from chronic pain conditions (Bood, 2007). One study showed that when flotation-REST was applied extensively (30 sessions) the benefits, in regard to pain and stress reduction, increased marginally compared to the *"12-float program"* (Bood, Sundequist, Kjellgren, Nordström, et al., 2007), except in some cases of severe fibromyalgia and whiplash associated disorder (Edebol, Bood, & Norlander, 2008).

2.5.3 Methodological findings

Flotation-REST has been investigated to determine if potential placebo effects can account for some of the treatment effects. A series of studies could not find that the method was influenced by certain placebo effects associated with attention (Bood et al., 2005), expectation (Norlander, Kjellgren, & Archer, 2001), or personality (Kjellgren, Lindahl & Norlander, 2009b). More specifically, the experiment regarding attention-placebo showed that when the laboratory staff gave double amount of attention to the participants, it did not have any effect on

treatment outcome compared to control condition (normal amount of attention). The experiment on expectation-placebo showed that neither setting (fantasy-like vs. strict) or previous experience of Altered State of Consciousness (ASC; e. g. as induced by meditation, hypnosis, psychoactive drugs) impacted treatment outcome in respect to pain reduction or mood enhancement. The experiment on how personality influenced flotation-REST showed that the trait sensitivity, as defined by the Highly Sensitive Personality (HSP) scale, did not have any effect in regard to comfort and stress reduction during flotation. However, later studies (**Jonsson**, Grim, & Kjellgren, 2014; Kjellgren, Lindahl, & Norlander, 2009a) reported that sensitive individuals experience more ASC during flotation sessions compared to non-sensitive individuals. In addition, one study (Bood, Kjellgren & Norlander, 2009) reported no difference concerning how women and men were affected by flotation-REST treatment in regard to reduction of pain, anxiety, as well as in regard to increase in energy and sleep quality. However, a gender difference in regard to depression was found (Bood et al., 2009), in which women displayed higher depression scores before treatment and reached the same levels as for the men at post-treatment.

2.5.4 Clinical findings

The main clinical findings from the second wave of flotation-REST research were that the method effectively induced relaxation in patients with severe stress related ailments (Bood, Sundequist, Kjellgren, Norlander et al., 2006), and that patients with chronic pain conditions improved markedly (Bood et al., 2005; Kjellgren, Sundequist, & Norlander, 2001). In addition, Bood and collegues (2005) found that the use of alcohol and psychoactive medications were lowered by treatment. Ancillary measures in these studies (Bood et al., 2006; Bood et al., 2005; Kjellgren et al., 2001) indicated improved sleep, increase in optimism, as well as reduction of depression and anxiety, in both patients with stress-related ailments and healthy individuals. One study also indicated that all of the beneficial effects were maintained at the 4-month follow-up in a patient sample with stress-related ailments (Bood et al., 2006).

The observed findings that flotation-REST lowered level of stress, and induced relaxation, was indicated both by well validated self-report measures, as well as by measurements of stress-related physiological markers, such as cortisol and noradrenaline metabolite MHPG (Bood et al., 2006; Kjellgren et al., 2001). The level of these physiological markers was significantly lowered by treatment in patient samples with stress-related ailments (Bood et al., 2006; Kjellgren et al., 2001). Interestingly, another hormone, namely prolactin, was shown to rise in patients with stress-related ailments during flotation-REST treatment and then stabilize at normal levels at 4-month follow-up (Bood et al., 2006). Prolactin was named after its ability to promote lactation in mammals, but later research has suggested that the hormone plays a multitude of roles, among other things it affects the immune-system as well as homeostatic processes (e.g. Freeman, Kanyicska, Lerant, & Nagy, 2000). The implications of this observation are yet not clear, but they could imply that some sort of restorative process was initiated physiologically by the flotation-REST treatment.

The investigation of flotation-REST beneficial effects in a therapeutic context were also examined by combining flotation-REST with psychotherapy, and by doing so attempted to follow up earlier findings from Jessen (1990). These investigations (Kjellgren, Buhrkall & Norlander, 2011; Åsenlöf, Olsson, Bood, & Norlander, 2007) concluded that both patients and the psychotherapists subjectively experienced that the therapeutic process became more efficient. One of the studies (Åsenlöf, et al., 2007) observed that some beneficial effects from the treatment persisted 18-months later. Secondly, a pilot-study reported that the combination of flotation-REST and a psychotherapeutic intervention could prevent sick-leave for individuals with high stress-load and burn-out syndrome (Kjellgren, Buhrkall & Norlander, 2010).

2.5.5 Performance enhancement

A series of experiments strengthened Forgays and Forgays' (1992) findings that flotation-REST increased originality immediately after a flotation session (Norlander, Bergman & Archer, 1998; Norlander, Kjellgren & Archer, 2003; Sandlund, Linnarud & Norlander, 2001). One study on performance (Norlander, Bergman & Archer, 1999) also found that athletes experienced marksmanship as more effortless, and that elite archers performed more consistently, after flotation-REST. It is worth noting that some of these performance enhancing effects of flotation-REST, especially creativity enhancement (originality), in a salutogenetic perspective (Antonovsky, 1987) can be seen as health promoting effects in that they have potential to move an individual towards the healthy pole of the illness-health continuum. This highlights that the distinction between therapeutic and performance enhancing effects of flotation-REST might not be as clear cut as it appears at first glance.

2.5.6 Altered states of consciousness

The research at Karlstad University comprised exploration of ASC as induced by flotation-REST. Degree of ASC during flotation has been extensively assessed in studies (e. g. Kjellgren et al., 2001; Norlander et al., 2001) by utilizing the Experienced Deviation from Normal state scale (EDN). The scoring on EDN ranges from 0 - 100, and a score of 30 on the first flotation session and approximately 40 on the subsequent sessions has in previous studies (e. g. Kjellgren et al., 2001) been considered to indicate an adequate treatment response. By comparison, a typical scoring when resting in a dark room has been reported to be 15 (Kjellgren et al., 2007). The EDN is based on the standardized psychometric instrument APZ (Abnorme Psychische Zustände) that was developed to assess ASC in human subjects, as well as the psychometrically improved and extended version OAVAV (Dittrich, 1998). The APZ comprises three main dimensions ("oceanic boundlessness", "dread of ego dissolution", and "visionary restructuralization") derived from the administration of the APZ to asses

ASCs as induced by various methods. The OAVAV contains two additional dimensions ("reduction of vigilance", and "auditative alterations") and has been validated in German (Dittrich, 1998). One study on flotation-REST as a treatment of muscle tension pain (Kjellgren et al., 2001) suggested that the ASC experienced during the flotation sessions mainly related to deep relaxation, as the items with highest scoring were associated with bodily pleasure and relaxation, dreamlike imagery, experiences of weightlessness, as well as feelings of deep peace. Another study (Kjellgren, Sundequist, Sundeholm, & Norlander, 2004) explored differences in the level of ASC between flotation-REST compared to a dark and silent chamber condition using a sample of healthy participants. The main finding was that flotation-REST induced more ASC then the dark and silent chamber condition. Kjellgren and collegues (2004) also found that individuals who experienced a high degree of ASC during flotation-REST experienced significantly more pain and stress than individuals experiencing low levels of ASC in the same condition when pain (blood test) was induced after the flotation session. This result was explained by earlier research (e. g. Ludwig, 1990), which suggests that ASC is associated with heightened sensitivity and awareness of internal processes. ASC was also explored phenomenologically (Kjellgren, Lyden, & Norlander, 2008) by interviews with eight healthy participants in regard to their experience of flotation-REST. Besides deep relaxation, the experience of flotation-REST was characterized to induce various types of ASCs. The induced ASC effects were primarily changes in time perception, feelings of weightlessness, out of body experiences, as well as mental imagery (complex imagery; movie-like). Two participants also reported that they re-experienced their own birth, experiences that were characterized as profound and emotionally intense. Considering that two later studies (Kjellgren et al., 2009b; **Jonsson et al., 2014**) indicated that individuals high in sensitivity tend to experience more ASC during flotation, it might be that strong ASC during flotation is reserved for certain types of individuals.

2.5.7 Neuro-imaging findings

In a recent neuro-imaging study with healthy participants, Feinstein (2016) for the first time reported on how the brain is affected by flotation-REST. In his study he used a modified flotation-REST condition comprising 90-minute flotation sessions on three separate occasions in a pool filled with Epsom salt. The flotation pool was located in a room where audio and visual input were reduced to a minimum (dark and silent). In total, 40 participants were randomized to either the flotation condition or an active control condition. Baseline fMRI brain scans were performed prior to randomization, as well as directly after the third flotation session. Each brain scan comprised four separate tasks and the analyses conducted checked for Group x Time interactions under resting state functional connectivity, interoceptive attention, as well as emotion and reward processing. The main findings were that, in comparison with the active control condition, flotation-REST significantly heightened levels of serenity and relaxation, while reducing stress and anxiety. Flotation-REST also significantly increased interoceptive sensations, particularly regarding heart beat and breathing, thus indicating that flotation-REST, while minimizing external sensory input, enhances awareness of interoceptive sensations. The enhancement of interoceptive sensations was also associated with increased activity in the insular cortices. In terms of function the insular cortices have been associated with interoceptive awareness, motor control, homeostatic processes, self-awareness, and social emotions (for review, see Nieuwenhuys, 2012). For the present thesis, the link between interoceptive awareness and emotional awareness is relevant, and it is an old debated subject in the field of psychology (e. g. James, 1884; Lange, 1885). In contemporary neuro-biological research, it has been suggested that the experience of emotions are based on interpretations of alterations in the physiological state of the body (e.g. Seth, Suzuki, & Critchley, 2011), and several studies have also highlighted the insular cortex as a crucial area for both interoceptive and emotional awareness (Craig, 2010, 2011; Singer, Critchley, & Preuschoff, 2009), thus supporting the claim that interoceptive awareness and emotional

awareness are closely related. Deficits in emotional awareness, coined alexithymia (Taylor, 2000), have also been linked to functional impairments in the insular cortices (Gu, Hof, Friston, Fan, 2013; Jones, Ward, & Crithcley, 2010). A recent study (Oglodek et al., 2016) found that among anxiety patients, comorbid with the psychosomatic skin-disease, alexithymia, was most commonly seen in patients with GAD and social phobia, and earlier research (Berthoz, Consoli, Perez-Diaz, & Jouvent, 1999) has found alexithymia to correlate with trait anxiety and depression

3. Theoretical perspectives on sensory deprivation

Three types of research questions have been proposed to exist in psychological research (Zanna & Fazio, 1982). The first generation research questions are in general *"is"* questions, investigating if there is an effect or an existing relationship. For example, a first generation research question tries to establish whether the level of stress is reduced by flotation-REST. Second generation research questions are characterized by *"when"* questions. For example, such research questions ask under what circumstances a certain effect of flotation-REST treatment is present. Within the field of flotation-REST research the possibilities to answer these types of questions were improved through the establishment of methodological principles during the second wave of research. The third generation of research questions are *"how"* questions, and as a consequence this type of research involves determining the underlying mechanism and explanations for certain observed phenomena or relationship. Flotation-REST research and SD research in general have not paid much direct attention to exploring third generation research questions to identify the underlying mechanism of observed clinical effects. As a result, no coherent theory exists that explains how beneficial effects from SD are manifested, although there has been a fair amount of speculations, and theoretical attempts to explain certain observed effects. Below I present the most frequently used theories that researchers on the clinical use of SD utilized to understand their findings.

3.1 The Relaxation Response

It has been observed that various types of relaxation techniques often lead to similar effects on the psyche and body. Taken together these effects have been coined the Relaxation Response (RR), which is the opposite of the stress response, or the so called *"fight or flight"* response (Benson, 1975). The RR is linked to acute physiological changes, as a result of sympathetic nervous system activity (e.g. reduced heart rate and respiratory frequency; Hoffman, Benson, Arns, Steinbrook, et al., 1982). Psychologically, the RR is usually experienced as a deep and re-vitalizing

rest. Having continuous access to this experience has been observed to increase the sense of control, as well as the ability to cope with stressful events in life (Setterlind, 1990). Today a plethora of techniques exist that elicit the RR, such as progressive relaxation (e.g. Conrad, & Roth, 2007), autogenous training (e.g. Smith, 1993) and meditation (e.g. Khalsa, Rudrauf, Davidson, & Tranel, 2015). Flotation-REST is a method that effectively elicits the RR (van Dierendonck & Te Nijenhuis, 2005) without demanding much effort, and also works on individuals with severe stress ailments (e.g. Bood et al., 2006). This makes the method especially interesting, considering that people in most need of relaxation often find it hard to perform relaxation techniques (Maslach, 1998). The RR can also be induced by psychopharmacological means, alcohol included, although this seldom works in managing stress in the long run, and, in addition, often comes at the price of unwanted side-effects and/or risk of addiction (Lundberg & Wentz, 2004).

Not being negative in itself, stress can, when experienced for long periods without breaks, lead to various health problems, both physiologically and psychological, such as fatigue, depression, chronic pain, anxiety and sleep difficulties (Öhman, Bergdahl, Nyberg, & Nilsson, 2007). In view of this, it is not farfetched to assume that at least some of the beneficial treatment effects observed in research on flotation-REST might be explained by the method's stress reducing effects. Some studies on flotation-REST have also had an outspoken aim to *"elicit the relaxation response"* (e.g. Bood et al., 2006). The repeated provision of access to a RR through flotation-REST might lead to other effects, such as increased sense of control and resilience to stress. In addition, if a continuous level of stress can be broken by a flotation-REST intervention, it might explain why mood is enhanced, sleep improved, and chronic pain conditions alleviated in patient samples with high stress levels. What it might explain to a lesser extent is why healthy individuals experience mood enhancement, as well as improvements in sleep and performance, by flotation-REST.

3.2 Optimal level of stimulation and arousal

Early on in the history of psychological research Wilhelm Wundt (1893) used introspection to investigate how intensity of sensory stimulation corresponded to experiences of pain and pleasure. Wundt was among the first to illustrate in a theoretical model that a certain increase in sensory stimulation over a certain optimal set point resulted in pleasure, while a continued increase from this *"pleasure level"* brought forward pain and suffering. Later theorizing (e. g. McClelland, Atkinson, Clark, & Lowell, 1953; Young, 1936) reached a similar conclusion: Small deviations from an optimal level of stimulation result in pleasant affect, while large deviations result in unpleasant affect. Also in Breuer and Freud´s early work on hysteria, one can find a theoretical model describing a tendency in their patients to manifest agitation if they became over-stimulated. Breuer and Freud (1895/1937) also noted that a low level of stimulation, such as spending time in a dark and silent room, could produce agitation as well. In addition, Breuer and Freud (1895/1937) proposed that the reaction to low levels of stimulation varied based on individual differences in neurological constitution.

Later on Donald O. Hebb (1949) revived the idea of an optimal level of stimulation based on progression in the field of neuroscience, especially the discovery that electrical stimulation of a set of interconnected nuclei in the brainstem (the reticular formation) resulted in cortical activation (Moruzzi & Magoun, 1949) and that lesioning of the same region caused sleep-like brain states (Lindsley, Bowden, & Magoun, 1949). These studies indicated at the time that the brain needed external input to maintain its function, and that the reticular formation played a crucial role in regulating brain activity (Zuckerman, 1979). Hebb also substantiated his ideas of an optimal level of stimulation from other researchers, such as Leuba (1962) who proposed that behaviours which resulted in moving the arousal level in the organism to an optimal level (not to high and not to low) have been reinforced throughout the evolution. Hebb´s model (1955) consisted of two functions: (1) the cue function which guide behaviour and (2) the arousal function which activates the organism on a general level. The model illustrates the idea

of an optimal level of arousal in which the organism functions at its best, but also that an increase of arousal over the optimal level results in negative emotional states (e.g. anxiety) as well as decrease in the influence of cues which guide behaviour. The effect that high levels of anxiety (arousal) weaken the response to changes in the environment has also been observed in neurotic anxious patients (Lader & Wing, 1966) as well as healthy anxious individuals (Neary & Zuckerman, 1976).

