App-Based Blended Psychological Skills Training in Sports and Business

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List of Figures and Tables

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1 General Abstract

Psychological skills training refers to the systematic and consistent practice of psychological skills that facilitate performance and personal well-being. This thesis presents five newly developed app-based blended psychological skills trainings executed using an app and workshops in real-life settings. Each study included an outcome evaluation and a process evaluation focusing on the particular rather than the general, incorporating the researchers' theoretical-based reflection. The outcome evaluation of Study 1 demonstrated a significant increase in concentration, self-efficacy, and more frequent recovery after the intervention. Study 2 introduced an app-based blended psychological skills training where various traditional and third-wave cognitive behavioral techniques are combined. Study 2 highlighted the opportunity for data collection via apps and subsequent psychological skills training individualization. Study 3 described the implementation of an app-based blended mindfulness intervention to improve goalkeepers' attention. A significant development in the players' attention scores over time was found. The outcome results of Study 4 suggested that it is questionable whether the app-based loving-kindness meditation is suitable to foster compassion, team cohesion, and fairness. Business-focused Study 5 developed and evaluated a new app-based blended emotion regulation training within a German insurance company. The outcome evaluation demonstrated that this training improves stress, mindfulness, and self-compassion. All process results revealed that app user engagement is a recurrent challenge. Thus, the health action process approach is used to derive multifaceted suggestions for future app-based blended intervention design enabling optimal app usage. This includes video content, diagnostic individualization, decreasing stigma of psychological skills training, individualized action and coping plans, and mechanisms to foster perceived self-efficacy.

2 General Introduction

"The mental part is the hardest part, and I think that's what separates the good players from the great players."

This quote from Michael Jordan (Herman, 2011, 00:52), who is widely considered the greatest basketball player of all time, reflects numerous scientific reports that document how psychological skills distinguish successful athletes from those who are less successful (Durand-Bush & Salmela, 2002; Gould, Dieffenbach et al. 2002; Krane & Williams, 2006; Orlick & Partington, 1988). However, sports psychology professionals question whether mental aspects are truly "the hardest part" or whether, as in physical skills development, they are a matter of systematic training (Vealey, 2007; Weinberg & Gould, 2019). The scientific term that paraphrases this systematic training is psychological skills training (PST), also known as mental training. PST describes the consistent and systematic practice of psychological skills that facilitate athletic or business performance and personal well-being (Foster, 2002; Vealey, 2007; Weinberg & Gould, 2019).

2.1 Historical Development of Psychological Skills Training

PST became a prominent focus for research and practice when sport psychology moved from a basic research discipline to application. This development was driven by early pioneers and institutional foundations (Bäumler 1993; Hänsel et al., 2016; Janssen 2009; Goodwin 2009; Vealey, 2007). For example, Coleman Griffith founded the first American athletic research laboratory as a research institute for competitive sports at the University of Illinois in Urbana in 1925 and published the renowned book *Psychology and Athletics* in 1928 (Janssen 2009). Moreover, he is one of the early practical pioneers of PST in North America. He worked with the Chicago Cubs baseball team in 1938 to foster self-confidence

and team dynamics via PST (Green, 2003; Vealey, 2007). Another PST pioneer of this era was Dorothy Hazeltine Yates, who particularly used relaxation techniques to improve performance of boxers and aviators (Kornspan & MacCracken, 2001; Yates, 1943).

The Soviet Union was the first country to systematically engage in PST with athletes on a larger scale around 1950 (Ryba et al., 2005; Vealey, 2007). One of the key figures was the Russian practitioner and scholar Avksenty Cezarevich Puni (1898–1986). In his article "Psychological Preparation of Athletes for Competition," he developed and published perhaps the earliest formalized PST, which included the improvement of attention, self-confidence, and goal setting (Ryba et al., 2005).

The clinical psychologist Richard Suinn conducted one of the first systematic intervention studies that assessed the effectiveness of PST in 1972 in North America (Suinn, 1972; Vealey, 2007). The study demonstrated that relaxation techniques, behavioral rehearsal, and imagination improved race performance in a group of elite skiers.

Further milestones for the systematic practice and study of PST emerged in the 1980s. This included the first hiring of a full-time sport psychologist by the U.S. Olympic Committee in 1984 (Suinn, 1985), the establishment of the Association for the Advancement of Applied Sport Psychology (AAASP) in 1985, and the founding of two new applied international journals – the Sport Psychologist in 1987 and the Journal of Applied Sport Psychology in 1989 (Vealey, 2007). Additionally, in Germany, PST received greater attention in practice and research around the 1980s. This is considerably related to the work of Hans Eberspächer. His book *Sport Psychology*, published in 1982, became one of the most widely read books in the field of PST in Germany (Mayer & Hermann, 2011; Mayer & Hermann, 2014).

Starting in the 1980s, publications about the transfer of PST to business settings emerged (Fletcher, 2010). For example, Loehr and McLauglin (1986) describes in their book

Mentally Tough: The Principles of Winning at Sports Applied to Winning in Business psychological techniques of professional athletes, such as breathing or visualization to attain peak performance, and suggests how they can be applied to achieve success in business. In 1989, the International Society for Mental Training and Excellence (ISMTE) was founded. The ISMTE serves as a vehicle for the ongoing advancement of knowledge in PST in a wide variety of performance domains, including sport, music, business, medicine, and other domains (Ievleva & Terry, 2008). Today, PST is backed up by an accumulating body of knowledge (for an overview, see Vealey, 2007) and is guided by established training standards and professional competencies (Morris et al., 2003; Tenenbaum et al., 2003) and ethical guidelines for PST delivery (Petitpas et al., 1994).

The digital revolution of the 21st century also offers chances for the delivery of PST. Approximately 5 billion people will own a smartphone by 2025, and each smartphone will have more computing power and memory than any current desktop computer (Miller, 2012). Apps turn smartphones into multifunctional technologies. The smartphone with its apps is akin to an electronic Swiss Army knife: it is a watch, music player, calendar, GPS navigator, camera, and more, having already replaced many other devices (Barkhuus & Polichar, 2011). PST apps offer the opportunity to delivery psychological techniques that can empower greater access, lower cost, and immediate support (de Korte et al., 2018; Howarth et al., 2018; Price et al., 2014; see also the section "2.7 App-Based Blended Psychological Skills Training").

2.2 Clarification of Terms

Some authors have distinguished between psychological qualities, psychological skills, and psychological techniques (e.g., Holland et al., 2010; Zakrajsek & Blanton, 2017). *Psychological qualities* are characteristics or attributes individuals experience to varying

degrees (e.g., high or low self-confidence). *Psychological skills* are an individual's abilities to regulate psychological qualities (e.g., to maintain high self-confidence). *Psychological techniques* are the procedures individuals employ to develop psychological skills (e.g., positive self-talk).