Building on Hebb´s optimal level of stimulation theory, Schultz (1965) developed what he coined the sensoristasis model. Schultz proposed that sensoristasis is a state in which the organism strives to maintain an optimal range of variation in sensory input, a range that is flexible enough to respond to the demands from the environment but still constant enough to maintain regularity. In Schultz research in the field of SD his main hypothesis was that organisms would compensate the reduction of sensory input by increasing their sensitivity to sensory information (both external and internal). Schultz saw this as an attempt by the organism to restore their sensoristasis. The sensoristasis model has been used to explain physical unpleasant sensation during SD (Zuckerman, Albright, Marks, & Miller, 1962), which was suggested to be a result of increased sensitivity to interoceptive signals as a way for the individual to compensate for loss of sensory input in other sensory modalities.

Although the initial research at McGill University in the 1950s focused on clarification of the mechanism behind *"brainwashing",* the experimental SD condition was also employed to test aspects of optimal level of stimulation theories (see Zuckerman, 1979 for a review). The Sensation Seeking Scale (SSS) was developed (Zuckerman, Kolin, Price, & Zoob, 1964) with the aim to explore individual differences in reactions to SD conditions. More specifically, the SSS scale was used to assess the individual need for novel and varied stimulation (internal or external), and initially the SSS was used to predict stress response during SD (Zuckerman, 1979). Zuckerman and colleagues´ initial working hypothesis was that individuals scoring high on the SSS would be the

29

most stressed in the SD condition (Zuckerman, 1979), but several studies failed to confirm this (e.g. Zuckerman et al., 1966; Zuckerman, Persky, Link, & Basu, 1968). One study by Myers (1969) even showed that high scoring on the SSS predicted completion of a week of SD as well as eagerness to repeat the experience, possibly due to the RVSs which, it was speculated, were likely to be of interest to sensation seeking individuals. Despite the non-conclusive results Zuckerman (1964) proposed that the optimal level of stimulation theory could be useful in understanding the effects of SD, and especially the varied response individuals up to that date had experienced in these SD conditions.

The SSS scale was also used in clinical studies by Brownfield (1966) who used the scale to screen a mixed sample comprising healthy individuals and psychiatric patients. He found that the patients often had low scorings on the SSS and thus were characterized as sensation avoiding, while healthy individuals often scored medium to high on SSS and thus were characterized as sensation seeking (Brownfield, 1966). When Brownfield subsequently put a small group of the participants (both patients and healthy individuals) with high scoring on SSS in a SD condition he found that they experienced restlessness, anxiety, cognitive deficits, as well as mild hallucinations (Brownfield, 1966). Conversely, a small group (both patients and healthy individuals) with low scoring on SSS experienced the SD condition as relaxing and pleasant, and in addition reported that problem solving were enhanced (Brownfield, 1966). The conclusion from Brownfield (1966) was that individual preference of stimulation level seemed to predict positive response to SD more than psychological health status.

3.3 Primary and secondary processes

The theory of primary and secondary process thinking was first coined by Freud (1921, 1957) and refers to two distinct but yet complementary types of mental functioning of the psyche. According to Freud (1957), primary process thinking constitute the first mental functioning in the infant that consists of associations based on imagery and bodily sensations; this drive, according to Freud, serves the pleasure principle

and functions as a substitute for instant gratification. Secondary process is cultivated parallel to language, as language has a logical foundation that enables adaptation of the individual to external reality. The primary processes, on the other hand, function regardless of time, casual relationship or logic and in brief correspond with the individuals´ inner world where everything is potentially possible to manifest in sometimes bizarre ways such as dreaming. In the adult and healthy individual the psyche, according to the dual process theory (Freud, 1921, 1957), comprises a blend of primary and secondary processes functioning in a ratio that varies for different times; primary processes are dominant, for example, when dreaming and while fantasizing unrealistically and secondary processes are dominant during problem-solving and reality-oriented planning. The dual process theory has, in contemporary research, gained support (Sloman & Steinberg, 1996; Evans, 2008; Shanks, 2010), and has been developed and extended in the field of psychology (Noy, 1969; Pribram & Gill, 1976; Robin, 2004). In contemporary theory of dual processing, it is assumed that secondary processes exercise control over primary processes through hierarchically higher level cognition (Arminjon, 2011). Several methods, such as hypnosis, meditation, biofeedback training (Larsson & Starrin, 1988), alcohol (Norlander, 1997), psychedelic drugs (Barr, Langs, Holt, Goldberger, & Klein, 1972; Kraehenmann et al., 2017; Martindale & Fischer, 1977), as well as SD (Goldberger, 1961; Norlander et al., 1998; Norlander et al., 1999) have also been suggested to induce a shift from a secondary process-oriented mode of functioning to a primary process-dominated functioning of the psyche. It has also been suggested that early parts of childhood, phases in the creative process, as well as schizophrenia, in addition, are characterized as dominated by primary process functioning (Hermle & Kraehnmann, 2017; Martindale & Dailey, 1996). Degree of primary process functioning can be assessed by reliable and well-validated linguistic measures (e. g. Brakel, Kleinsorge, Snodgrass, & Shevrin, 2000).

Relevant to the research field of SD is Noy's (1969) claim that primary and secondary processes can be distinguished by their need for external

stimulation, in which the secondary processes are dependent on external feedback, while primary processes are not; thus suggesting that primary processes might be the prevailing mode of functioning during SD. In the early SD research, it was believed that certain individuals were afraid of their primary processes, and, according to Noy´s (1969) line of thinking, negative reactions to SD were thus in part explained by the variety in tolerance to primary process functioning (e.g. Myers, 1969). In contemporary research on SD, the theoretical framework of primary and secondary processes has primarily been used to explain flotation-REST's effects in relation to aspects of creativity, problem-solving ability (Norlander et al, 1998) and performance enhancement in sports (e.g. Norlander et al., 1999). Norlander and collegues (1998), for example, assessed problem-solving and originality after one flotation-REST session (45 minutes) through written tests and found that problem-solving were impaired and that originality increased; their conclusion was that results indicated that primary processes still dominated the psyche an hour after the flotation-REST session. Although the dual process theory mainly has been used to understand flotation-REST's effect on performance, the theory could also be of value to understand how flotation-REST improves health. To be able to *"regress in the service of the ego"* (Kris, 1952) temporarily and under controlled circumstances would arguably offer a safer and less demanding route to balance primary and secondary process functioning, compared with for example alcohol intoxication, psychedelic drugs, or meditation practices. This could hypothetically give the individual access to internal resources (e.g. fantasy and imagery) that otherwise would be difficult to access in a conscious and non-intoxicated state. Drawing on a similar line of thought, early research on SD suggested (e. g. Goldberger, 1961; Kris, 1952) that increase in primary process functioning during and after SD could be of value in psycho-analytic therapy as it would increase contact with sub-conscious material within the psyche and thus provide material to work with, making the psycho-therapeutic processes more effective. Similarly, flotation-REST could potentially be of value in contemporary psychotherapy by increasing contact with suppressed material in the psyche that is of an emotional and visual (e.g. recollection of trauma)

32

character and thus functions as a method to induce exposure to aspects of the psyche that are avoided in a maladaptive and pathological manner.

3.4 Altered states of consciousness

The use of methods to induce unique states of consciousness goes back several thousand years (Metzinger, 2009), and it has been suggested that humans (Weil, 1998), and even animals (Samorino, 2002), have an inherent drive to experience non-ordinary states of consciousness. ASC is a concept that refers to these non-ordinary states. In this field of research, there has been an emphasis on characterizing these deviations from normal state consciousness, understand their meaning and purpose, as well as to clarify how they come about (Blackmore, 2013). In the field of psychology, William James (1902) was among the first to underline the importance of investigating non-ordinary states of consciousness, and he pointed out that *"our normal waking consciousness is but one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different"* (James, 1902, p. 292).

The possibility to correlate certain states of consciousness (e.g. dreaming, acute psychosis, deep relaxation) to physiological correlates, as well as the discovery of the psychedelic substance LSD in the 1940s, fuelled the interest to explore ASCs (Metzner, 2009). Although even relaxation on the couch induces a shift in consciousness which by some definitions can be considered an ASC, much research in the area has been suggested to mainly focus on radical shifts in consciousness (Kokoszka, 1992). One example is the American psychologists Siegel and Jarvik (1975) who trained participants to report back on experiences of intense ASC, induced by various psychedelic drugs (e.g. LSD, Mescaline, Cannabis). Besides the mind-altering substances, there is a plethora of techniques and activities that can induce ASCs of varying intensity, such as hypnosis, meditation, music, sensory overload, sleep deprivation, to name a few (Dietrich, 2003; Farthing, 1992). Possibly the most dramatic ASC people experience on a regular basis is nocturnal dreaming, and, during the Rapid Eye Movement (REM) phase, vivid sensation and

perceptions are internally generated, characterized by being illogical and bizarre in nature (Hobson, 2002).

ASCs can be defined by objective (e.g. brain imaging, eye-movements, induction method) or subjective criteria and both definition strategies entail problems that have been discussed in depth elsewhere (see Blackmore, 2013). However, most commonly a subjective strategy is applied. Tart (1972) was one of the first to coin a subjective definition of ASCs, which has been extensively used in research: *"a qualitative alteration in the overall pattern of mental functioning, such that the experiencer feels his consciousness is radically different from the way it functions ordinarily"* (Tart, 1972, p. 1203). Another popular definition is provided by Metzner (1992) who defines it as alterations in cognition, perception and emotion that create a state that is perceived as different from normal state consciousness and which is temporary. In addition, Farthing (1992) have provided a comprehensive list of the content in consciousness that can potentially be altered when ASC is experienced, including attention, perception, imagery, memory, complexity of cognition, time perception, emotion, self-control, suggestibility, body image, and sense of identity.

Considerable effort has also been made to develop theoretical frameworks to organize the many different types of ASC in a comprehensive model (e.g. Fischer, 1971; Fromm, 1978; Tart, 1975). Often few and distinct variables of conscious experience (e.g. arousal, awareness, irrationality) have been used to create a simplified model in which different types of ASC can be placed on a continuum. For example, Fromm (1978) used balance of secondary and primary processing as a method of organizing different ASC. According to Fromm's model (1978), psychosis and nocturnal dreams were placed in one end of the continuum (primary processes) and normal waking state at the other end (secondary processes), while medium hypnotic states and mild psychedelic states were placed in the middle. Another prominent model was developed by Fischer (1971), who used level of arousal as a single variable which he claimed corresponded to the variety of ASC that could

be experienced by humans. According to Fischer (1971), consciousness can be altered either by increasing or decreasing arousal. From a normal state (daily routine, relaxation) increased levels of arousal push the human psyche along the so called ergothropic/hallucinogenic axis consisting of (1) aroused states (creativity, anxiety, and sensitivity), (2) hyper-aroused states (acute psychosis), (3) and ecstatic states (mystical rapture). Similarly, through decreasing arousal the human psyche moves along the trophotropic/meditative axis consisting of (1) tranquil states (deep relaxation, zazen meditation), (2) hypo-aroused states (lethargy, apathy, dissociation), and (3) yoga Samadhi. At the end-points of these axes is the Self, which, according to Fischer´s model (1971), can be reached through both the ecstatic mystical peak of arousal (being one with all) and through the meditative peak of yoga Samadhi (being nothing). Both peak states entail a subjective experience of one´s self-referential nature, without any contact with external sensory information, and according to Fischer, any movement along either the ergothropic or trophtropic axis results in a reduced contact with sensory information. Fischer, in addition, contrasts *"the Self"* with the *"I"*, which pre-dominate normal state consciousness, and where it interacts and influences the objective world *"out there"*.

4. Complementary and alternative medicine

The majority of CAM therapies fall into one of two sub classes (NCCAM, 2015), either natural products (e.g. botanical herbs, dietary supplements) or mind and body practices (e.g. relaxation techniques, yoga, chiropractice). The use of these non-mainstream practices has increased substantially in industrialized countries in the last decades (e.g. Barnes, Bloom, & Nahin, 2008; Eisenberg et al., 1998; Kelner & Wellman, 1997), and the one-year prevalence for using CAM therapies has been reported to be 20-50 % in the adult population of industrialized countries (Barnes et al., 2008; Clarke et al., 2005; Ernst, 2000; Tindle, Davis, Phillips, & Eisenberg, 2005). The frequent use of CAM is also mirrored by the monetary resources spent on CAM therapies by the public. One study (Eisenberg et al., 1998) revealed that the population in the United States spent about 40 billion dollars on CAM therapies in 1997, an amount which is larger than what was spent on health care visits in the same year. The World Health Organization (WHO) has also highlighted the use of CAM as an important issue that needs to be addressed, and in their strategy protocol for CAM spanning 2014 – 2023 they state: *"T&CM [Traditional and Complementary Medicine] is an important and often underestimated part of health care. T&CM is found in almost every country in the world and the demand for its services is increasing. TM, of proven quality, safety, and efficacy, contributes to the goal of ensuring that all people have access to care. Many countries now recognize the need to develop a cohesive and integrative approach to health care that allows governments, health care practitioners and, most importantly, those who use health care services, to access T&CM in a safe, respectful, cost-efficient and effective manner. A global strategy to foster its appropriate integration, regulation and supervision will be useful to countries wishing to develop a proactive policy towards this important - and often vibrant and expanding - part of health care."* (WHO, 2013, p. 7).

Earlier research has reported that the main reasons for the use of CAM are to improve health and well being (McCaffrey, Pugh, O´Connor, 2007;

Green, Walsh, Sirois, & McCaffrey, 2009), as well as to mitigate symptoms of chronic illness or negative side effects of conventional medicine (Nahin et al., 2012; Lo, Desmond, & Meleth, 2009). In addition, the most common psychiatric ailments reported as an incentive for seeking out CAM are insomnia, depression and anxiety (Eisenberg et al., 1993; Eisenberg et al., 1998). It has also been reported that people with self-defined anxiety and depression more often seek out CAM than conventional medicine, and that the majority of those that seek help for anxiety and depression in conventional medicine also use CAM (Kessler et al., 2001).

Considering that flotation-REST is marketed as a CAM therapy in the private sector, and that these types of therapies are used by the public as a way to improve psychiatric ailments, such as depression and anxiety, underlines the importance of research-based evaluation of flotation-REST effects on psychiatric mood disorders. This rationale is also highlighted by the WHO (2013) as an important step to turning the use of CAM into an asset for society, potentially contributing to ensuring that all humans have access to good health. Furthermore, the accelerated use of CAM by the public stresses that CAM therapies need to be better understood and acknowledged by physicians and researchers alike, so that the communication gap between the public and healthcare clinicians does not expand further (Chez and Jonas, 1997; Eisenberg et al., 1998). Reports also show that patients are reluctant to ask their physicians about CAM therapies, and in addition seldom want to tell their physicians that they use CAM (Tasaki et al., 2002). This further stresses the importance of increasing the knowledge about CAM. In addition, these reports display the danger involved when CAM therapies are combined with conventional medicine without physicians being aware of it, thus running the risk of causing dangerous interactions.

4.1 Flotation-REST as a Complementary and Alternative Medicine

Although flotation-REST has documented evidence-proven effects (e.g. Van Dierendonck & Te Nijenhuis, 2005) and to some extent is used in main-stream healthcare in some countries, like other forms of CAM such

as massage, acupuncture and meditation (Cambrella, 2015), it is more often used in the private sector where it is marketed as a CAM therapy that can relieve or cure a variety of health disorders. CAM is broadly defined as the healing practices and beliefs that currently are not a part of conventional Western medicine, and sometimes Traditional Medicine (TM) is used as a term referring to CAM, that is, related to cultural traditions (WHO, 2013). CAM is also often associated with a holistic outlook on health (NCCAM, 2015). In brief, the holistic paradigm has a multidimensional approach to sickness and health, and in general views health as an interaction of physical, cognitive, emotional, spiritual, and societal factors (Williams, 1998). Illness is then understood as a disruption of the complex workings of the whole (Deliman and Smolowe, 1982). Most therapeutic research on flotation-REST can, in the light of Antonovsky (1987), be regarded as conducted within a patogenetic research paradigm, implying that the research was focused on removing specific pathological symptoms, such as pain, stress, depression, or anxiety. In contrast, the salutogenetic perspective on health stresses the importance of a holistic approach to health (Antonovsky, 1987), implying that the individual as a whole has to be taken into account for successful initiation of a process which improves and maintains health. One example of a holistic model is the Holistic Process Theory (HPT), which, although tentatively, offers an alternative conceptual framework for how flotation-REST treatment improves health. According to this theory, sickness results because of suppression of distressful emotional content that manifests in the body as psychosomatic and/or chronic pain conditions (Ventegodt, Andersen, & Merrick, 2003). The HPT suggests that coming into contact with these suppressed emotions, as well as subsequently describing and integrating the emotions, improves the physical ailments that are considered to be caused by emotional suppression (Ventegodt et al., 2003). Although theories like the HPT currently lacks research support, it is worth noting that the interdisciplinary field of psychosomatic medicine acknowledges that social, psychological, and behavioural aspects of the human experience affect bodily processes and life quality. This suggests that conventional medicine to some extent considers mental and emotional states able

cause and influence physical illness. For example, experience of stress in everyday life has been linked to lower back pain (Sarno, 2006), and lack of ability to express emotions among anxiety patients have been suggested to cause skin-disease, which then can be mitigated by treating the anxiety issue (e.g. Oglodek et al., 2016).

5. The age of anxiety

Anxiety disorders are today the most prevalent psychiatric ailments in Europe and USA with life time prevalence reported as high as 31 % (Kessler, 2007; Kessler et al., 2007; Nutt et al., 2007). Anxiety disorders have been reported as under-diagnosed (Vermani, Marcus, & Katzman, 2011), and under-treated (Kroenke et al., 2007; Weisberg, Dyck, Culpepper, & Keller, 2007). Anxiety disorders are usually linked to fear, nervousness, foreboding, and panic, which can result in several negative, bodily reactions (Rakel, 1981). Patients with anxiety disorders in addition often display other comorbid psychiatric disorders, such as depression (e. g. Kessler et al., 2005), but also more general medical ailments, such as chronic pain, hypertension, migraine, and asthma (Roy-Byrne et al., 2008). Increased risk of suicide attempts has also been reported for anxiety patients (Sareen et al., 2005). Taken together, anxiety disorders constitute a high cost for society, as well as a high degree of suffering on the individual level (Kessler, 2007; Nutt et al., 2007).

Anxiety has been acknowledged for centuries, and so has its phylogenetic origins in animal species (Hofer, 2009). Interestingly, not until recently has anxiety been subdivided into several distinct diagnoses, such as panic disorder, post-traumatic stress disorder, phobias, and so on (Martin, 2003). For an in-depth review of existing types of anxiety disorders, their empirical foundations and treatments, see Stein, Hollander and Rothbaum (2009).

Despite the fact that industrialized countries in general have a higher quality of life than ever in regard to access to food, housing, communication and healthcare, it has been suggested that we live in an *"age of anxiety"* (e.g. Spielberger et al., 1983). Comprehensive national surveys in several industrialized countries also confirm this claim, reporting increases in prevalence of anxiety, both diagnosed and non-diagnosed, during the last two decades, (Halliwell, 2009; Kessler et al., 2005; Kawakami et al., 2004; WHO, 2004). Several factors have been put forth to explain this rise in anxiety, such as rapid societal changes,

increased demand in work life, increased contact with media, individualism, as well as an overly materialistic approach to mental health care (Menzies, 2005; Wainright & Calnan, 2002). It also has to be acknowledged that the reported increase in anxiety does not necessarily need to indicate that we are more anxious in the modern world than earlier in history; an alternative interpretation is that clinicians have become more skilled in identifying, diagnosing and treating anxiety-related issues. However, the current level of anxiety is a real issue that creates suffering for a substantial portion of the population, which is burdensome for both the private and national economy in the modern world.

5.1 Generalized Anxiety Disorder

Generalized Anxiety Disorder (GAD) is a chronic and debilitating anxiety disorder characterized by excessive worry persisting for at least 6 months with worry being present on more days than not (DSM-5; APA, 2013). The topics of anxiety revolve around finances, health, safety, and other everyday matters. The features that distinguish the worry seen in GAD from the worry seen in other anxiety disorders are its future direction (Dugas, Gagnon, Ladoceur, & Freeston, 1998), its frequent occurrence, and its perceived uncontrollability (Craske, Rapee, Jackel, & Barlow, 1989). Besides uncontrollable and persistent worry, three of the following six symptoms have to be present for diagnosing GAD: (1) restlessness, (2) fatigue, (3) difficulties concentrating, (4) irritability, (5) muscle tensions, (6) sleep difficulties (DSM-5; APA 2013). In addition, the associated GAD symptoms must result in marked distress and impairment, none of which are better explained by another disorder, medical condition, or drug use (DSM-5). GAD is also associated with a high risk for comorbidity, in which major depressive disorder, social phobia and panic disorder are the most common (Brown et al., 2001).

A comprehensive survey (Kessler et al., 2005) indicated that the life time prevalence of GAD is 5.7 % and the mean age onset for the disorder is 31 years. In addition, GAD is about twice as common in women compared to men (McLean, Asnaani, Litz, & Hoffman, 2011). Although existing

41

treatments for GAD should be considered as relatively effective, they are not as effective as for other forms of anxiety disorders (Newman et al., 2013). Longitudinal studies have found that the probability of becoming fully remitted when being treated for GAD is relatively low (38 %) and the majority of treated GAD patients only reach partial remission (Ninan, 2001; Yonkers, Dyck, Warshaw, & Keller, 2000), suggesting that treatment protocols for GAD can be further improved.

Although research on the neural mechanism underlying anxiety disorders are limited (Duval, Javanbakht, & Liberzon, 2015), neurobiological research has indicated that individuals with GAD might have an unbalanced central nervous system (Rowa, Hood, & Antony, 2013). Regarding neurological underpinnings of anxiety disorder, GAD and Post Traumatic Stress Disorders (PTSD) have been suggested to be similar because individuals with these disorders reportedly show heightened activity in the prefrontal cortex (Duval et al., 2005), possibly mirroring that cognitive control mechanisms play an important part in the maintenance of these disorders. Regarding abnormalities in neural regions, one study is of particular interest (Etkin, 2009) as it showed that patients with GAD differed from healthy individuals in displaying abnormally increased connectivity of the amygdala with executive control networks and decreased connectivity with the insular cortices. Furthermore, chronic worry has been associated with rigid autonomic activity (Friedman, 2007), implying a more or less constant, slightly elevated, level of stress; contrasted to a more normal and dynamic autonomic activity, characterized by a marked increase in stress when needed and marked decrease or absence of stress when possible. This rigidity in autonomic activity has also been associated with a tendency for short-term solutions (e.g. avoidance), at the cost of long term adaption, in the contact with stress (Friedman, 2007).

Research has suggested that several etiological factors make individuals more prone to develop and maintain GAD. Negative and stressful life events have been associated with a higher susceptibility for GAD (Blazer, Hughes, & George, 1987), although it has been pointed out that negative

life events also increase the risk of developing psychopathology in general (Faravelli et al., 2012). There is also research which has underlined traumata and insecure attachment styles (Bowlby, 1973) in the formative years as important factors for developing GAD (Borkovec, Alcaine, & Behar, 2004), possibly making individuals with GAD more prone to view the world as a dangerous and unpredictable place, and thus setting the stage for chronic worrying. Furthermore, it has been hypothesized that inadequate interpersonal skills play an important part in the maintenance of GAD (Sibrava & Borkovec, 2006; Newman & Erickson, 2010). Poor problem-solving ability of real-life events is also assumed to play a part in the maintenance of GAD (Davey, Hampton, Farell, & Davidson, 1992), although it has been shown that individuals with GAD do not differ from healthy individuals regarding their problem-solving ability (Dugas, Freeston, & Ladoceur, 1997). However, it has been shown that GAD patients have low confidence in their ability to solve problems (Davey, 1994), and they tend to respond negatively when confronted with problems (Belzer, D´Zurilla, & Maydeu-Olivares, 2002).

Since GAD was defined as a diagnosis in DSM 1980, research has established that pharmacological treatments of GAD are indeed efficient (e. g. Baldwin & Polkinghorn, 2005; Mitte, 2005). In spite of this, research shows that clinicians and patients alike prefer psychotherapeutic interventions over medication (Tyrer & Baldwin, 2006). The first line of psychotherapeutic intervention of GAD (CBT) is also to be considered an effective treatment of GAD, but treatment outcome is modest (least effective) when comparing it to psychotherapeutic interventions of other types of anxiety disorders (Borkovec & Ruscio, 2001 Newman et al., 2013; Ninan, 2001; Yonkers et al., 2000) and especially so for GAD patients with high symptom severity and comorbidity prior treatment (Durnham et al., 2004). Treatment strategies of treatment-resistant GAD is not well-established either (Menezes et al., 2007), which suggests that the development of novel treatments for this patient group is warranted. Although GAD has not been well researched in regard to the development of theoretical frameworks compared with other types of anxiety disorders (Dugas,

2000), there has been progress in both psychotherapeutic interventions and conceptualizations of GAD during the last decades, and with few exceptions these have been rooted in the field of cognitive behavioural therapy (CBT; Cuijpers et al., 2014).

5.2 Theoretical models of generalized anxiety disorder

The most prominent model of GAD is the Avoidance Model of Worry (AMW; Borkovec et al., 2004), solidified by earlier psychological research such as Mowrer's two-stage theory of fear (1947) and emotional processing theory (e. g. Foa, Huppert, & Cahill, 2006). The AMW claims that worry, by being a cognitive and verbal activity, inhibits feared imagery and associated unwanted physical sensations and emotions (Behar, Zuellig, & Borkovec, 2005). This inhibition then results in short-term gains (less anxiety) but also hinders adequate emotional processing of fear and subsequent habituation, as well as extinction (Foa et al., 2006). The worrying is then negatively reinforced by enabling a shift from anxiety provoking imagery, emotions and physical sensations, towards a less anxiety provoking verbal thought process (Rowa et al., 2013). Although this strategy leads to short-term benefits in regard to anxiety, it has also been linked to heightened anxiety in the long run (Wells & Papageorgiou, 1995). Building on the AWS, Newman and Llera (2011) claimed that worry also extends negative emotional states through cognitive conceptualization of a certain feared stimuli, which then literally is just one thought away.

Building on the theoretical and empirical foundation of the AMW, several new models of GAD have been developed as attempts to further enhance existing treatment and the understanding of the disorder. Dugas and colleagues (2004) suggested in their Intolerance of Uncertainty Model (IUM) that individuals with GAD are prone to respond negatively to ambiguity or uncertainty, and that this reaction in part drives the chronic worrying (Koerner & Dugas, 2008). Furthermore, Wells (2005) suggested in the metacognitive model (MCM) that individuals with GAD tend to worry about their worry, by for example believing that it is uncontrollable or that it is deleterious to their health.

Wells labelled this type of meta-cognition type 2 worry, which he distinguished from normal worry that centres on everyday matters (type 1 worry). Wells (1999) further proposed that individuals with GAD reinforce these negative beliefs regarding their worry by unsuccessful attempts to control their worry, for example.

The Emotion Dysregulation Model (EDM; Turk et al., 2005), on the other hand, attempts to understand GAD primarily through emotion dysfunctionalities and emotional regulation difficulties. This model claims that individuals with GAD experience negative emotions more intensely, seldom comprehend their emotional reactions, often interpret their emotions as threatening or overwhelming, and, in addition, lack the ability to cope with their emotions, which results in utilizations of maladaptive strategies for controlling their emotional responses (Mennin, Heimberg, Turk, & Fresco, 2005; e.g. worrying). Recent progression in psychological research on emotion and emotion regulation suggests that deficits in emotional regulation may constitute an overarching disability that underlies the symptomatology in several types of complex, persistent and treatment-resistant anxiety disorders, GAD included (Mennin, 2006). Although difficulties in emotion regulation have earlier been shown to be of relevance in understanding pathological worry, deficits in emotional regulation have also been demonstrated to predict GAD better than worry, anxiety levels and depression (Mennin et al., 2005), thus suggesting that difficulties in emotional regulation might be central in the development and maintenance of the disorder. From the perspective of EDM, and according to the work of Mennin and colleagues (2005), individuals with GAD, due to their difficulties in emotional regulation, use avoidance strategies to control and reduce their emotional experience, which comprises, but is not limited to, pathological worry (Mennin, 2005, 2004).

Lastly, the Acceptance-Based Model (ABM) of GAD suggests that individuals with GAD have a problematic attitude and reaction pattern to internal experience that lead to avoidance, as well as behavioural

restriction (e.g. Roemer & Orsillo, 2005). The ABM proposes that individuals with GAD hold a negative attitude towards unpleasant internal experiences, and therefore react to them by thinking negative thoughts, and/or by exhibit additional negative emotions. The model also posits that they tend to become entangled or identified ("fused") with these negative reactions, in a way that makes them believe that the reactions are an intrinsic part of their individuality. As a strategy to avoid a more or less constant stream of unpleasant and negative reactions, the individuals with GAD, according to this model, partake in experiential avoidance (e.g. worrying about everyday matters), as well as behavioural restrictions, as an attempt to minimize negative experiences.

Because these models (AMW, EDM, and ABM) are relatively new, their empirical support are mixed. However, these models have all contributed to enhancing the treatments of GAD by offering alternative perspectives on how to approach the disorder, and should primarily be seen as integrative approaches that complement existing treatment protocols for GAD (Covin, Ouimet, Seeds, Dozois, 2008). Metacognitive therapy for GAD is based on the AMW, which, although similar to regular CBT approach of treating GAD, distinguishes itself in terms of focus and goals (see Wells & Simons, 2013); a crucial difference is that metacognitive therapy primarily focuses on changing the attitudes and thoughts about worry and not primarily aiming at reducing pathological worry per se (Wells & Simons, 2013). The EDM led to the development of Emotion Regulation Therapy (ERT; Mennin, 2006), which is characterized by primarily focusing on increasing the ability to regulate emotions, including (1) the ability to label, differentiate and coming in contact with emotions, (2) lower the utilizations of worry and other forms of avoidance strategies used to circumvent emotional experiences, (3) increase acceptance of emotional experience and the use of adaptive strategies to control emotion when needed, (4) increase the ability to use emotions functionally; by using emotions to increase awareness of needs, making decisions, setting goals, guide behaviour and managing interpersonal relations (Mennin, 2006). Examples of contributions to the treatment of anxiety disorder that are related to ABM are

mindfulness-based interventions (e.g. Kabat-Zinn, 1990), which aim to foster flexibility and non-judgmental awareness of one´s inner life, and ACT (Acceptance and Commitment Therapy; Hayes et al., 1999), which focuses on enhancing experiential openness as a strategy to reduce tendencies to avoid thought processes, emotions and life in general. It is important also to acknowledge that all the contemporary models of GAD presented here highlight experiential avoidance of unpleasant internal experience as a central tenet of GAD. For a comprehensive review, see Cuijpers et al., 2014.