2.3 Psychological Skills

Vealey (2007) identified and summarized several psychological skills into broader categories that are associated with performance and personal well-being, including foundation, personal development, performance, and team skills. The selected skill examples shown in Figure 1 have not the claim to contain all the necessary skills that are important for sport success but clarify that multiple skills are important. Thereby, a psychological skill can support the application and execution of another skill. Moreover, a psychological skill can be divided into several minor skills.

Figure 1

Psychological Skills (adapted from Vealey, 2007)

Foundation Skills	**Performance Skills**	**Personal Development Skills**	**Team Skills**
• Achievement Drive • Productive Thinking • Self-Confidence	• Perceptual-Cognitive Skill • Attention • Stress and Emotional Regulation	• Identity Achievement • Interpersonal Competence	• Team Confidence • Cohesion

Foundations skills summarize the intrapersonal basic resources to achieve success in sports. For example, achievement drive describes the will to apply persistence effort to achieve success and to overcome obstacles. The skill achievement drive is composed of several other skills such as time management, hard and smart training, and the delay of gratification (Durand-Bush & Salmela, 2002; Greenleaf et al., 2001; Holt & Dunn, 2004; Vealey, 2007). Productive thinking defines the skill to regulate thoughts to effectively prepare for and respond to sports challenges. Successful athletes focus on task-relevant thoughts, positive expectations, problem-solving, and planning strategies (Greenleaf et al., 2001; Jones et al., 2002; McPherson, 2000; Orlick & Partington, 1988; Vealey, 2007). The skill self-confidence describes the ability to regulate the belief of having the skills to achieve success. International elite athletes showed a robust and resilient self-confidence (Jones et al., 2002; Thelwell et al., 2005).

Performance skills represent skills that are particularly critical during sport performance execution. The perceptual-cognitive skill defines the strategic processing of task-relevant information and the subsequent decision-making such as tactical knowledge, recognition of patterns, visual search, and anticipation (McPherson & Kernodle, 2002; Tenenbaum, 2002; Vealey, 2007). Attention can be defined as the ability to direct and sustain focus on execution relevant stimuli. Tennis coaches have seen attention as the most important skill needed in their sport (Gould et al., 1999), and study results have demonstrated that attention can differentiate between failing and peak performance (Eklund, 1994; Privette & Bundrick, 1997; Vealey, 2007). Stress and emotional regulation represent the ability to manage stress and emotional states including anxiety, anger, excitement, or fear. The optimal extent of emotional patterns depends on the sport task and individual preference summarized by Hanin (2000) as Individual Zones of Optimal Functioning (IZOF). Moreover, emotional regulation can be seen as an interaction sequence of several other skills (see also Study 5;

Berking & Whitley, 2014). This begins with the skill of emotional awareness and ends with the ability to accept or change an emotional state (see Study 5; Berking & Whitley, 2014).

Personal development skills summarize maturational markers of psychological functioning to foster well-being within and outside of the sport context. For example, identity achievement is the ability to engage in introspection to develop a clear sense of identity ("who I am"). This sense can change over time and requires long-term development. Identity achievement can result in resistance to conformity and sociocultural pressure within and without the sport context (Coakley, 1992; Sparkes, 1998; Vealey, 2007). Interpersonal competence is the ability to interact and communicate effectively with others. This is important to use and provide social support (Holt & Dunn, 2004; Vealey, 2007).

Team skills are collective abilities that are crucial for an effective team environment and success (Vealey, 2007). For example, team confidence is the belief that the team has the collective resources, particularly sports abilities, to strive for peak performance. Team confidence predicts team success better than the sum of the individual self-confidence levels of all team members (Feltz & Lirgg, 1998; Gould, Greenleaf et al., 2002). Cohesion can be defined as "a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or the satisfaction of member affective needs" (Carron et al., 1998, p. 213). The relationship between cohesion and performance is positive and bidirectional. A high level of cohesion can foster performance, and successful team performance can develop team cohesion (Carron et al., 2002).

2.4 Psychological Techniques

A single psychological technique can create different psychological skills, depending on the specific purpose, content, or application. For example, imagery can improve self-confidence or reduce stress, depending on its content (Beckmann & Elbe, 2011; Vealey, &

Greenleaf, 2001). Additionally, different psychological techniques can be applied to create the same psychological skill: progressive muscle relaxation and autogenic training can both be employed to reduce stress (Kellmann et al., 2018; Vealey, 2007).

2.4.1 Imagery, Self-Talk, Goal Setting, and Relaxation

The techniques most widely used in practice and whose effectiveness is well proven in research to develop psychological skills are imagery, self-talk, goal setting and relaxation (arousal) techniques (Vealey, 2007; Weinberg & Gould, 2019). Based on the overview of Vealey (2007), these techniques are described below (see also Röthlin et al., 2016).

Imagery represents the creation or recreation of sensory experiences in one's mind. This can involve all one's senses and without a real stimulus. Imagery is the most widely used and studied technique (Vealey, 2007). For example, of 235 Canadian Olympic athletes in 1984, 99% stated using imagery (Orlick & Partington, 1988). Athletes use imagery for (re)activation of psychological qualities, skill learning and practice, and strategy development (Hardy & Callow, 1999; Morris et al., 2005; White & Hardy, 1998).

Self-talk describes a verbal dialogue in which a person interprets their feelings and perceptions and provides themself with reinforcement and instructions. The self-talk can be expressed out loud or internally (Vealey, 2007). For example, a self-talk can be used to manage stress (e.g., "I am very calm") and can be instructional (e.g., "look at the opponent") or motivational (e.g., "I will finish the marathon"; Hardy et al., 2001; Landin & Hebert, 1999; Zinsser et al., 2006).

Goal setting is the process in which a person set a goal (target, standard, or accomplishment) that enables one to plan, focus on, manage, and evaluate behavior in relation to one goal. Goals can be differentiated according to outcome goals, performance goals, and process goals (Burton et al., 2002; Kingston & Hardy, 1997; Vealey, 2007). Outcome goals are defined as the final result of a game or competition (e.g., a rank at the end

of a season) and facilitate long-term motivation. Performance goals are set based on a comparison between an athlete's own previous achievements rather than an opponent's performance (e.g., improvement of swimming speed by 0.5 s for 50 m). Performance goals are more controllable than outcome goals and enable an athlete to continually raise or lower difficulty levels to stay challenged and motivated in the midterm. Process goals clarify specific task demands and actions to execute a skill in an immediate situation (e.g., a golfer pays attention to the correct posture during putting).

Relaxation (arousal) techniques influence psychological and physiological arousal levels by decreasing (e.g., autogenic training) or increasing (e.g., fast breathing) the level (Vealey, 2007). Relaxation techniques are used to facilitate recovery (Kellmann et al., 2018; Kudlackova et al., 2013), reduce anxiety (Maynard & Cotton, 1995), and support athletes to remain in their IZOF (Annesi, 1998).

2.4.2 Cognitive Behavioral Therapy

The aforementioned techniques imagery, goal setting, self-talk, and relaxation techniques are named as the four basic or traditional psychological techniques based on cognitive behavioral therapy (CBT; Beck, 2011; Birrer & Morgan, 2010; Röthlin et al., 2016; Vealey, 2007). Based on the CBT rationale, a person learns through these techniques to recognize functional and dysfunctional psychological and bodily states and to control these states directly by, for example, changing or reducing qualities such as competition anxiety.

Third-wave CBT focuses less on direct control, assuming that performance can indirectly improve when a person's relationship with their psychological and bodily states is altered (Kittler et al., 2018; Röthlin et al., 2016). Thus, a person should first integrate mindfulness as a core concept. Mindfulness allows a person to observe and accept their own emotions without judging and identifying with them. This prevents the person from being overrun by their emotions and allows them to consciously focus on the task at hand.

Though mindfulness is its core concept, third-wave CBT does not contradict previous CBT forms. Mindfulness can be seen as a top-down process that opens the opportunity to consciously execute other CBT techniques (Berking & Znoj, 2006; Chiesa et al., 2013). For example, mindfulness can facilitate CBT techniques such as cognitive reappraisal within the skill sequence of emotional regulation (Berking & Whitley, 2014; Chiesa et al., 2013). Ultimately, PST exists within a broad definition that includes various (CBT) techniques designed to enhance psychological skills (Zakrajsek & Blanton, 2017).

2.4.3 Psychological Skills Training and Coaching

It is a challenge to separate psychological techniques of PST from those of coaching. In the past, a working group of sport psychology known as *Arbeitsgemeinschaft für Sportpsychologie* (Arbeitsgemeinschaft für Sportpsychologie [ASP], 2014) offered one curriculum on PST and one on coaching. They described coaching as a process of client-centered support that improves psychological and physical health. Typical coaching situations concern personal development, such as managing an ending career, and injury management. Client-centered support is a humanistic approach toward a client that uses talk-therapy techniques, solution-oriented actions, and systemic exercises to help the client reflect on their situation (Cropley et al., 2007; Høigaard & Johansen, 2004; Ruchti et al., 2020).

However, both intervention types utilize both PST and coaching techniques (Brown & Fletcher, 2017; Vealey, 2007; Zakrajsek & Blanton, 2017). PST techniques can be applied within a typical coaching situation (e.g., relaxation techniques for injuries), and coaching techniques can be helpful at the beginning of PST, when developing an influential psychologist–athlete relationship (ASP, 2014; Kraus et al., 2012; Petitpas et al., 1999). Because of this, ASP now offers only one curriculum where PST and coaching are taught in combination (ASP, 2021). Likewise, this thesis focuses mainly on PST interventions but also contains coaching elements such as the interactive atmosphere in the studied workshops.

2.5 Process of Psychological Skills Training

PST has matured from the random application of (several) techniques to a systematic application following a coherent process. Weinberg and Gould (2007) suggested education, acquisition, and practice as the three sequential phases for PSTs. Education aims to raise the general awareness and knowledge that psychological skills are important for performance and success. Next, the acquisition phase describes the development of psychological skills by executing psychological techniques. Finally, the practice phase transfers psychological skills from practice to actual competitions.

2.5.1   Psychological Skills Training as a Multilayer Process

Vealey (2007) describes the application of PST as a multilayer process. The first layer is the philosophy of the sport psychologist (Figure 2).

Figure 2

Multilayer Process of Psychological Skills Training (adapted from Vealey, 2007)
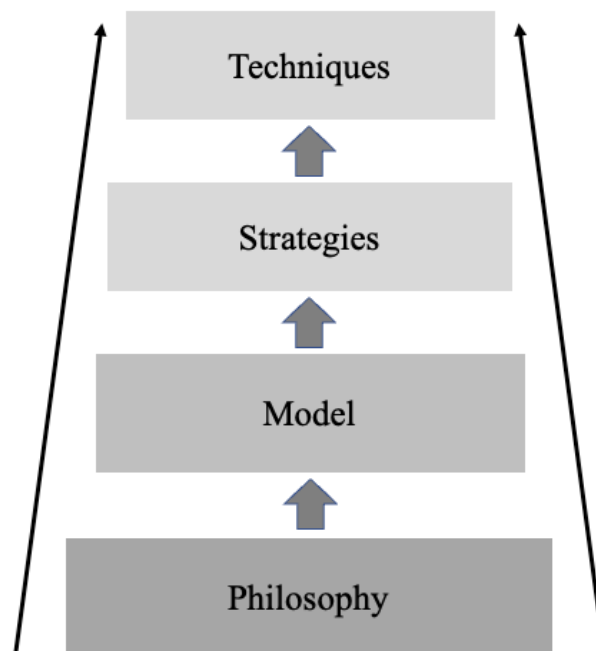
The philosophy summarizes the set of ideas and beliefs about PST, including the role of the sport psychologist (e.g., an educator, an observer and learner of a given team and sport, a service provider, or a facilitator and catalyst); the objectives and areas of PST (e.g., performance enhancement, health, clinical approaches, personal growth, or organizational counseling); and the role of the client (e.g., program centered vs. athlete centered; Poczwardowski et al., 2004). For example, in Study 3 of this thesis, the authors compromised the common philosophy that peak performance, in the long run, can only be achieved if performance improvement is balanced with the athlete's well-being (Brady & Maynard, 2010; Stambulova et al., 2006). Moreover, the authors see their PST intervention as an offer to athletes, which athletes can accept in a self-determined manner and of their own free will.

The transition between the philosophy and the model is fluid and not entirely clear. The model describes the overarching framework from which strategies and techniques are utilized or developed (Vealey, 2007). In the section "2.4.2 Cognitive Behavioral Therapy", I already described the models CBT and third-wave CBT. Another widespread model is the systemic approach (Beckmann & Elbe, 2011). The systemic approach moves the context and multifaceted interactive psychosocial conditions more in the focus. Thus, the action, such as the execution of a PST, represents an action or reaction in a system from one's own experiences, cultural norms, and people important in this system (e.g., trainer, family; Beckmann & Elbe, 2011; Ruchti et al., 2020). The systemic approach assumes that there are no objective assessments and that, consequently, the sport psychologist cannot know what constitutes the right intervention. Therefore, the client is seen as the expert and decision maker, whereas the sports psychologist acts more as a facilitator. In a PST, this would mean that the sport psychologist offers suggestions for certain strategies and techniques and the athlete picks the ones that suit her or him best. Although there are no objective assessments in this model, these intervention suggestions must have a scientific basis (Beckmann & Elbe,

2011). The specific systemic techniques (e.g., miracle question) are more related to coaching than to PST, although such a separation is difficult (see section "2.4.3 Psychological Skills Training and Coaching"; Beckmann & Elbe, 2011; Ruchti et al., 2020). No one model or philosophy is better than the other. Sports psychologists should question their model and philosophy on a case-by-case basis to adapt regarding the objectives, user, and the social-cultural context (Vealey, 2007). In the studies of this thesis, the PSTs followed the model of CBT and third-wave CBT.