Psychotherapeutic interventions for GAD research have mainly been focused on evaluating the evidence of CBT, which is not surprising in the light of the existing conceptualizations of the disorders. CBT treatment often varies in the therapeutic components utilized or emphasized during treatment, and regarding CBT treatment for GAD, it might vary even more due to the rapid progression in research during the last decade. However, the most commonly used components during CBT treatment for GAD is psycho-education, relaxation techniques, monitoring of cues and triggers for worry, exposure (imaginal, in vivo or emotional), as well as cognitive restructuring (for review see Ouimet, Covin, & Dozois, 2012).

6. The present investigation

6.1 Rationale for the present investigation

The use of CAMs (Barnes, Bloom, & Nahin, 2008; Eisenberg et al., 1998; Kelner & Wellman, 1997) as well as the prevalence of anxiety (Halliwell, 2009; Kessler et al., 2005; Kawakami et al., 2004; WHO, 2004) have increased substantially in industrialized countries worldwide during the last decades. The most common incentives to use CAMs as treatments of psychiatric ailments reportedly are issues of anxiety, insomnia and depression (Eisenberg et al., 1993; Eisenberg et al., 1998). Research has not kept pace with this development in regard to the scientific evaluation of the effectiveness and potential risk of many of the CAMs that are used. This is unfortunate because the lack of research information regarding CAMs leaves more room for the non-scientific information provided by private actors, who might have other interests than effective and safe care for all. This underlines the importance to investigate the information about CAM that can be easily accessed by the public, and which in general consist of information provided by various private actors that promotes and provide certain types of CAMs. Considering that CAMs are used for the purpose of mitigating anxiety, also suggests that a scientific evaluation of CAMs' effectiveness as treatment of anxiety is warranted. In this context, the use of CAMs as treatments of anxiety disorders which indicate treatment-resistance is of special interest to evaluate, as failure to reach remission by conventional medicine might make individuals with these types of anxiety disorders both prone to seek out CAM as a cure for their ailments, as well as more susceptible to marketing of CAMs effects. The rationale of evaluating CAMs for treatment-resistant anxiety disorders is twofold: besides generating research information regarding CAMs' efficacy and safety, it also constitutes a possibility to discover treatments that work, which then, potentially, can be usefully integrated in existing treatment protocols. To this end, the current work has a focus on evaluating flotation-REST as a treatment of Generalized Anxiety Disorder (GAD), as the disorder has been indicated as relatively treatment resistant compared with other

types of anxiety disorders (Borkovec & Ruscio, 2001; Newman et al., 2013; Ninan, 2001; Yonkers et al., 2000). Treatment strategies of treatment-resistant GAD is, in addition, not well-established (e. g. Menezes, Fontenelle, Mululo, & Versiani, 2007), and despite the indication that psychopharmacological intervention strategies have been effective (e. g. Baldwin & Polkinghorn, 2005), both patients and clinicians generally prefer other forms of treatment (Tyrer & Baldwin, 2006), which underlines the importance of further developing non-pharmacological treatment strategies that are safe and effective. The choice to evaluate flotation-REST was foremost based on previous research indicating that the method could mitigate the symptoms and comorbidity associated with GAD (Ballard, 1993; Bood, Kjellgren, & Norlander, 2009; Bood, Sundequist, Kjellgen, Nordström, & Norlander, 2007; Bood et al., 2006; Kjellgren, Sundequist, Sundholm, & Norlander, 2001; Kjellgren & Westman, 2014). In addition, the method is mainly used as a CAM outside of the healthcare system despite having evidence-proven effects (Spencer, 2015), which makes it a relevant CAM to evaluate as it potentially could enhance the existing treatment protocols of GAD. In the light of the above, the main aim of the present thesis was to explore two primary questions: (1) is the information provided by privately owned flotation-REST centers regarding flotation-REST effects in line with existing scientific evidence? (2) Is flotation-REST a valid treatment option for individuals with GAD? An additional question was also explored: (3) if flotation-REST has beneficial effects for individuals with GAD, what are the mechanisms underlying these effects?

6.2 Study 1: Curing the sick and creating supermen: how relaxation in flotation tanks is advertised on the internet

6.2.1 Aim

The aim of study 1 was twofold. Firstly, it was conducted to characterize the information privately-owned flotation centers provided in regard to flotation-RESTs effects. Secondly, the aim was to examine how well this characterization corresponded to scientific research on flotation-REST.

6.2.2 Procedure

The Internet was searched for websites hosting privately-owned flotation centers that provided information about flotation-REST. The Google search engine was used to identify these sites, by entering keywords associated with the flotation-REST method. The identified websites were investigated in depth, and all texts that described effects resulting from flotation-REST were collected in a word document. All searches were made in October 2013. In total, the data were collected from 84 websites hosting commercial flotation-REST centers that were active in five countries. The data were subsequently analyzed thematically to characterize the advertisement as a whole. The result of the thematic analysis was then compared to existing scientific research on flotation-REST.

6.2.3 Analysis

The analysis was performed in five steps. The first step involved getting accustomed to the data by reading and re-reading it until an in-depth understanding of the contents was reached. In the second step data were transformed from raw text into coded elements (CE) based on the essential semantic meaning of the text. This step resulted in 1429 CE. Step 3 consisted of identifying and ordering the CEs into sub-themes based on how they related to each other. This step resulted in 58 sub-themes. Step four involved further refinement of the sub-themes as well as combining them into potentially overarching themes. The goal was to reach optimal distinction between the overarching themes as well as coherence within them. Step five entailed labelling and describing adequately the overarching themes with clarifying quotations from the raw data. Guidelines for thematic analysis (Braun & Clarke, 2006) were complied with throughout the whole analysis process. As a final step, the results were compared to existing scientific evidence on flotation-RESTs effects, provided by major scientific databases.

6.2.4 Ethics

The data collection was conducted by accessing publicly available websites hosted by commercial flotation tank centers. Thus the data collected were freely available and even expected to be accessed by the public. All information that could identify a certain flotation tank center was deleted, such as name of the flotation centers, URLs and anything else that could jeopardize anonymity. The potential risk that the study could affect the commercial flotation centers negatively is also outweighed by the benefits that the public in general, and vulnerable individuals with diagnosed or non-diagnosed ailments in particular, could gain by an evaluation of the quality of the information provided by these private actors.

6.2.5 Result

The analysis resulted in five overarching themes: (1) *physiological changes*, (2) *alleviation of medical conditions*, (3) *relaxation*, (4) *personal growth and enhancement, and* (5) *altered states of consciousness*. On the whole, the advertisements seemed to target four different interest groups: *The inner explorers; the sick; the supermen; and the stressed out*. Various effects of flotation were highlighted for the different interest groups. The main finding of the study was that the information provided by privately-owned flotation centers was not sufficiently consistent with scientific research, which underlines that the information could be misleading and potentially putting individuals at risk.

6.2.6 Conclusion

The information provided consisted of a potpourri of scientific research, popular literature associated with flotation-REST, and personal anecdotes. Despite the fact that the advertisement referred to scientific evidence, the lack of sound scientific skepticism resulted in overly optimistic interpretation of scientific findings. The study indicates that there is a substantial discrepancy in the information on effects resulting from flotation-REST between advertisements on the Internet and scientific evidence, which highlights the importance to further develop

scientifically grounded sources of information on CAM therapies on the Internet.

6.3 Study 2: Promising Effects of Treatment with Flotation-REST (Restricted Environmental Stimulation Technique) as an Intervention for Generalized Anxiety Disorder (GAD): A Randomized Controlled Pilot Trial

6.3.1 Aim

The aim of the study was to perform an initial evaluation of a 12-session treatment program of flotation-REST as a treatment for Generalized Anxiety Disorder (GAD), by examining the method's effect on suggested core problems, the most common secondary diagnosis (depression), as well as the symptomatology associated with the disorder.

6.3.2 Design

This was a randomized, parallel group, non-blinded trial with 1:1 allocation ratio to waiting list control condition (n=25) or to a 12-session treatment program of flotation-REST (n=25). A two-way split plot design was performed, where *Time* with assessments baseline, 4-weeks in treatment, and after treatment, constituted the within-subject factor. *Group* (treatment; waiting list control) constituted the between-subject factor. In addition, 6-month follow-up data were gathered for the treatment group to provide some indication regarding lasting effects of treatment. The primary outcome was GAD symptomatology. Secondary outcomes were pathological worry, sleep difficulties, emotional regulation difficulties, mindfulness, and depression. Degree of ASC during the flotation session was also measured as an indication that adequate treatment response during the flotation sessions was reached.

6.3.3 Instruments

Flotation tanks

Flotation-tanks measuring 270 cm x 150 cm x 130 cm were used. The tanks were filled with water saturated with Epsom salt (magnesium sulphate), approximately 0.3 meter in depth. The water temperature was

maintained at a temperature of 35 degrees Celsius. The tanks were insulated to keep out sound and light, and earplugs were used to further minimize sensory input. The tanks were situated in quiet rooms, locked from the inside, but possible to open from the outside by the flotation laboratory staff. Shower and toilet could be accessed in the flotation rooms. The flotation-tanks were continually cleaned by filtering and exposing the water to UV-light between each use. In addition, hydrogen peroxide was added daily to further ensure that the water was kept hygienic. The participants were instructed to shower before and after the flotation session. Ventilation and light could be controlled by the participants from inside the tanks. The participants were instructed to keep the lights out in the tank if possible. Also an alarm button could be pushed from inside the tank to alert the staff in the laboratory if needed. This button was not used by any of the participants. No further instructions on what to do during the flotation sessions were given.

Demographics

Background information was gathered using a self-constructed questionnaire which contained questions regarding age, gender, as well as questions related to the exclusion criteria. In addition, other forms of ongoing therapeutic treatment were assessed by questions regarding medication used, dosage, and if the participant received psychotherapeutic treatment, and if so, what type and to what extent.

Primary Outcome: GAD-Symptomatology

GAD symptomatology was assessed by administering the Generalized Anxiety Disorder Questionnaire 4th edition (GAD-Q-IV). The GAD-Q-IV is a 9-item self-report measure assessing severity of GAD. The GAD-Q-IV was initially developed as a screening tool for GAD (Borkovec & Roemer, 1995) and in the present study the measure was used as a continuous variable by summing the responses and creating a total score ranging from 0 (minimum) to 12 (maximum). Newman et al. (2002) have suggested a cut-off score of 5.7+, yielding optimal ratio between sensitivity and specificity when identifying GAD.

Secondary Outcomes

a) The Penn State Worry Questionnaire (PSWQ) was used to assess level of pathological worry. The PSWQ has 16 items and is the most frequently used questionnaire for assessing pathological worry (Meyer, Miller, Metzger, & Borkovec, 1990). The PSWQ has shown good validity and reliability in both clinical and non-clinical samples (Brown, Antony, & Barlow, 1992; Davey, 1993). The PSWQ has also shown to be able to distinguish GAD-patients from patients with other psychiatric disorders (Startup & Erickson, 2006). The instrument yields a total score ranging between 16 (minimum) and 80 (maximum), with a recommended cut-off score of 45+ indicating GAD (Behar, Alcaine, Zuellig, & Borkovec, 2003).

b) The Montgomery-Asberg Depression Rating Scale (MADRS-S) was used to assess level of depression. The scale has 9-item and is a well-established Swedish self-report assessment of depressive symptoms (Svanborg & Åsberg, 1994). The MADRS-S has shown good reliability (Montgomery & Åsberg, 1979) and corresponds well with clinicians' ratings (Cunningham et al., 2011). The MADRS-S yields a total score ranging from 0 (minimum) and 54 (maximum). Each item relates to symptoms of depression, which is rated from 0 to 6 by respondents regarding how well it corresponds with their experience of the last three days. Cut-off values have been established at: 0-6 = no depression; 7-19 = mild depression; 20-34 = moderate depression; 34+ = severe depression (Svanborg & Åsberg, 1994).

c) The Pittsburgh Sleep Quality Index (PSQI) was used to assess degree of sleep difficulties. The PSQI is a 19-item self-report measure assessing subjective sleep quality, and is widely used in both clinical and non-clinical settings (Buysse et al., 1989). PSQI have demonstrated acceptable levels of validity and reliability in both clinical (Backhaus et al., 2002) and non-clinical samples (Grandner, Kripke, Yoon, & Youngstedt, 2006). The instrument measures sleep disturbance during the previous month and gives a global score ranging from 0 (minimum) to 21 (maximum) that distinguishes between "good" and "poor" sleepers.

A global score of five or higher indicates poor sleep quality (Buysee et al., 1991).

d) The Dysfunctional Emotion Regulation Scale (DERS) was used to assess level of difficulties in emotional regulation. The DERS is a 36-item self-report measure developed by Gratz and Roemer (2004), which has shown good reliability and validity, and gives a total score ranging from 36 (minimum) to 180 (maximum). The scoring was recorded so that higher scoring indicates greater difficulties in emotion regulation. In the present study the total score is used as a general indicator of degree of emotional regulation difficulties.

e) The Mindful Attention Awareness Scale (MAAS) was used to assess trait mindfulness. The MAAS is a 15-item self-report measure (Brown and Ryan, 2003), which has been the most empirically tested measure of trait mindfulness (Black, Sussman, Johnson, & Miliam, 2012). The scale gives a general indication on levels of mindfulness in daily life. MAAS scores range from 1 to 6, and high scores indicate high level of mindfulness.

Ancillary Measures

a) The Experienced Deviation from Normal state scale (EDN) was used to assess adequate treatment response during the flotation sessions. The EDN is a Swedish 29-item self-report measure specifically designed to be used in flotation-REST experiments, and assess degree of relaxation and deviation from normal state experienced during the flotation session (Kjellgren et al., 2001). The items consist of statements such as *"I could see images clearly"*, *"It felt like I was about to fall asleep"* and *"I felt a deep peace within me"*, which were graded on VAS-scales ranging from 0 to 100 on how well they corresponded to the experience during the flotation-REST session. The EDN yields a total score by averaging the scoring from the 29 items. A score of 30 on EDN at the first flotation session, and a score of 40 at the subsequent flotation sessions, is viewed as an indication of typical treatment response (Kjellgren et al., 2001),

55

and can be compared to resting on a bed in a dark quiet room, which in general gives the score of 15 (Kjellgren et al., 2007).