The strategy compromises how the PST specifically works, typically using organizational plans of action such as sequential steps. In the light of this definition, the aforementioned process of Weinberg and Gould (2007)—which suggested the education, acquisition, and practice phases—can be also seen as a strategy. In Study 3 of this thesis, the authors used a strategy based on the Berlin Mindfulness-Based Training for Athletes (Berliner Achtsamkeitstraining zur Leistungsoptimierung [BATL]; Jekauc et al., 2017). The BATL is an 8-week mindfulness training intervention consisting of one approximately 60-minute workshop per week. The workshops consisted of psychoeducation, guided group discussions, and in-workshop exercises. Moreover, participants were instructed to complete mindfulness techniques between sessions on their own; however, a control whether these techniques, without concrete audio instructions, are really carried out is difficult. Thus, we decided to combine the BATL with an app to facilitate the in-between training.

The final layer of the mental training process is to choose and execute the specific techniques used in the PST. Study 1 of this thesis gives a concrete example of how to apply the multilayer process approach of Vealey (2007) within competitive youth soccer academy. Table 1 summarizes additional examples of PST processes (Vealey, 2007).

Table 1

Examples of the Multilayer Process of Psychological Skills Training (adapted and cited from Vealey, 2007, p. 295)

Authors	Philosophy	Model	Strategies	Techniques
Vealey (2005)	Help athletes attain optimal development, experiences, and performance; coaches serve as educational mental trainers.	Getting the inner edge, foundations to mental training toolbox to big three mental skills.	P^3 thinking, goal mapping.	Self-monitoring, thought-stopping self-talk, imagery, physical relaxation, goal setting, behavior management.
Martin et al. (1998)	Goal is to teach athletes to teach/manage themselves; focus is on education and mental health (not illness).	Integrative psychoeducational approach, combines reality therapy and behavioral counseling.	Problem-focused process: 1. Identify problem category. 2. Identify problem type. 3. Determine problem cause. 4. Select problem solution.	Goal setting, goal attainment scaling, self-management plans, self-talk.
Singer (1988)	Direct instruction of mental strategies to enhance learning and performance by activating appropriate cognitive processes.	Information-processing metastrategy for self-paced sport skills.	Five-step strategy: 1. Readying. 2. Imaging. 3. Focusing. 4. Executing. 5. Evaluating.	Self-talk, imagery, focus plans, centering, physical relaxation.

2.5.2 Basic and Advanced Psychological Skills Training

Beckmann and Elbe (2011) designed a structure model that specifies the process of a PST regarding time and content. This process and structure distinguished between an initial diagnostic, basic PST (level 1); advanced PST (level 2); crisis interventions (level 3); and a continuous monitoring (see Figure 3).

Figure 3

Structure Model of PST (adapted from Beckmann & Elbe, 2011)
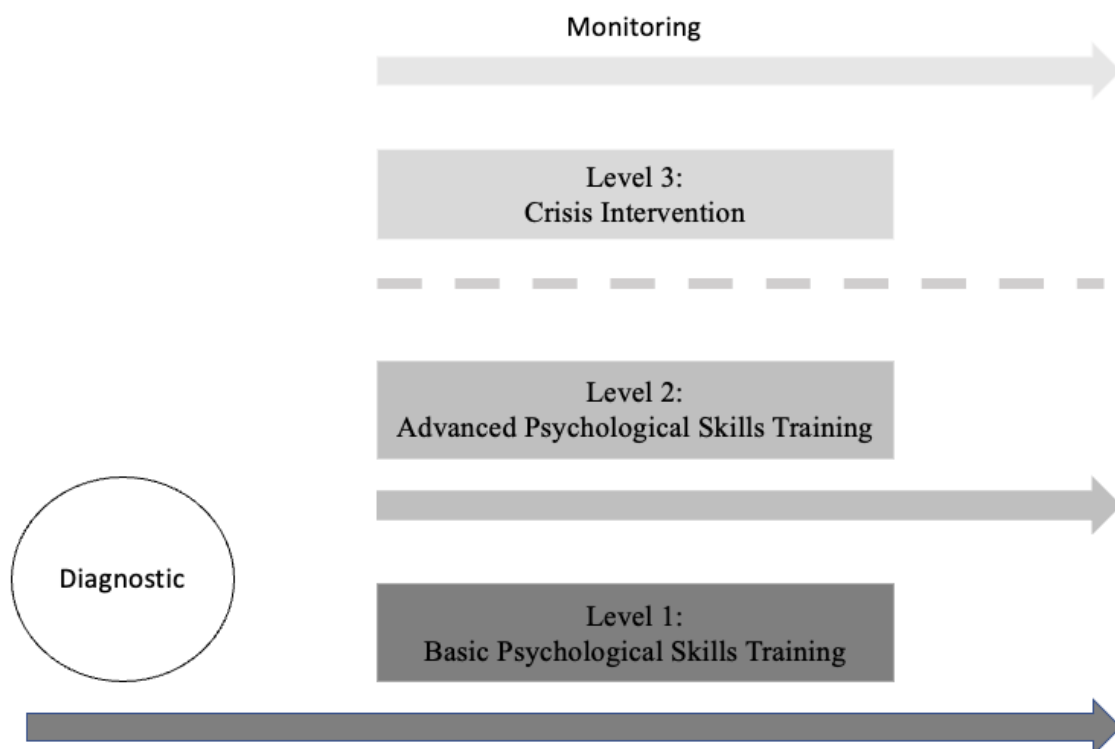
The intervention objectives should be based on collecting diagnostic data via questionnaires, (sports) psychological interviews, systematic observation, and/or computerized tests (Beckmann & Elbe, 2011). Based on the diagnostic, the strength and weaknesses in terms of psychological skills of a single athlete or team can be detected.

The basic PST does not need an initial diagnostic and aims to improve relaxation skills. For this purpose, different relaxation techniques are practiced in a sequential manner. First, breathing techniques are practiced. This is followed by progressive muscle relaxation. When these techniques have been mastered, autogenic training is practiced. According to Beckman and Elbe (2011), autogenic training is the most difficult to learn but has the strongest psychotropic effects (see p. 30). This sequential approach is based on practical experiences of the authors (p. 68) and must be critically questioned. Because a range of relaxation techniques (e.g., mindfulness meditation, imagination) are available, and individuals learn them at different speeds and respond to them differently (Kellmann et al., 2018; Petermann & Vaitl, 2014). This implies that athletes need to find one technique or a set of appropriate relaxation techniques that suits their unique needs (Kellmann et al., 2018; Petermann & Vaitl, 2014). However, starting with improving relaxation skills is beneficial in that a relaxed state simplifies the application of other skills. For example, relaxation in an emotionally triggered situation facilitates functional emotional regulation strategies and avoids dysfunctional ones (Berking & Whitley, 2014). For teams, Beckman and Elbe (2011) recommend psychological technique team building to improve cohesion as a basic training, although other study results suggest that team building does not have a long-term effect on cohesion (Lau et al., 2022).

Advanced PST follows and builds on the basic PST. Advanced PST is closely linked to the initial diagnostics by targeting the improvement of weaknesses regarding psychological skills. Subsequently, appropriate techniques can be selected to address these weaknesses. For example, advanced PST could focus on self-talk techniques to improve motivation (Beckmann & Elbe, 2011). Figure 4 summarizes the different psychological techniques taught within basic and advanced PST.

Figure 4

Basic and Advanced PST (adapted from Beckmann & Elbe, 2011)

Basic **Psychological Skills Training**	**Advanced** **Psychological Skills Training**
• Breathing • Progressive Muscle Relaxation • Autogenic Training • Team Building	• Goal Setting • Self-Talk • Self-Efficacy Techniques • Attentional Control Techniques • Imagery

The crisis intervention (level 3) should help the athlete to deal with specific challenges like injuries. While basic and advanced PST are continuous, crisis intervention is situational and needs based. Crisis intervention can rely on learned techniques of basic and advanced PST. Importantly, PST is not sufficient to treat mental disorders, and the sports psychologist needs to have the appropriate training to be able to offer psychotherapy in such a crisis (Beckmann. & Elbe, 2011).

The continuous monitoring enables a constant actual-target analysis, for example, by additional diagnostic tools. This allows the sport psychologist to make progress and successes visible to athletes. Moreover, the sport psychologist can adapt the advanced PST and detect crises (Beckmann & Elbe, 2011).

Regardless of the utilized process, a PST should end with a success review to evaluate the training (Beckmann & Elbe, 2011; Weinberg & Gould, 2019) and should consider that a psychologist-client relationship is crucial for positive PST outcomes (Dunn & Holt, 2003; Lambert & Barley, 2001; Petitpas et al., 1999; Richards & Simpson, 2015). Such a relationship is characterized by compassion, warmth, and congruence from the psychologist

and by opportunities for the clients to express themselves (Lloyd & Trudel, 1999; Tod & Andersen, 2005).

2.6 The Sport–Business Link

Sports psychology professionals deliver PST to not only athletes but also businesspeople. For example, Timothy Gallwey started to produce a series of books in the field of sport psychology, including *The Inner Game of Tennis* (1974) and *The Inner Game of Golf* (1998) and later applied his knowledge to the business world, when he wrote *The Inner Game of Work* (2001), which has since received great resonance among (sports) psychologists (Ievleva & Terry, 2008). Weinberg and Gould (2007) observed that some in the business community perceive sports psychology as primarily about improving motivation. This is reflected in many requests to former coaches such as Phil Jackson for short motivational speeches in the business world (Ievleva & Terry, 2008). Many sports psychologists try to change this or use this opportunity by showing a clear connection between the two worlds and how a systematic and longer-term PST can help (Bar-Eli, 2018; Fletcher, 2010; Foster, 2002; Gordon, 2007; Jones, 2002; Lloyd & Foster, 2006; Hays, & Brown, 2004).

For example, in both contexts, a person must perform under pressure and maintain their health. Stress and emotion regulation are similar whether they relate to a soccer player kicking a penalty or to a manager giving an important presentation (Bar-Eli, 2018; Fletcher, 2010). However, Ievleva, and Terry (2008) highlight specific divergences between sport and business. First, the visible and objective nature of sports ensures more rapid feedback on performance. In the business context, there tends to be a greater time lag before results are reported. Second, goal setting in sports is more straightforward than in business due to business's complex organizational structures. Third, the rules in sports are clearer than those

in business. Fourth, the ratios of training time to performance time in sports and in business are opposite of each other. Fifth, a business career is longer than most athletic careers. Thus, the transfer of knowledge between sports and business must be conducted with caution and on an individual, case-by-case basis (Fletcher, 2010).

2.6.1 Psychological Skills and Techniques

Jones (2002) identifies five psychological skills where direct links can be drawn between the sport and business contexts. He states that competitive athletes and business executives are equally concerned with five psychological skills: emotional regulation, leadership, team skills (e.g., cohesion), communication skills (e.g., one-to-one coaching), and problem-solving skills (e.g., to deal with organizational issues).

Foster (2002), Gordon (2007), and Lloyd and Foster (2006) have reported five psychological techniques shown to transfer effectively from sports to the business world to facilitate such skills: imagery, preperformance routines (systematic sequences of psychological actions that occur before the execution of a task), self-talk, relaxation (arousal) techniques, and attentional control techniques (goal setting and creation of tactical plans).

The sport–business link in this dissertation is based on psychological techniques used for developing three skills that might also support performance and well-being in sports and business: mindfulness, self-compassion, and compassion. These skills and their outcomes are described in the following chapters by presenting outcomes and other affected psychological areas. Moreover, I outline how the psychological techniques utilized for developing these skills connect sport and business studies.

2.6.2 Mindfulness

Mindfulness is derived from Buddhism, but within western psychology, the skill is still defined in different ways (e.g., Bishop et al., 2004; Berking & Znoj, 2006; Brown & Ryan 2004; Heidenreich & Michalak 2003; Kabat-Zinn, 2003; Walach et al., 2006). Kabat-

Zinn (2003) describes mindfulness as the awareness that arises when paying attention to the present moment without judgment. Accordingly, mindfulness compromises two skills (Bishop et al., 2004): attention self-regulation and acceptance. Attention self-regulation describes the ability to direct and sustain attention to a particular sensation, object, thought, or emotion or to openly monitor internal and external stimuli (Chiesa et al., 2011; Jekauc et al., 2017; Kaufman et al., 2017; Lutz et al., 2008). Acceptance is the ability to observe and tolerate all experiences without judgment. Rather than observing experiences through the filter of one's own beliefs, assumptions, and desires, acceptance deidentifies into the perspective of an external observer (Berking & Znoj, 2006; Jekauc et al., 2017; Singer et al., 2016).