6.3.4 Procedure

Upon accepting participation in the study, participants were shown the flotation tank at Karlstad University and informed about the flotation intervention, before signing an informed consent form. Participants were also informed that they could continue with ongoing therapeutic treatments while participating in the study. Participants then completed the self-report measures used in the study, except for the EDN scale. After checking that the participants met the inclusion and no exclusion criteria for the study, participants were randomized to either treatment or waiting list control condition. Participants in the waiting list control group were informed that they were entitled to a shortened treatment program (four flotation sessions) after they completed the post-treatment assessments, and two additional visits to the laboratory were booked four and seven weeks later for further assessments. For the participants in the treatment group the two initial flotation sessions were booked for the coming week. During the flotation sessions, staff were present in the laboratory and could be alerted with an alarm button inside the flotation tank. The EDN scale was administered for the treatment group after their first flotation session, followed by four weeks in treatment and post-treatment assessments (after a flotation session). Four weeks in- and post-treatment, the self-report measures, except for background data and EDN, were filled out again by all the participants. For the treatment group this was done in adjunction to a flotation session (before), and for the waiting list control group this was done at the booked visits to the laboratory. Six months after completed treatment, follow-up data, consisting of all the self-report measures at post-treatment except for EDN, were collected by mail correspondence with the participants in the treatment group.

6.3.5 Statistics

A two-way mixed Pillais' MANOVA was used, where *Time* with assessments before (Baseline), four weeks in treatment (Mid), and after treatment (Post-treatment) constituted the within group factor and where *Group* (Treatment, Waiting list control) constituted the between group factor. The primary outcome was the participants' level of GAD-symptomatology (GAD-Q-4), and the secondary outcomes were pathological worry (PSWQ), difficulties in emotional regulation (DERS), Mindfulness (MAAS), sleep difficulties (PSQI), and depression (MADRS-S). In addition, independent sample t-tests were performed comparing the groups scoring on the dependent variables at post-treatment. For the treatment group a one-way ANOVA was conducted for the scoring on EDN for the three time periods (Baseline, Mid, Post-treatment). Paired sample t-test was also carried out comparing participants scoring on the dependent variables at post-treatment with 6-month follow-up scoring. This was only assessed for the treatment group to assess any lasting effects of the treatment. Chi-Square goodness of fit tests was conducted, comparing the groups in regard to received psychotherapy and the use of anxiolytic, antidepressant, as well as sleep medication at baseline and post-treatment. The criteria for "clinical significant improvement" as defined by Jacobson, Follette and Revenstor (1984), were used to determine the precision of the treatment effects. This implies that treated individuals must, in addition to showing a statistically reliable change, fall within the range of a normal group, at post-treatment assessment, as indicated by, for example, established cut-off values for a specific self-report measure. Clinical significant change was assessed for PSWQ, GAD-Q-IV, MADRS-S and PSQI. See the instrument section above for the cut-off values used for these assessments.

6.3.6 Ethics

The protocol for this study was approved by the Ethical Board on Experimentation on Human Subjects in Uppsala, Sweden (Dnr. 2013/357). The study is registered in the Australian New Zealand Clinical Trial Registry (ACTRN12613001105730). Date of registration:

09/10/2015. Personal data were anonymized when the data were transferred into the matrix used for the statistical analyses. The collected data were locked away in security-approved cabinets and will be destroyed after 10 years, according to good research ethics and Karlstad University´s policy document (Dnr. 230/02).

6.3.7 Results

The main findings were that flotation-REST significantly reduced both the general GAD symptomatology, as well as several symptoms associated with the disorder, namely difficulties in emotion regulation, sleep difficulties and depression, while having ambiguous or non-existent effect on the level of pathological worry and mindfulness. In addition, all improved outcome variables at post-treatment, except for depression, were maintained at 6-month follow-up assessments. In addition, the EDN indicated that adequate treatment response was reached during the flotation sessions.

6.4 Study 3: Characterizing the experiences of flotation-REST (Restricted Environmental Stimulation Technique) treatment for generalized anxiety disorder (GAD): A phenomenological study

6.4.1 Aim

The aim of **study 3** was primarily to characterize the experience of undergoing a seven-week flotation-REST treatment program while suffering from prolonged anxiety (GAD).

6.4.2 Design

Study 3 utilized a phenomenological approach and in-depth interviews were performed with subjects that met the criteria for GAD according to self-report measures before commencing a seven-week treatment program with flotation-REST. The Empirical Phenomenological Psychological (EPP; Karlsson, 1995) method was used to obtain and analyze the data.

6.4.3 Participants

In total, nine individuals (two men and seven women) with a mean age of 45 years (age range 24-61) participated in the study. The participants were recruited from a sample consisting of 24 individuals included in a research project that evaluated flotation-REST as a treatment for GAD. Originally this sample was recruited from outpatient psychiatry clinics as well as by advertisement in the local paper (Karlstad, Sweden). Half of the sample members (n=12) were invited for an in-depth interview session upon completing the flotation-REST treatment. Who to invite for participation was determined by randomization. In total, nine accepted to participate, while three declined. All participants had GAD, as defined by well validated self-report measures, when they received the flotation-REST treatment. The baseline measurements (before flotation-REST treatment) in the sample recruited from indicated high levels of GAD symptom severity, as well as substantial issues with depression, sleep difficulties, and emotional regulation. On average, the interviewed participants had experienced problems with anxiety for the past 16 years.

6.4.4 Instruments

Self-report measures

For detailed description of the self-report measures used to assess GAD symptom severity, demographic information, as well as variables associated with GAD in the sample recruited from see **study 2** (2.3.3 Instruments).

The flotation-REST intervention

Flotation-tanks measuring 270 cm × 150 cm × 130 cm were used. The tanks contained water saturated with Epsom salt (magnesium sulphate) 0.3 m in depth, and maintained at a temperature of 34.7 °C (skin temperature). The tanks were insulated to reduce sound and light, and earplugs were used to further minimize sensory input. The tanks were located in quiet rooms. Toilet and shower could easily be accessed. Before and after each flotation session the participants could sit down and relax in the flotation facilities. The flotation treatment consisted of

12 flotation session (à 45 min.) over a seven-week period with two sessions a week, and with the fourth week treatment free to make it possible for female participants to plan the timing of their flotation sessions according to their menstrual cycle. No specific instructions were given before treatment, except information regarding practicalities.

6.4.5 Procedure

The interviews were performed within two weeks of flotation treatment completion. The interviews were between 45 and 75 minutes long, and took place in a secluded room at the flotation laboratory at Karlstad University, Sweden. The interviews were semi-structured and started with the question: *"Can you tell me about your experience of the first flotation session?"* The interviewees were then encouraged to describe their experiences of undergoing the treatment-program in as much detail as possible. Follow-up questions were used to clarify the verbal accounts when needed. Two additional questions were used if not already answered: *"Were there any experiences during the flotation sessions, positive or negative, that have been especially meaningful to you, and can you describe them in more detail?"*, and *"Was your daily life affected by the treatment, and can you describe how?"* Besides the three pre-formulated main questions the interview was focused on creating a setting in which a genuine dialogue could take place and provide interviewees the opportunity to share what they felt were the most important experiences of the treatment program. The interview strategy was intended to help the participants relate to and express what they actually experienced during the treatment, while minimizing their own interpretation of their experiences. All the interviews were recorded with a digital recording device and transcribed into a word document for subsequent analysis.

6.4.6 Data analysis

The EPP method (Karlsson, 1995) was used to analyze the obtained data. The method aims to capture the implicit meaning structure of a certain phenomenon as it manifests itself, based upon direct world experiences. This implies that the researcher(s) must keep an open and bias free

approach toward the immediate experiences, as provided by the participants. This is done by bracketing (temporarily putting aside theoretical knowledge). The analysis process followed the 5-step guidelines of the EPP method. Step 1 consisted of reading and re-reading the text until a good comprehension of the content was reached by both authors. In step 2 the text was divided into separate meaning units (MU). A division was made each time the text changed its substantial meaning, as is illustrated by the following example: *"When I floated I felt calm (MU 1), and my thinking became clear and focused (MU 2)"* This step generated 610 MUs. In Step 3 each MUs were transformed into the language of the researchers, with the aim of raising the implicit meaning of the participants' described experiences. The MUs presented in the example above were thus transformed into: *"The subject experienced relaxation" (tMU 1) and "The subject experienced enhancement of cognitive functions"* (tMU 2). In step 4 the transformed MUs were ordered into categories based on their characteristics and similarities. This step generated 47 categories. Finally, step 5 consisted of synthesizing the categories into overarching themes based on their relation to each other at a higher level of abstraction, and presenting them as a written analysis with illustrative quotations from the raw data. During this step alternative interpretations were discussed by both authors until a consensus was reached. The researchers strived to ensure credibility by continually comparing the raw data with interpretations made, and by making adjustments and refinements of interpretations as the analysis process progressed.

6.4.7 Ethics

The protocol for **study 3** was approved by the Ethical Board on Experimentation on Human Subjects in Uppsala, Sweden (Dnr. 2013/357). Date of registration: 09/10/2015. All information that potentially could be used to identify the interviewees was deleted in the transcription process. The collected data were stored on a USB and locked away in security approved cabinets. The data will be destroyed after 10 years, according to Karlstad University´s policy document (Dnr: 230/02).

6.4.8 Results

The analysis resulted in six overarching themes that characterize the experience of undergoing a flotation-REST treatment while suffering from prolonged anxiety (GAD): *(1) obstacles in treatment, (2) a relaxed and safe vantage point, (3) non-ordinary states of consciousness, (4) connecting with oneself, (5) new attitudes and coping strategies, and (6) enhanced life-quality.*

6.4.9 Conclusion

Flotation-REST treatment of GAD was characterized as a comprehensive process that entailed both challenges as well as pleasant experiences. The results indicate that flotation-REST improved the core issue (pathological worry) and the symptomatology in GAD on an experiential level. The use of flotation-REST when having GAD was also indicated to be more challenging than for other previously researched populations, which suggests that psychotherapeutic support might be warranted to reduce negative experiences and increase the effectiveness of treatment. The study also shed light on potential mechanisms that might underlie and maintain positive treatment effects when flotation-REST is applied as an intervention of GAD.

7. General discussion

The main purpose of the present thesis was to increase the knowledge of flotation-REST's role in modern society, and in particular the role of this method as a treatment of GAD. The work stems from the observations that anxiety issues as well as the use of CAM amongst the public have increased over the last decades. Flotation-REST was chosen as the focus for the investigation because the method has earlier been shown to mitigate symptoms and common areas of comorbidity associated with GAD (Ballard, 1993; Bood et al., 2006; Bood et al., 2007; Bood et al., 2009; Kjellgren et al., 2001; Kjellgren & Westman, 2014), and because the method has evidence-proven effect but is mainly used within the private sector where it is marketed as a CAM (Spencer, 2015). The main aim of the studies presented in this thesis were to answer two primary questions: (1) is the information regarding flotation-REST effects, as provided by privately-owned flotation-REST centers, in line with existing scientific evidence? (2) Is flotation-REST a valid treatment option for individuals with GAD? An additional secondary question was also explored: (3) if flotation-REST has beneficial effects for individuals with GAD, what are the mechanisms underlying these effects?

In sum, the obtained results indicate that the information provided in the marketing of the method as a CAM by privately-owned flotation-REST centers is not adequately up to date with scientific evidence, and thus could be misleading to consumers and potentially putting them at risk. The results also highlight flotation-REST as a promising treatment of GAD and indicate that more research evaluating the method as an intervention of GAD is warranted. Lastly, the findings contribute to the understanding of how flotation-REST has beneficial treatment effects for individuals with GAD, as well as how the treatment could be optimized when applied as a treatment of generalized anxiety. In this last chapter the findings and problematic issues of **study 1 − study 3** are discussed in a wider perspective with the aim to put the findings in a context that increases their relevance. Furthermore, limitations and possible implications of the findings for future research are discussed.

7.1 Is flotation-REST a valid treatment option of GAD?

7.1.1 Main findings

The results from **study 2,** the first of its kind**,** indicated that flotation-REST has potential as an addition to existing treatment protocols of GAD, and that further research on the methods efficacy as a treatment of GAD is motivated. Besides providing information that could enhance the treatment of GAD, the results of **studies 2 -3** have implications for the research field of CAM, as the present work suggests that flotation-REST might be a valid choice of CAM if the aim is to mitigate symptoms associated with GAD. In addition, the result in **study 3** implies that the use of flotation-REST as a CAM entails problematic issues, which need to be acknowledged, as it indicated that flotation-REST treatment might be challenging and may entail negative experiences for individuals with generalized anxiety. The main finding in **study 2** was that the flotation-REST treatment substantially improved the primary treatment outcome (GAD-symptomatology), and 37 % of the participants in the treatment condition reached full remission according to self-report assessment post-treatment (Waiting list control group: 14 %); effects of treatment were also maintained at the 6-month follow-up assessment. This rating is similar to the treatment outcome reported for first line psychopharmacological GAD treatment with anti-depressants (Gelenberg et al., 2000; Pollack et al., 2001), and slightly lower than CBT for GAD where about half of the treated patients reportedly reach full remission post-treatment (Chamberless & Gillis, 1993; Dugas & Robichaud, 2007). Despite the fact that the combination of psychopharmacological medication and CBT is increasingly prevalent in the treatment of anxiety disorders (Harman et al., 2002), the effectiveness of this combination as a treatment of GAD is, to date, under-researched and not well-established in regard to efficacy (Crits-Christoph et al., 2011). An area that has recently been highlighted as important to address in the treatment of GAD (e.g. Mennin, 2006; Newman et al., 2011), namely deficits in emotional regulation, was also markedly improved by the flotation-REST treatment according to results in **study 2,** and additional support and understanding regarding how

64

flotation-REST might improve emotional regulation abilities is found in **study 3** and will be discussed later. In addition, **study 2** indicated that the flotation-REST treatment improved two common areas of comorbidity in GAD, depression and sleep difficulties, in clinically relevant levels. These findings were triangulated in **study 3** as the results showed that the flotation-REST treatment was experienced to increase functionality in daily life, including mood enhancement and improved sleep quality. Taken together, the findings in **study 2 − 3** thus constitute evidence that flotation-REST can improve established areas of importance in assessing treatment response and remission of anxiety disorders (Bandelow, Baldwin, Dolberg, Andersen, & Stein, 2006; Pollack et al., 2007), namely symptomatology of the disorder, functionality, and common areas of comorbidity. The findings in **study 2 - 3** are also in line with earlier studies reporting that flotation-REST can mitigate depression (e.g. Bood et al., 2007), anxiety (e.g. Kjellgren & Westman, 2014), as well as parts of the symptomatology in GAD such as fatigue (Bood et al., 2006), muscle tensions (Kjellgren et al., 2001) and sleep difficulties (e.g. Ballard, 1993). Despite the fact that **study 2** indicated that GAD-symptomatology decreased substantially as a result of the flotation-REST treatment, the scoring on the PSWQ (pathological worry) was not convincingly affected. Although the GAD-Q-IV measure assesses pathological worry, the dimensional scoring beyond this dimension comprises symptoms associated with GAD based on established diagnostic criteria of the disorder (DSM-5; APA, 2013), such as fatigue, restlessness, concentration difficulties, irritability, muscle tensions, and sleep difficulties. The PSWQ on the other hand assesses only pathological worry, and thus focuses on assessing the cognitive aspect of GAD. A possible interpretation of the result in **study 2** then might be that flotation-REST mainly affects the symptomatology in GAD, while leaving the core issue of the disorder (pathological worry) marginally affected. Although it is important to note that contemporary models of GAD have suggested that avoidance strategies utilized by individuals with GAD are not limited to worry alone (e.g. Mennin, 2006). However, considering earlier research on flotation-REST (e.g. Bood et al., 2006; Kjellgren et al., 2001) this interpretation is plausible as the

65

method repeatedly has been demonstrated to effectively mitigate stress-related ailments (e.g. muscle tensions, fatigue, sleep difficulties) and induce mood enhancement, but never in previous research studies has been reported to reduce pathological worry. Other alternative interpretations are also possible and will be discussed later. The findings in **studies 2 -3** also gain relevance in the light of that GAD is a relatively treatment-resistant disorder (Newman et al., 2013; Ninan, 2001; Yonker et al., 2000), and that pre-treatment assessments in **study 2** indicated high symptom severity and potential comorbidity (sleep issues, depression) in the sample used. Considering that high symptom severity and comorbidity are associated with low prognostic rating in CBT treatment of GAD (Durnham et al., 2004), and that anxiety disorders in comorbidity with other mood disorders are linked to lowered efficacy and increased cost of treatment (Ballenger, 2000; Gorman, 1997), these relations further underline that results in **studies 2 − 3** are of importance, as they suggest that flotation-REST might be a valuable and novel treatment strategy for treatment-resistant GAD. The method might also be of interest to use for patients whose prior treatments display high symptom severity and comorbidity, as they, according to current state of knowledge, have an increased risk of being non-responsive to current treatment protocols. In the light of this, further research of the flotation-REST as a treatment of GAD is motivated and should foremost evaluate if the findings in **study 2** can be replicated and thus be generalizable to clinical populations, preferable with high symptom severity and comorbidity.