      2.6.2.1 Mindfulness Outcomes Within Sports. Bühlmayer et al. (2017) systematically reviewed the literature on mindfulness outcomes within sports, finding that mindfulness can improve performance in precision sports such as pistol and rifle shooting and dart throwing (Bühlmayer et al., 2017; Josefsson et al., 2020). Additionally, mindfulness beneficially affects athletes' relaxation (Bu et al., 2019), attention (Kittler et al. 2022; Thompson et al., 2011; Zadkhosh et al., 2019), and emotional regulation (Josefsson et al., 2019; Kittler et al., 2018). Furthermore, various studies suggest that mindfulness-based interventions facilitate flow experiences (Chen et al., 2018; Kaufman et al., 2009; Scott-Hamilton et al., 2016).

      2.6.2.2 Mindfulness Outcomes Within Business. In a meta-analysis, Vonderlin et al. (2020) systematically summarized randomized controlled trials (RCTs) examining mindfulness-based interventions in various workplace settings. Their results support the conclusion that mindfulness techniques increase well-being, improve life and job satisfaction, and reduce self-perceived stress and burnout symptoms (Bartlett et al., 2017; Janssen et al., 2018; Lomas et al., 2017). However, empirical evidence on improved work engagement and

performance is still limited and controversial (Vonderlin et al., 2020). Shonin et al. (2014) found that mindfulness fosters employer-rated performance of middle hierarchy managers. By contrast, Wolever et al. (2012) did not find that mindfulness positively affected insurance carriers' self-rated ability to perform job roles.

2.6.2.3 Relevance to the Thesis. Mindfulness techniques guide participants to focus attention without judgment on a particular stimulus, such as breathing. This is also known as focused attention meditation. Meanwhile, open-monitoring meditation involves nonreactive monitoring of everything happening within the present moment (Chiesa et al., 2011; Jekauc et al., 2017; Kaufman et al., 2017; Lutz et al., 2008). In both styles, participants learn to perceive thoughts and emotions that arise during meditation as fleeting mental events within themselves by taking the perspective of an external and nonjudgmental observer (Singer et al., 2016; Berking & Whitley, 2014; Kaufman et al., 2017).

This cumulative thesis involves four studies that use such techniques. In the sports-focused Studies 1 and 3 of this thesis, the researchers utilized mindfulness techniques such as object meditation, targeting the improvement of the skill attention of soccer players. In the sports-focused Study 2 of this thesis, the researchers employed a systematic mindfulness course based on various mindfulness techniques (e.g., Breathing) to stabilize attention and improve emotional regulation. Similarly, in the workplace-focused Study 5 of this thesis, the researchers used mindfulness techniques (e.g., Body Scan) as part of a constructive emotional regulation sequence.

2.6.3 Self-Compassion and Compassion

An additional aspect of this research relates to self-compassion and its connection to mindfulness. Moreover, self-compassion is distinct from but similar to compassion.

2.6.3.1 Self-Compassion. Neff (2003) conceptualizes self-compassion as an attitude toward oneself that entails three key elements: self-kindness, sense of common humanity, and

mindfulness. Self-kindness means treating oneself with understanding, tenderness, and warmth in the face of suffering. Sense of common humanity denotes the understanding that failures and painful experiences are part of the human condition that is shared with all people. Mindfulness here describes the ability to accept unpleasant emotions by observing them unjudgementally rather than overidentifying with them (López et al., 2018).

    2.6.3.2 Self-Compassion Outcomes Within Sports. Past results indicate that self-compassion encourages adaptive physiological and psychological responses in athletes when recalling a sports failure (Ceccarelli et al., 2019). Additionally, self-compassion can help female athletes adaptively regulate self-criticism, rumination, and concern over mistakes (Mosewich et al., 2013). For women athletes, self-compassion is positively correlated with perceived sports performance (Killham et al., 2018). Furthermore, self-compassion can reduce physical symptoms of performance anxiety in male and female climbers (Röthlin & Leiggener, 2021). However, female participants may fear that if they adopt self-compassion, they will be viewed negatively by others or become mediocre in the highly evaluative context of competitive sports (Ferguson et al., 2014; Mosewich et al., 2014; Sutherland et al., 2014).

    2.6.3.3 Self-Compassion Outcomes Within Business. Dodson and Tse Heng (in press) have systematically reviewed the literature on self-compassion within business, finding that self-compassion has been associated with positive mental health outcomes, such as fewer depression symptoms (Ghorbani et al., 2018; Kotera et al., 2019, 2021) and improved resilience (Delaney, 2018; Franco & Christie, 2021). Additionally, self-compassion has been found to improve sleep quality (Kemper et al., 2015; Vaillancourt & Wasylkiw, 2019) and reduce physical fatigue (van der Meulen et al., 2021). Furthermore, study results have indicated that self-compassion is positively linked to job satisfaction (Abaci & Arda, 2013), perceived job performance (Reizer, 2019), and better interpersonal outcomes, such as improved coworker and supervisor relationships (Neff & Davidson, 2016).

2.6.3.4 Compassion. Compassion can be defined as sensitivity to others' suffering and a motivation to alleviate that suffering (Gilbert, 2005; Gilbert, 2017; Singer et al., 2016). Both self-compassion and compassion entail the provision of care, but the recipient of that care differs. Compassion focuses on another individual, whereas self-compassion focuses on the self (Dodson & Tse Heng, in press). Study results indicate that compassion and self-compassion are not significantly related (López et al., 2018).

2.6.3.5 Compassion Outcomes Within Sports and Business. No known prior research exists regarding compassion in sports. Related research in the workplace context is also scarce (Dutton et al., 2014). Some existing results link compassion to positive emotions (Lilius et al., 2008), positive work-related identity (Ko & Choi, 2019), and higher perceived job performance (Aboul-Ela, 2017). Moreover, the expression of compassion positively relates to perceptions that an individual is a leader within a workplace team (Melwani et al., 2012).

2.6.3.6 Relevance to the Thesis. Though compassion and self-compassion are not significantly related (López et al., 2018), both constructs can be cultivated through loving-kindness meditation (LKM) or compassion meditation (Engel et al., 2021; Hutcherson et al., 2008; Weibel et al., 2016; Weng et al., 2013). In LKM, participants are guided to direct feelings of connection, warmth, and kindness toward themselves, a close person, a stranger, a problematic person, and finally all humans (Salzberg, 1997; Singer et al., 2016). The participants are instructed to use sentences such as "May you be happy," "May you be healthy," and "May you live with ease" while observing their bodily sensations. The scientific literature provides no clear distinction between LKM and compassion meditation. Some authors describe compassion meditation as a special form of LKM directed toward people who are suffering (Galante et al., 2014; Shonin et al., 2014).