7.1.2 Implications for current treatment protocols of GAD

The results in **study 3** indicated that the flotation treatment enabled undisturbed self-exploration; an exploration comprising both exposure to unpleasant and feared internal experiences and symptom relief such a mood enhancement and increase in sleep quality on an experiential level. In addition, new attitudes and strategies to cope with oneself, others and life in general were experienced and cultivated during the flotation-REST treatment. These are effects and experiences that would be a natural part of successful GAD treatment consisting of psychotherapeutic

intervention and psychopharmacological medication. What is different, however, is the method used to reach these effects. The medications of first-line treatments of GAD (anti-depressants), besides providing symptom-relief, are known to have negative side-effects (Bystritsky, Khalsa, Cameron, & Schiffman, 2013) and might even increase the risk of suicidality in some individuals (e.g. Reeves & Ladner, 2009). Unfortunately so, because anxiety disorder is associated with heightened risk for suicide attempts (Sareen et al., 2005). Non-adherence to anti-depressant medication treatment of anxiety disorders is also common, and reportedly 53-70 % of patients do not adhere to medication regimes 6 months in treatment (Sheehan et al., 2008; Stein et al., 2006). Suggestions of possible causes of the high rate of non-adherence are lack of efficacy, side effects, delay in experienced effects, and natural improvement of symptomatology (Davidson, Feltner, & Dugar, 2010). Undergoing psychotherapy can also be a challenging process which demands effort on the part of the patient. It is well known that not all patients with anxiety disorders have the adequate resources to adhere to psychotherapeutic intervention (e. g. Taylor, Abramowitz, & McKay, 2012), and high symptom severity, as well as comorbidity, increases the risk of non-adherence and/or lack of sufficient treatment effect (Durnham et al., 2004).

Unlike psychopharmacological treatment, flotation-REST to date has no documented side-effects, and the method has been indicated to be exceptionally liked by the majority of users (Borrie, 1993; Norlander et al., 2001). Termination of flotation-REST treatment has been suggested to be under 5 % (Borrie, 1993), a statement which is supported by clinical studies using flotation-REST where even lower drop-out rate has been reported (e. g. Bood et al., 2009; Bood et al., 2005). The low drop-out rate could in part be explained by the fact that the effects of flotation-REST treatment (e.g. relaxation, mood enhancement) are manifested without much effort and prior training, and therefore might increase the chance of an adequate treatment response. In line with Borrie´s (1999) suggestion, only 4 % (n=1) of the participants in the flotation-REST did not complete treatment in **study 2**. This drop-out level should be

considered very good, especially when contrasted to the relatively high rate (25-50 %) of treatment termination to be expected when applying psychotherapeutic interventions in research settings (McFarland & Klein, 2005). Considering that drop-outs in CBT for GAD often are those in most need of it (Durnham et al., 2004), further suggests that flotation-REST might be a well needed treatment option for patients who do not have the social and/or psychological resources to adhere to existing treatment protocols. Furthermore, the observation in **study 2** that GAD-symptomatology, sleep difficulties and depression were substantially improved already after six treatment sessions with flotation-REST suggests that the method can be suitable as an early intervention of generalized anxiety, especially so, since anti-depressants are known to take time to reach full effect and side effects can manifest prior symptom reduction (Davidson et al., 2010). GAD patients with high symptom severity and comorbidity, in addition, might benefit from a flotation-REST intervention prior to psychotherapy, as a brief lowering of their symptomatology can improve the chances to respond adequately to treatment. The results in **study 3** also indicated that the flotation-REST treatment increased the motivation to seek out activities that induced effects similar to those experienced during flotation-REST treatment and that were characterized as being free from performance and promoting being in the present. This effect would suggest that mindfulness-based interventions might be especially effective if provided after the completion of a flotation-REST treatment program as motivation to acquire these techniques might be present. Lastly, the result in **study 2** that indicated considerable improvement in emotional regulation difficulties as an effect of the flotation-REST treatment has implications for recent progress of GAD treatment (Mennin, 2006, 2004), which underlines that this construct plays a key role in the maintenance of the disorder, for which preliminary results are compelling and supports this claim (Mennin et al., 2005). ERT (Emotion Regulation Therapy; Mennin, 2006) focuses on increasing the contact, understanding, and functional use of emotions in a therapeutic context, which in brief consist of psychoeducation, somatic awareness, skills-training of adaptive emotional regulation strategies and experiential exposure to

feared emotional themes. As discussed later, **study 3** indicated that flotation-REST was experienced to induce several of the desired outcomes of the treatment strategies used in ERT without the guidance of a therapist, namely increased contact with bodily sensations, experiential exposure to feared emotional themes, as well as improvement of adaptive emotional coping strategies. Mennin also suggested that experiential exposure in ERT could be difficult due to resistance and fear of losing control (Mennin, 2006). Flotation-REST could here play an important part of ERT as it potentially could be an effective method to facilitate exposure to feared emotional themes, possibly due to an attenuation of the main avoidance strategy in GAD (worry), relaxation, and increased awareness of bodily sensations during the flotation sessions. ERT could also provide what flotation-REST alone might fail to provide prior to experiential exposure; psychotherapeutic support, developed skills to regulate emotions and psycho-education about the disorder. This most likely would lower the likelihood of negative experiences resulting from flotation-REST that relate to experiences of being, at times, overwhelmed by emotional states as indicated in **study 3**.

7.1.3 Negative experiences during flotation-REST treatment of GAD

An alternative explanation of the low treatment termination and lack of documented negative side-effects of flotation-REST treatment might be that clinical studies on flotation-REST seldom have used samples with high symptom severity and/or chronic psychiatric ailments. This implies that we cannot exclude the possibility that negative experiences from flotation-REST might manifest themselves for certain patient groups. The result in **study 3** is therefore of value as it provides an opportunity to explore potential negative side-effects when the method is applied to a sample with persistent and severe anxiety. Firstly, pre-treatment anxiousness and worry were experienced, which might be elicited by starting a relatively unknown treatment, although this might reflect the participants already existing anxiety issues rather than the flotation-REST treatment per se. Pre-treatment anxiousness and worry have, in addition, been reported in earlier research evaluating flotation-REST for

chronic pain conditions (Edebol et al., 2008), implying that the phenomenon might not be unique for individuals with generalized anxiety. Nevertheless, the pre-treatment anxiety could possibly be mitigated by providing information about what to expect from treatment. Several of the experienced obstacles in the treatment, such as difficulties managing heightened energy level, increase in self-awareness, and ideas for positive life-changes, could also potentially be turned into an asset in the treatment process if flotation-REST was combined with a psychotherapeutic intervention providing support and guidance. These reported obstacles would most likely provide fruitful material to work with in psychotherapy, especially if the psychotherapeutic intervention comprised well-being exercises (e.g. focusing on improving the quality and positive aspects of life; Fava et al., 2005), which have been highlighted as a promising addition to existing treatment protocols of GAD (Huppert & Sanderson, 2010). Furthermore, the findings in **study 3** indicated that the flotation-REST treatment involved challenging experiences relating to coming in contact with past negative episodes, physical sensations and emotions without attempting to control or avoid the experience. Although these experiences were temporarily demanding, they most likely played an important part of the flotation-REST treatment, especially when considering existing theories and treatment approaches of GAD (Cuijpers et al., 2014). Nevertheless, the occurrence of this type of challenging experience underlines the importance that psycho-social support is available after flotation session to ensure safety, reduce negative experiences of treatment, and increase efficacy of flotation-REST when applied as a treatment of GAD.

7.1.4 The role of mindfulness in flotation-REST treatment

An alternative interpretation of the results in **study 2,** which indicated that the flotation-REST treatment did not reduce degree of pathological worry, is that the treatment had an impact on the attitude towards worry. According to Meta Cognitive Therapy (MCT), which is based on the MCM, emotional dysregulation can be mitigated by activating a meta-cognitive mode, implying that the worry is experienced in a detached way, and where the experiencer is aware that thoughts do not

equate with reality but rather are internal experiences that can be modified (Wells, 2000, 2002). According to Wells (2002), the meta-cognitive mode entails that negative attitudes about worry (e.g. that they are harmful and uncontrollable) do not get activated even when worrying, which over time can lead to a decrease in negative attitudes about worry (type 2 worry) because they are not reinforced. In view of this, cultivation of a more detached attitude towards worry (and psychological processes in general) might explain why flotation-REST (**study 2**) improved deficits in emotional regulation and GAD-symptomatology, but not pathological worry. The result in **study 3** supports this interpretation as it indicated that the flotation-REST treatment was experienced as resulting in a more detached attitude towards thoughts and emotions in daily life, as well an increased control over when to pay attention to psychological processes. On the other hand, this interpretation is not supported by the findings in **study 2,** which failed to convincingly indicate that the flotation-REST treatment increased the trait mindfulness in daily life, despite the fact that this method in qualitative research has been shown to induce a deeply relaxed and meditative state, at least during flotation-session (Kjellgren et al., 2008). In line with Kjellgren and colleagues (2008), **Study 3** indicated that the participants at least experienced themselves to be deeply relaxed and more centered in the present during the flotation sessions, and that they strived to maintain a more mindful approach in daily life. The MAAS scale used to assess mindfulness in **study 2** does not, however, assess different aspects of mindfulness but rather the trait mindfulness in general. Thus it is possible that the flotation-REST treatment might affect a specific component of mindfulness. As discussed earlier, and supported by the results in **study 3**, a likely component could be detached mindfulness (Wells, 2002), or so called cognitive diffusion in terms of the third wave of CBT (e.g. Yovel., 2009), which both implies the ability to soundly distance oneself from psychological processes while observing them from an objective vantage point.

7.1.5 The role of ASC in flotation-REST treatment of GAD

The EDN scale has been extensively used in the clinical research on flotation-REST (e.g. Kjellgren et al., 2001; Kjellgren et al., 2009a; Norlander, et al., 2001) as an indication that adequate treatment response is achieved, and the results in **study 2** showed that individuals with generalized anxiety had a similar treatment response as other patient groups, and healthy individuals, included in previous research on flotation-REST in regard to degree of ASC during the flotation sessions (e.g. Bood et al., 2006; Kjellgren & Westman, 2014; Kjellgren et al., 2001). In addition, after-analysis indicated that the five items on the EDN with the highest mean score across all data-collection points were: *"my body felt wonderful", "I experienced dreamlike alteration of time and space", "it felt like I was about to fall asleep", "it felt like I was floating", and "I felt a deep peace inside"*. However, to further explore what other types of ASCs occurred and to triangulate the EDN assessment, the result in **study 3** has to be consulted. Firstly, the result in **study 3** confirms that deep relaxation and experiences of states in the borderland of sleep and wakefulness occurred during the flotation sessions. This is also in line with earlier research on flotation-REST (e.g. Norlander et al., 2001; Kjellgren et al., 2001), and the occurrence of these types of hypnagogic states and their implications for psychodynamic therapy have previously been associated with flotation-REST by Budzynski (1990). The result in **study 3** also revealed the occurrence of phosphonic phenomena (e.g. seeing flashes or dots of light) during the flotation sessions, which is in line with the early research on SD (Zuckerman, 1969a) where these types of experiences were labeled as simple RVS, which preceded RVS of a more complex type (e.g. seeing natural scenery, bizarre architecture, and people). Although speculative, the occurrence of these so called simple RVSs during flotation-REST might then suggest that complex RVS could be induced by administration of longer flotation sessions.

Study 3 indicated that alterations in body-perception were experienced during the flotation-REST sessions. These alterations were characterized by feelings of weightlessness and the expansion of bodily boundaries,

which became less defined. These types of dissociative effects from flotation-REST is in line with earlier studies (e.g. Norlander et al., 2001; Kjellgren et al., 2008), and in addition, have been pointed out as an overlooked and potentially important aspect of flotation-REST treatment (Schultz & Kaspar, 1994). More radical consciousness shifts also occurred in which bodily sensations disappeared altogether, accompanied with reduced or no thought processes, which entailed feelings of deep peace and/or euphoria. Considering that experiences of being trapped in a heavy, rigid, and anxious body have been suggested to characterize the phenomenology of mood disorders (Fuch, 2005) and that an overactive verbal thought-process (pathological worry) is highlighted as the core issue of GAD (e. g. Borkovec et al., 2004), imply that the ASCs that in part characterized the flotation-REST treatment (**study 3**) could be of significance in trying to understand how beneficial treatment effects are manifested in individuals with GAD. Especially so because temporarily *"losing"* the body and mind, which potentially could be an unsettling experience, entailed positively toned emotional states. The results here bear resemblance with the *"oceanic boundlessness"* dimension that is suggested in part to characterize ASCs as induced by various methods (Dittrich, 1998), which comprise reduced body boundaries, deep and positive emotional states, as well as experiences of unity that extends into mystical states. Furthermore, the results in **study 3** indicate that another dimension that characterizes ASCs, according to Dittrich (1998), namely *"dread of ego dissolution"*, which refers to negative experiences relating to de-personalization and de-realization (e.g. paranoia, cognitive abnormalities, fear of going insane), did not characterize the experience of flotation-REST for GAD sufferers. Taken together, this suggests that flotation-REST might be a method of inducing ASC that are relatively mild, and are perceived as positive and manageable by individuals with GAD. In the light of the above, it is reasonable to assume that ASCs during flotation-REST do play an important part in the treatment of GAD. This needs to be explored further and not dismissed as an ancillary phenomenon without therapeutic value. The assumption is also supported by several recent clinical studies that have used methods to induce ASC as intervention for

treatment resistant mood disorders with promising results (Carhart-Harris et al., 2016; Gasser et al., 2014; Grob et al., 2011; Murrough et al., 2013). Considering that these clinical trials have exclusively utilized psychedelic substances as their method of ASC induction, flotation-REST offers a less daunting route to reach ASC that can be of therapeutic value.