LKM was used in this thesis's sports-focused Study 4 and business-focused Study 5. In Study 4, the researchers examined whether an LKM-based intervention affected soccer players' compassion, team cohesion, and fairness. In Study 5, the researchers explored how LKM and self-talk techniques enabled participants to be self-compassionate even when facing difficult situations and emotions.

2.7 App-Based Blended Psychological Skills Training

Most of the previously studied PST interventions have been delivered by psychologists face to face (Richardson et al., 2008; Vealey, 2007). However, face-to-face PSTs have disadvantages; for example, they are inflexible in terms of time and availability and are associated with high costs (Gulliver et al., 2012; Moreland et al., 2018). Apps offer a powerful delivery mechanism that can empower greater access, lower cost, and immediate support (de Korte et al., 2018; Howarth et al., 2018; Price et al., 2014).

Nevertheless, the scientific literature about PST apps is scarce. In sports, Cogan (2019) employed the mindfulness app Headspace to support coaching of Olympic athletes. Additionally, Rist and Pearce (2017) utilized Headspace in a 4-week intervention with a group of 64 male Australian rules football players. These authors did not find any improvements in resilience, flow state, determination, or overall well-being. However, in business, app-delivered PST has had promising initial results (Bostock et al., 2019; Coelhoso et al., 2019; Hwang & Jo, 2019; Kersemaekers et al., 2018; Weber et al., 2019). Weber et al. (2019) demonstrated that the CBT and mindfulness self-monitoring app Kelaa reduces stress and facilitates well-being. Kersemaekers et al. (2018), Bostock et al. (2019), and Coelhoso et al. (2019) all used meditation apps based on mindfulness and LKM techniques and saw a beneficial effect to stress and well-being. Additionally, Hwang and Jo (2019) found that an

app based on mindfulness techniques and psychoeducation fosters emotional labor and self-efficacy, even though depression and anxiety were not affected.

2.7.1 App-Based Blended Versus App Alone

App-based PST interventions can be implemented as standalone digital services (e.g., Bostock et al., 2019; Rist & Pearce, 2017) or as blended services (e.g., Cogan, 2019; Kersemaekers et al., 2018). App-based blended PSTs combine a digital app with face-face contact and thus make the best of two worlds. As mentioned above, a strong psychologist-client relationship is crucial for positive PST outcomes, regardless of the utilized techniques (Dunn & Holt, 2003; Lambert & Barley, 2001; Petitpas et al., 1999; Richards & Simpson, 2015; see section "2.5.2 Basic and Advanced Psychological Skills Training"). So far, PST apps have mainly focused on audio-guided mental techniques and psychoeducation (Bostock et al., 2019; Coelhoso et al., 2019; Cogan, 2019; Hwang & Jo, 2019; Kersemaekers et al., 2018; Rist & Pearce, 2017; Weber et al., 2019). However, without interaction features, users cannot develop a strong psychologist-client relationship. In the studies of this cumulative thesis, group workshops were used to achieve face-to-face contact. This kind of atmosphere, in which participants can ask questions and express themselves, can result in a powerful psychologist-client relationship (Torous et al., 2018, Alldredge et al., 2021).

Standalone, app-based PSTs also suffer from low user engagement rates. Weber et al. (2019) saw only 137 out of 347 participants use the Kelaa app. Bostock et al. (2019) found that within an 8-week intervention period, participants trained on average for only 20.75 minutes per week. Kersemaekers et al. (2018) used a blended PST that combined an audio-guided mindfulness app with workshops and achieved more user engagement than Bostock et al. (2019). Over the 10 weeks, participants reported exercising 45.70 minutes per week. However, this result could stem from methodical flaws because it is derived from self-reports and only 269 participants out of 425 reported their training time.

2.7.2 App-Based Blended Versus Face-to-Face

Ong et al. (2015) and Fitzpatrick et al. (2018) reported potential benefits of app-based blended PST compared with face-to-face intervention: clients can access and train with techniques at any time, there are lower costs when compared to face-to-face interventions, there are lower time constraints for psychologists compared to face-to-face interventions, waiting time between initial face-to-face contact and subsequent continued support is minimized, and clients can be more active in the intervention because of the self-paced nature of the app-based techniques. Overall, app-based blended PST is still in its infancy, but it could have several benefits and may be an attractive alternative to solely face-to-face or solely digital-driven PSTs.

2.8 Mindance App

In all studies of this thesis, the authors used the digital infrastructure of the Mindance app for the respective study app and adapted it to the needs and requirement of the corresponding PST interventions (Mindance GmbH, 2017). The Mindance app is used in the business context (Herzberg & Stenzel, 2020) and in sports (Deutscher Fußball Bund [DFB], 2019; 2021) by delivering audio-guided psychological techniques to the users. Figure 5 represents screen examples of the study app (see next page).