7.1.6 The role of primary processes functioning in flotation-REST treatment of GAD

In contrast to the reported experiences of reduced bodily awareness, the flotation-REST treatment also promoted contact with bodily sensations as well as emotions, according to the results in **study 3.** This finding is in line with Schultz´s theory (1965) of sensoristasis, which claims that internal sensory information migh become attenuated during SD as a way to compensate for reduction of external sensory input, as well as neuroimaging findings (Feinstein, 2016), indicating that flotation-REST increase awareness of interoceptive sensations and activity in the insular cortices. Many theoretical models of GAD have highlighted experiential avoidance as a central issue of GAD, and that pathological worry serves as an avoidance strategy for individuals with GAD (Behar et al., 2005; Borkovec et al. 2004) who suppress anxiety provoking internal experiences (mental imagery, physical sensations, and emotion) by directing attention to verbal linguistic thought processes (worry). In the light of this, the flotation-REST treatment might break this pattern as it, according to the results in **study 3**, at times promoted contact with the body and emotions, as well as vivid recollection of past negative experiences. This line of thought is supported by earlier studies on flotation-REST (Norlander, Kjellgren, & Archer, 2001, 2003; Norlander, Bergman, & Archer, 1998), as well as early research on SD (Goldberger, 1961), which suggests that so called secondary processes (e.g. verbal thought processes, analytical and reality oriented thinking) diminish during SD, and that so called primary processes (vivid images, increased body-awareness and emotional experiences) are promoted. A temporary shift to a more primary processing mode of functioning during the flotation sessions could thus promote successful habituation and extinction (Foa et al., 2006) of anxiety-provoking internal experiences,

and arguably reduce the need for avoidance. Results in **study 3** support the claim that the participants were exposed to feared internal experiences (intense emotions, vivid recollection of past negative experience) during the flotation-REST treatment, and that by facing these experiences, associated anxiety with time diminished and were replaced by relief and positive emotional states. Although speculative at this point, this might in part explain the observed improvements in GAD-symptomatology and emotional regulation deficits reported in **study 2**. The results in **study 3** further suggest that these confrontations with feared internal experience did not include attempts of control or avoidance, which might indicate that secondary processing decreased during the flotation sessions, as the central avoidance strategy in GAD (worry) is dependent on secondary processes functioning according to its verbal nature. This line of thought also gains relevance when considering recent evidence (Sloman & Steinberg, 1996; Evans, 2008; Shanks, 2010) that confirms Freud´s dual processing theory of the psyche (Pribram & Gill, 1976), which in its contemporary form postulates that secondary processes serve as a hierarchically higher-level cognition that controls lower-level cognition, and often emotionally driven, primary processes (Arminjon, 2011). Taken together, the flotation-REST treatment might in part reach beneficial treatment effects for individuals with GAD by temporarily making primary process the dominating mode of functioning, and thus indirectly *"disable"* their main strategy (worry) to cope with unsettling inner experiences. This then opens for the possibility to modify learned responses to feared aspects of their own experiences, and to develop more adaptive strategies to cope with their inner life. The results in **study 3** also suggest that new strategies to cope with anxiety provoking experiences were cultivated during the flotation-REST treatment and that these strategies mainly consisted of acceptance and sound distancing from internal experiences. From the perspective of Freud´s dual processing theory, the development of these coping strategies was probably not coincidental as it might be one of the few options to handle internal experience in a state that is dominated by primary process functioning. The opportunity to observe and experience emotions without avoidance during the flotation-REST treatment could

also explain the improved ability in emotional regulation reported in **study 2,** as it is reasonable to assume that this would facilitate the ability to label, differentiate and coming in contact with emotions, which is an essential part of ERT (Emotion Regulation Therapy; Mennin, 2006) and a prerequisite for using emotions in a functional manner.

7.1.7 Increase in problem solving during the flotation-REST treatment

The results in **study 3** also indicated that problem solving was enhanced during the flotation sessions. Considering that individuals with GAD experience themselves as having lost control of their thought processes (excessive worrying), it is an interesting finding as it suggests that the flotation-REST treatment enabled individuals with GAD to regain control and use their cognitive ability in a functional manner from time to time during treatment. The line between worry and problem solving might also be very thin, and according to MCM (Wells, 1995, 1997) individuals with GAD have positive meta-cognitions about worry as they believe it to be an effective strategy to avoid threats. Although research has reported conflicting results in regard to whether individuals with GAD have deficits in problem solving, research has showed that they have low-confidence in this ability (Davey, 1994), and that they often react negatively when confronted with problems (Belzer et al., 2002). In the light of this, the experience to solve everyday problem from a relaxed vantage point inside of the flotation tank might be empowering, thus potentially increasing confidence in this ability.

7.1.8 An attempt to unify paradoxical effects of flotation-REST

Earlier studies (Kjellgren et al., 2008; Norlander et al., 2001), as well as findings in the present work (**study 3**), suggest that the flotation-REST treatment to some extent induce paradoxical effects. For example, both increased and reduced contact with bodily sensations occurred according to results in **study 3,** and increased ability to solve everyday problems as well as diminished or no active though-process were reported. The present work thus confirms the difficulties in earlier research on SD to combine the effects of SD in a unified theoretical model. Nevertheless, it is compelling to try to use some common effects resulting from flotation-

REST to explore the treatment effects and experiences reported in **studies 2 − 3** which on the surface might be considered paradoxical. Drawing on earlier research on flotation-REST (e.g. Van Dierendonck & Te Nijenhuis, 2005), a good candidate might be decrease in arousal (relaxation). On the basis of Fischer´s model (1971) that aims at mapping level of arousal to (altered) state of consciousness, one could argue that individuals with GAD prior to flotation-REST treatment are on the first level of arousal (ergothropic axis) as it entails anxiety. Floating might then initially lower arousal, placing them within a normal range of arousal (daily routine, relaxation), which is supported by the results in **study 3,** which indicated that thoughts became calmer, paving the way for a clearer and relaxed way of thinking. This might then correspond to the enhanced ability in problem solving reported in **study 3**. As treatment proceeds, arousal might then be lowered (moving down the trophotropic axis) even more, which according to Fischer (1971), entails deep relaxation and meditative states, which were also reported to occur during the flotation sessions (**studies 2-3**). If arousal becomes even more reduced as treatment continues, dissociative states might be induced, according to Fischer (1971), which then might correspond to the dissociative phenomena reported in earlier flotation-REST research (Kjellgren et al., 2008; Norlander et al., 2001) as well in **study 3**, in which experience of separation from the body and mind occurred with weightless sensation, blurred body boundaries, as well as a sense of losing contact with the body all together. Furthermore, experience of dissociative states could in part explain cultivation of a sound distance to psychological processes as reported in **study 3**, in which thought, emotions and memories could be viewed as if from a distance. Although speculative, the flotation-REST treatment in this regard could work as a form of training ground where the experience of transient dissociative phenomena might promote insight and less entanglement with the contents of the psyche. If arousal is lowered even further, one reaches what Fischer (1971) labels yoga Samadhi, the end point of the continuum, which according to Fischer (1971) corresponds to the Self, and is a sort of meditative peak, in which the mind becomes still and where the present moment is all there is. Interestingly, this bears

resemblance to the described experiences of the more radical ASC reported in **study 3,** where the experience of body and mind disappeared altogether, accompanied by feelings of euphoria and/or deep peace. Despite the speculative character of this though-experiment, this line of thought at least illustrates how several effects that may appear paradoxical can be connected and understood as the result of a single effect (decrease in arousal).

7.1.9 Summary

In summary and referring back to one of the main questions of this thesis (1), the present thesis suggests that SI in the form of flotation-REST might indeed benefit individuals with GAD to a clinically relevant degree. Further research is needed to confirm this claim, but in the light of results in **study 3**, as well as earlier research and theoretical frameworks relating to SD, flotation-REST and GAD, the promising treatment outcome observed in **study 2** is substantiated by several potential explanations, which support and help us understand how flotation-REST might result in beneficial treatment effects for individuals with GAD. Although flotation-REST is suggested as a promising treatment option for GAD, the current work also underlines that flotation-REST is a method that entails challenges and negative experiences for sufferers of GAD which motivate additional support, and possible modifications of the flotation-REST treatment, when applied as an intervention for GAD.

7.2 How to turn the use of CAM from being a problem to be solved into an asset for society

7.2.1 General implications for the use of CAM

Against the backdrop of the recent rise of interest in and usage of CAM amongst the public, **study 1** aimed to clarify the nature of the information given about flotation-REST when it is marketed as a CAM treatment. The result indicated, in line with previous research on the marketing of CAM (e.g. Tascilar et al., 2006), that the information varied greatly in quality and that it in some cases was directly misleading.

Although one study concluded that many CAM websites provide correct and valuable information (Schmidt & Ernst, 2004), the same study also observed that several websites provided information that promoted companies' own products and treatments, and some sites even advised against the use of conventional health care. Considering that research has suggested that 60 % of people who use Internet search for information about health (Fox & Raine, 2002), and that about half of these people stated that the information they found on the Internet was correct, the result from **study 1** becomes even more alarming. This implies, in line with earlier researchers' conclusions (e.g. Eysenbach, Powell, & Kuss, 2002; Schmidt & Ernst, 2004), that the public needs to be further informed about the quality of web sites providing information about CAM. Misleading information, whether or not it is intentionally used to increase profit or springs from lack of knowledge, could potentially jeopardize individuals' well-being. Misinformation about CAM may also especially put those who experience issues with anxiety and depression at risk because these types of psychiatric ailments are common incentives to seek out CAMs (Eisenberg et al., 1993; Eisenberg et al., 1998). Considering that treatment of GAD currently is the least effective among the existing anxiety treatments (Newman et al., 2013), non-responders to GAD treatment might in addition constitute a considerable portion of those that seek out CAM to mitigate anxiety. Arguably, misinformation about CAM would mostly affect individuals who are vulnerable and desperate to find a cure for their ailments; a vulnerability and desperation that possibly make them even more prone to accept information about CAM. Best case scenario is that these individuals lose some money and might even find a CAM treatment that helps them, but it also puts them at some risk. The CAM treatment might, for example, interact negatively with conventional health care treatments, an issue that has been highlighted in previous research (e.g. Andersen et al., 2013; Baum, 2015). Although, the risk of fatal interactions primarily seems to apply to severe medical conditions (e.g. cancer, undergoing surgery), there could still be interactions that lead to mild to moderate negative impact for the individual, and/or decreased efficacy of treatments received. The fact that the use of CAM is common

among patients in the health care system (e.g. Kessler at al., 2001) and that many patients feel reluctant to inform their health care provider about CAM use (e.g. Tasaki et al., 2002) suggests that we have a situation that needs correction if we want to ensure patient safety. Obviously, we first need to address the communication problem between health care providers and patients. Without knowing what types of CAMs patients are using, knowledge about the effectiveness or cautions associated with certain CAMs would be useless. Currently, the information about hindering factors regarding the communication about CAM (Shelley et al., 2009; Tasaki et al., 2002) suggests that patients are afraid of being ignored, judged or opposed when informing health care providers about their CAM use. In Shelley and colleagues' study (2009) patients' anticipation of clinicians' reaction to their CAM use was indicated as the major factor determining their degree of openness regarding CAM use; implying that a non-judgmental and accepting attitude on behalf of the clinicians is of importance if communication about CAM should become effective. In addition, Tasaki and colleagues (2002) reported that patients' reluctance to open up about CAM use in the primary health setting in part was based on the notion that health care providers stress the importance of scientific evidence (Tasaki et al., 2002). The problem here is not that health care providers base their judgements on scientific evidence; rather the core of the problem seems to spring from lack of research evaluating cost-benefit ratios, potential risks and side-effects, as well as treatment efficacy of various types of CAMs. This line of thought is supported by findings in a study (Winslow & Shapiro, 2002) indicating that physicians feel uneasy about answering questions from patients regarding CAM due to lack of knowledge. Although there is a growing body of scientific evaluation of CAM, the body of evidence in regard to the efficacy of most CAMs as treatment of mood disorders is small (Van der Watt, Laugharne, & Janca, 2008). Nevertheless, the information that exists needs to be implemented so that it reaches both patients and health care providers. Part of the solution could be to provide education to health care providers to enable a more effective communication about CAM with patients, which also physicians seem to support (Winslow & Shapiro, 2002). Considering that

patients seldom specify a health care professional as their source of information regarding CAM (Molatossiotis et al., 2005), and that physicians are reluctant to ask patients about CAM use due to lack of knowledge about CAM (Winslow & Shapiro, 2002), suggests that increased awareness and education about CAM among health care providers might turn clinicians into a much needed informational and guiding asset for patients. It is also worth noting that physicians who use CAM themselves are more prone to recommend CAM to their patients (Winslow & Shapiro, 2002), and in the light of the poor evidence-base for CAM's efficacy to treat mood disorders, this can be unfortunate as it suggests that physicians' personal attitude to CAM might influence their professional work. A fruitful avenue forward would be to implement national and easy to access informational sites about CAM, based on scientific evidence, to serve as a valid information source on CAM that both patients and clinicians can access. Good examples have already been implemented in some countries (e.g. NCCAM, 2015) and such initiatives are likely to contribute to bridging the gap between health care providers and patient in regard to attitudes to CAM (Chez & Jonas, 1997; Eisenberg et al., 1998).

7.2.2 Specific implications for the use of flotation-REST as a CAM

Although partly grounded in scientific research, the results in **study 1** indicated that the advertisements of flotation-REST as a CAM created a skewed picture of what effects usually result from flotation-REST. Instead, most of the possible effects of flotation-REST as reported in scientific studies, popular literature, and personal anecdotes were stated as likely to occur; thus there was no differentiation among effects that were more likely to occur than others. In other words, the advertisements seemed to aim very broadly in their marketing as an attempt to attract interest in flotation-REST, a claim that also is supported by the results in **study 1** which indicated that the marketing seemed to target several distinct interest groups. Misinformation about CAM, besides putting individuals at risk, might also deter individuals who actually would benefit from a certain CAM therapy, such as flotation-REST. The results in **study 2** indicated that flotation-REST

81

might be beneficial for individuals with GAD, as a method to improve the symptomatology seen in GAD as well as associated psychological issues such as emotional regulation difficulties, depression, and sleep difficulties. When individuals with GAD then read about flotation-REST as depicted by the commercial flotation-centers, including, for instance, statements that flotation-REST induces intense and mind-bending experiences (strong ASC), they might be inclined not to use a method they would potentially benefit from. It would be more correct to state that strong ASC could be induced in some individuals, especially in sensitive individuals (Kjellgren et al., 2009; **Jonsson et al., 2014**), and to highlight other more robust effects resulting from flotation-REST, such as stress reduction, increase in well-being, and performance enhancement (van Dierendonck & Nijenhuis, 2005). Furthermore, and in the light of the results in **study 3,** the ASC that were experienced during the flotation sessions could possibly be an important part of treatment, which needs to be understood and explained as such prior to treatment, instead of reduced to a kind of entertainment as depicted in the advertisements. **Study 1** also indicated that the advertising claimed that flotation-REST could alleviate an array of medical conditions, and also that it especially seemed to target individuals suffering from psychological and/or physiological ailments. Although the information provided was supported by scientific evidence to some extent, it tended to be exaggerated and depicted in sensational terms without acknowledging that some of the studies referred to had methodological issues, thus implying that conclusions should be tempered. For example, an advertisement stated that flotation-REST enhances sleep quality, which is supported by some studies (e.g. Ballard, 1993), but statements that one hour of flotation-REST corresponds to several hours of rest, or that the method is effective as a treatment of insomnia are not supported. This type of sensationalism and misinformation could affect the communication between health care providers and patients negatively, as it potentially increases the gap between them if patients rely on information that lacks scientific support. Another area of concern is that many of the beneficial effects advertised did not take into account that many of the studies referred to involved a flotation-REST treatment

program consisting of 12 flotation sessions (à 45 minutes) over a seven-week period. The contemporary and therapeutically focused research on flotation-REST has primarily used a flotation-REST treatment program consisting of 12 sessions (à 45 min) over a seven-week period, which suggests that 12 sessions are needed to ensure maximum benefit from treatment. In addition, one study (Bood et al., 2007) indicated that more than 12 sessions might not increase the benefits for some ailments. Leaving out this type of information could create expectations that a few flotation sessions will result in beneficial effects, or make CAM consumers spend money on flotation sessions that are unlikely to alleviate their ailments further.

The results in **Study 3** in addition indicated that the first phase of treatment was challenging for individuals with generalized anxiety. Without being aware that this initial discomfort might be an unavoidable part of the treatment processes, individuals with generalized anxiety could be prone to turn away from the method. Although **study 3** indicated that the participants were motivated to continue treatment despite the challenges they had to endure, this might not be the case if the flotation-REST treatment entails considerable costs and is used as a CAM outside of a research or health care settings. The setting of flotation-REST treatment in the private sector also varies, which raises the question how well the findings in **study 2** is generalizable to the use of flotation-REST provided by privately-owned flotation centers. Furthermore, the challenges that were experienced during the flotation-REST treatment (**study 3**) suggest that psycho-social support may be warranted to reduce potential negative effects and increase efficacy when the method is used by individuals with GAD. If further research succeeds to replicate the results in **study 2,** a solution to ensure the safety and efficacy of flotation-REST, as well as to reduce negative experiences of treatment when used as a CAM, would be to implement government subsidization when the method is used with therapeutic aims, and to make it possible for health care institutions to refer suitable patients to privately-owned flotation centers. This would be a positive step forward as it would allow for some control over privately owned flotation centers

in regard to how they incorporate scientific evidence that may optimize the safety and treatment efficacy of the method. In addition, this would most likely increase the efficacy and safety of the method because diagnostic status, evidence-based information about the method, and additional psychotherapeutic support could be provided. Another positive result from this would be that the treatment cost on the individual level would be reduced, thus making the method more accessible to those that might benefit from it. If these necessary steps are taken to ensure the safety and efficacy of flotation-REST when used as a treatment of anxiety outside of the health care system, it could contribute to turn the the problematic use of CAM into a potential asset for society.

7.3 Limitations and methodological considerations

One important issue to consider is the representability of the samples used in **studies 2 − 3**. As the samples used did not consist of patients with GAD, but rather constituted analog GAD samples defined by well validated self-report measures, this could raise question regarding the extent to which the findings in **studies 2 -3** can be generalized to clinical populations. The samples used in **studies 2 -3** were also in part recruited by advertisement in a local newspaper in Karlstad, thus introducing potential issues of self-selection bias to the data. Above all, this could entail problem with the representability of the samples used. In the light of this, and although the results in **study 2** were promising, there is reason to be tempered when drawing conclusion about flotation-RESTs efficacy as a GAD treatment at this point. It is also important to bear in mind that **study 2** was a pilot-trial and the results primarily indicate that further research on flotation-REST's potential as a treatment of GAD is motivated. In other words, more randomized clinical trials with GAD patients are needed to verify the findings in **study 2.** However, the GAD-Q-IV have demonstrated good preliminary reliability and validity as a diagnostic screener (Newman et al., 2002a) and the self-report measure has been extensively used in CBT research (e. g. Mennin. Heimberg, Turk & Fresco, 2004; Holaway, Heimberg, & Coles, 2006) in which, similar to **study 2,** analog GAD samples were

used to investigate treatments of GAD. Although Newman and colleagues (2002) suggested a cut-off scoring of 5.7, which in their preliminary evaluation gave good balance between sensitivity (.89) and specificity (.83), a study by More and colleagues (2012) indicated that a cut-off score of 7.67 (sensitivity = .85, specificity = 0.74) outperformed the cut-off scoring of 5.7 (sensitivity = .90, specificity = .66) in a clinical sample. In retrospect, a more stringent cut-off would have been preferable in **studies 2** as it would strengthen the representability and generalizability of the findings. However, the high level of GAD-symptom severity at baseline in **study 2** (GAD-Q-IV; mean treatment group: 10.01(2.20); mean waiting-list control: 9.92(2.24)) indicated that, even when moving down one standard deviation from the mean, the sample as a whole exceeded the cut-off suggested by More and colleagues (2012), suggesting that 68. 2 % of the sample had a scoring above 7.67 on GAD-Q-IV at baseline. It is also worth noting that research (Calleo et al., 2009; Wittchen et al., 2002) has highlighted that even when physicians screen for GAD in a primary care setting, there is considerable difficulties in identifying GAD, as well as in differentiating it from closely related mood disorders. For example, Wittchen and colleagues (2002) found that physicians correctly identified 67 % of the individuals with GAD in a primary care setting.

Regarding self-selection bias, the main reason for concern would be that the participants in studies **2 − 3** did not have issues with generalized anxiety or that a certain sub-groups of individuals with generalized anxiety were more inclined to participate in the study. Considering that the baseline assessments in **study 2** indicated high symptom severity both in regard to generalized anxiety and to substantial suffering from related issues such as depression and sleep difficulties, this suggests that the participants in **studies 2 − 3** might have been desperate to find a solution for their ailments and possibly had experienced failure to reach remission from earlier treatments. Another concern is that the participants in **studies 2 − 3** were inclined to participate in the study because it would mean access to a treatment that otherwise would be expensive to undergo. In the light of the experienced anxiousness and

worry pre-treatment, as indicated by the results in **study 3,** this seems unlikely and especially so because the majority of the participants did not know what constituted a flotation-REST treatment of anxiety. Taken together, the above suggests that the findings in **studies 2 − 3** are representative enough to at least function as an initial evaluation of flotation-REST efficacy as a treatment of GAD.

Another issue to consider regarding **study 2** is the lack of allocation concealment and blinding, as this might exaggerate estimates of treatment effects in intervention studies (e.g. Wood et al., 2008). Allocation was concealed for both the participants and the researcher during the recruitment process, as well as during baseline assessments, but after this point it was not concealed. The flotation-REST treatment is also, for obvious reasons, hard to conceal for participants, as it is difficult to apply a control condition that would not raise suspicion of not being the main treatment. With hindsight, there are options, however, that would be feasible and would improve the research design when researching flotation-REST as a treatment intervention. For example, it would have been optimal to administer a *"lower dose"* of flotation-REST, as is often done in clinical trials on psychopharmacological treatment, as a control condition (e.g. 15- minute flotation sessions). This would also address potential issues of attention bias that are introduced in the study design when using a waiting list control condition, as it would require that all participants came to the laboratory to the same extent and received an equal amount of attention from the staff present there. However, it is worth noting that one study (Bood et al., 2005) has reported that degree of attention (as given by staff) did not affect the treatment outcome of flotation-REST. Blinding steps could have been taken to further strengthen the research design. For example, a physician or psychologist could have been engaged to evaluate diagnostic status post-treatment without knowing which allocation the participants had received.

Regarding **study 3,** the biggest problem and asset in phenomenological research is assumed to be the researcher (Patton, 2002). Validation of

results in qualitative studies can be problematic and strategies for assessing validity in quantitative research are not applicable to inquiry-based studies (Mishler, 1990). Phenomenological research comprises interpretative processes, and the researcher brings his previous experiences and expertise into the research. This suggests that phenomenological research will always be colored by the researchers who conducted it. This tendency is regulated during certain parts of the phenomenological research processes by the sincere effort to temporarily set aside pre-conceptions to be able to process the data in an open-minded manner. In other words, phenomenological research will always be biased to some degree, but this tendency has to be mitigated by an honest effort. This effort (bracketing) is an essential part of the EPP method (Karlsson, 1995) applied in **study 3**, and was rigorously observed along with other guidelines strongly recommended for ensuring trustworthiness (Karlsson, 1995). Following the research method used in an informed way is also required to increase trustworthiness in qualitative studies (Braun & Clarke, 2006). In addition, transparency is emphasized to strengthen the quality of phenomenological research (Janesick, 2011), as well as qualitative research in general (Braun & Clarke, 2006), as it enables the reader to better judge the significance of the results. In the light of this, it is relevant to acknowledge that **study 3** was conducted by an experienced flotation-REST researcher and a PhD student in psychology, who both can be seen as an asset and a weakness of the study. This suggests that data are interpreted against the background of psychological knowledge, as well as interest and experience of flotation-REST research. This might create bias for previously researched and reported effects of flotation-REST, as well as for theoretical frameworks in psychology. On the other hand, if the researchers should lack knowledge in these areas, it would probably mean that relevant aspects in the data would be overlooked; at least from a psychological perspective. Another aspect to consider is that the exact circumstances of phenomenological research can never be replicated, which raises questions regarding the generalizability of the results in **study 3** and in phenomenological research in general (Maxwell, 2013; Patton, 2002). However, the results in **study 3** can at

least provide initial information about the experience of flotation-REST while suffering from GAD, and this can generate ideas for further investigation with other research approaches. Triangulation of qualitative research has also been suggested as a good strategy to mitigate bias (Creswell, 2015). Thus, the findings in **study 2**, as well as earlier research on flotation-REST, strengthen the trustworthiness of the results in **study 3**.

Lastly, the main issue to consider in respect to **study 1** relates to generalizability. Data were mainly collected from websites of commercial flotation-centers in United States of America, Sweden and England, which suggests that the results in **study 1** foremost apply to advertisements in those countries, which is a limitation of the study and is the result of using English key-words when searching the Internet for data. The flotation centers in Sweden were represented in the data to a rather high degree, possibly because the keyword *"floating"* was used which is also a term used in Sweden to refer to flotation-REST outside of the academic community. Many of the websites hosting Swedish flotation centers also had the option to translate the information into English, or provided advertisement both in Swedish and English. Nevertheless, this suggests that the results in **study 1** might not be valid in regard to how commercial flotation centers in non-English speaking countries are advertising effects resulting from flotation-REST. The thematic analysis conducted did not differentiate between countries, and therefore important distinctions in how effects of flotation-REST are advertised might have been overlooked. For example, there might be a substantial difference in how commercial flotation-REST centers in the United States of America and Sweden conduct their advertising.

7.4 Further research

Foremost, further studies should try to replicate the findings in **study 2,** preferably with a randomized controlled study design as well as with GAD patients. As research indicates that GAD patients with high symptom severity and comorbidity have heightened risk not to respond to first- line psychotherapeutic interventions (Durnham et al., 2004), it

would be ethically right to first evaluate flotation-REST for this population. As discussed earlier, flotation-REST might also be of interest to combine with psychotherapy. A research design which comprises GAD patients randomized to (1) control condition, (2) flotation-REST treatment, (3) psychotherapy, and (4) flotation-REST treatment + psychotherapy, would then be a big step forward as it would establish if the findings in **study 2** is generalizable to clinical populations, as well as answer the question if the combination of flotation-REST and psychotherapy would increase the efficacy of treatment and/or mitigate potential side-effects from treatment. It would also be of interest to evaluate how different types of psychotherapeutic intervention strategies affect treatment when combined with flotation-REST, as well as when these are applied for optimal results. As discussed earlier, well-being exercises (Fava et al., 2005) alongside a flotation-REST treatment and/or a mindfulness-based intervention after the completion of a flotation-REST treatment might be of especial interest to evaluate.

In the light of the current thesis, it could also be valuable to evaluate modifications of the flotation-REST treatment scientifically. When the method is applied as a treatment of GAD, it would be rewarding to evaluate if information about what to expect of treatment can reduce pre-treatment anxiousness. As results in **study 2** indicated that GAD-symptomatology and several secondary outcomes were significantly affected by treatment already at mid-treatment assessment, it is also of interest to evaluate a shortened flotation-REST treatment program (e.g. six flotation sessions) to see if the cost-effectiveness of treatment could be enhanced.

Another important area of further research is to explore potential mediating factors behind the lowering of GAD symptomatology reported in **study 2**. Presently, further analysis of the data gathered in **study 2** is carried out and preliminary results suggest that decrease in emotional regulation difficulties in particular seem to mediate a substantial part of the reduction in GAD symptomatology. In other words, the role of this dimension needs to be explored further. In the light of the results in

study 3, certain aspects of mindfulness (detached mindfulness) call for further study. Since detached mindfulness has been suggested to entail disentanglement from worry as a coping strategy (Wells, 2002), it would be fruitful to explore if this effect could be reached through flotation-REST. If further studies find evidence that support this, it would indicate that flotation-REST is a unique asset in the treatment of GAD, as it enables patients that do not have the resources to adhere to mindfulness training program to reach similar effects.

It would also be relevant to evaluate flotation-REST as a treatment of other types of anxiety disorders. The results in **study 3** showed that individuals with GAD processed and integrated earlier negative events and traumas during the flotation sessions. This implies that flotation-REST might be of interest in the treatment of individuals with PTSD, possibly because the method facilitates the exposure and processing of traumatic events, which in turn might result in enhanced ability to regulate emotions.

7.5 Conclusion and final remarks

This thesis indicates that flotation-REST is a promising complement to existing treatment protocols for GAD and suggests that it should be further explored and evaluated. In particular, flotation-REST might be an important treatment option for GAD patients who exhibit high symptom severity and comorbidity and thus have poor chances to reach remission by existing treatments. It is a particularly suited method as it does not require any instructions or prior knowledge, and because exceptionally few terminate treatment. The present investigation also highlights that flotation-REST treatment might be more challenging and entail more negative experiences for individuals with generalized anxiety compared with healthy individuals, as well as previously researched patient populations. In the light of this, it is recommended to combine flotation-REST with additional psychotherapeutic support when applied as an intervention for generalized anxiety, as it most likely would enhance the method's efficacy as well as mitigate negative experiences of treatment. The present work also sheds light on possible mechanism

underlying the promising treatment effects observed for individuals with generalized anxiety. Foremost, it is suggested that flotation-REST has beneficial treatment effects through continually providing a safe and secluded setting that promotes self-awareness and contact with earlier negative experiences, physical sensations and emotions without the use of maladaptive strategies of avoidance. In addition, the treatment was experienced to facilitates the cultivation of adaptive strategies for managing anxiety provoking internal experiences. The present work also indicates that the information about flotation-REST, when marketed as a CAM by privately-owned flotation centers, is not adequately consistent with existing scientific evidence. This underlines the importance of expanding the scientific knowledge about flotation-REST, and CAMs in general, as well as developing strategies to disseminate information based on research so that it can be accessed by health care providers, patients, and society at large. This would contribute to transforming the problematic use of CAM into an asset, thus ensuring effective and safe care for all.

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Flotation-REST (Restricted Environmental Stimulation Technique) in the age of anxiety

Despite the fact that our lives are easier than ever before in human history, it has been suggested that we live in an age of anxiety. Concurrent with the increase in anxiety, the uses of alternative methods to alleviate our troubled psyches have also increased. The present thesis sets out to explore a novel form of seclusion and sensory isolation, namely flotation-REST, which seems to be the obvious antidote to a hyper-connected life-style in the 'age of information'. Considering that the method is used mainly as an alternative treatment provided by privately-owned flotation centers, the current thesis evaluated how well their information about flotation-REST and its effects corresponds with scientific evidence. The thesis also evaluated the method as an intervention of treatment-resistant anxiety and explores how the treatment was experienced. The results indicate: (1) that the information provided on Internet websites by privately-owned flotation centers does not adequately correspond with scientific evidence; (2) that flotation-REST is a promising intervention for generalized anxiety; (3) that the method benefits individuals with generalized anxiety primarily by enabling relaxation in a safe and secluded setting that promotes self-awareness.