Figure 5

Study App Screen Examples

Screen1	Screen 2	Screen 3	Screen 4
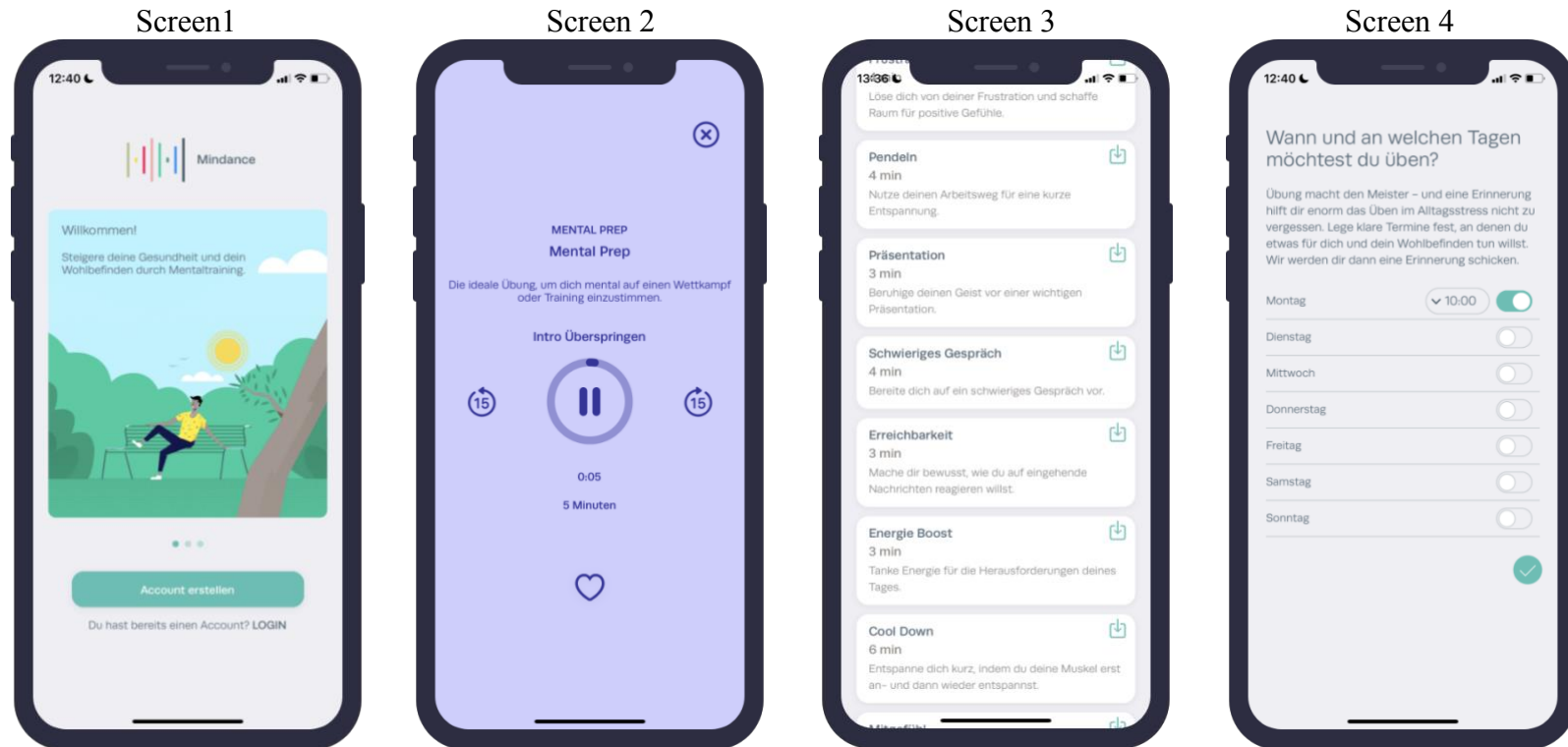
Note. Screen 1 shows the login page of the Mindance and studies apps. Screen 2 shows the Mental Prep technique from Study 1. Screen 3 shows the single mental techniques from Study 5. Screen 4 shows the possibility to set push notifications as a reminder for the training, which was possible in all five studies.

The author of this thesis is one of the cofounders of the Mindance GmbH, and he has a professional and financial relationship with Mindance GmbH that could influence or bias the content of the studies. This conflict of interest is stated in the acknowledgment of all studies.

2.9 Goals and Abstracts of the Studies

The studies in this thesis employed newly developed app-based blended PST interventions in sports and business contexts. All the studies contained an outcome evaluation and a process evaluation. The goals of this cumulative work were (1) to describe the content of different PST apps and their combination with workshops; (2) to evaluate the outcomes for tested skills before and after the interventions; (3) to derive practical suggestions for future app development and implementation through process evaluations of user engagement with the PST apps in real-life settings.

Study 1 aimed to describe the content and implementation of an app-based blended PST with a group of athletes from a Bundesliga soccer academy in Germany. In a pre–post design, the authors measured attention, competition anxiety, recovery and stress, and self-efficacy. There was a significant improvement in attention, self-efficacy and recovery. However, athletes showed no differences according competition anxiety and more frequent stress after the intervention. The user engagement in terms of training time was brief over nine weeks and did not moderate the intervention's effects. A comparison between active users and nonusers suggests that the workshops are more critical for the intervention than the app. The qualitative feedback of the athletes recommend that motivational functions should be added to the app-based PST.

Study 2 aimed to provide an overview and evaluation of the app-based blended PST of the German male U19 national handball team before and during the World Championship

2019 in Macedonia. The PST consisted of a 3-hour psychoeducational face-to-face workshop, an app, and an accompanying email campaign. The app features enabled an (initial) diagnostic and execution of psychological techniques. The athletes completed questionnaire about emotional regulation, competition anxiety, recovery and stress, and self-efficacy at two measurement points. The variables did not show significant changes between the measurement points. The process evaluation showed that the usage time with the app was low. For the future, the authors recommend to combine the use of apps with sufficient personal contact with athletes.

Study 3 aimed to describe and evaluate the implementation of an app-based blended mindfulness intervention in a German Bundesliga youth academy to improve goalkeepers' attention. A mindfulness app was combined with six group workshops. Originally, the intervention was planned with six face-to-face workshops. Due to personal contact restrictions during the COVID-19 pandemic, only the first workshop was conducted face to face, whereas the other five workshops were conducted digitally. The results indicated an improvement in goalkeepers' attention from before to after the intervention. The user engagement with the app was low, but the athletes performed the mindfulness exercises very often without the app. The authors stated that the online workshops had no crucial drawbacks compared with face-to-face workshops.

Study 4 employed a quasi-experimental design, in which the experimental group practiced a LKM via a single in-person workshop and via an app, whereas the active control group practiced progressive muscle relaxation. The groups completed a pretest and a posttest measuring compassion, fairness, and team cohesion. In contrast to the authors' hypothesis, there was no interaction effect. The LKM group did not show greater cohesion, fairness, and compassion after the intervention than the control group. By comparing user engagement and user rating between LKM and progressive muscle relaxation, the authors concluded that

LKM was as accepted as progressive muscle relaxation by the study cohort. The authors recommended to implement future LKM interventions with substantial interaction parts and considering specific person-by-context interactions.

Study 5 aimed to introduce an app-based blended emotional regulation training evaluated within a German health insurance company. The training lasted eight weeks and combined an app with three face-to-face workshops. The experimental and control group completed different questionnaires, measuring stress, mindfulness, self-compassion, well-being, and emotional regulation, before and after the training. The outcome evaluation revealed that the training helped to improve emotional regulation, stress, mindfulness, and self-compassion; however, it did not affect well-being. The user engagement with the app was moderate. Nevertheless, the training time with the app nor the number of attended workshops moderated the founded effects, suggesting other important variables such as working culture for the founded effects. In the next chapter of this thesis, the author states the performed studies.

3 Studies

3.1 Study 1

Stenzel, L., Röcken, M., Borgmann, S., & Stoll, O. (2021). Developing and Implementing an

App-Based Blended Psychological Skills Training: A Case Study. *The Sport*

Psychologist, 35(2), 1–13. https://doi.org/10.1123/tsp.2020-0113

In the printed version of the dissertation, the publication follows on pages 32 to 44 inclusive.

I kindly request online readers to follow the link https://doi.org/10.1123/tsp.2020-

0113

3.2 Study 2

Stenzel, L., Röcken, M., Thrien, H., & Stoll, O. (2020). Blended Learning zur Betreuung der

deutschen männlichen U19 Handballnationalmannschaft bei der WM 2019: Eine

Fallstudie. *Zeitschrift für Sportpsychologie, 27*, 153–163.

https://doi.org/10.1026/1612-5010/a000315

In the printed version of the dissertation, the publication follows on pages 46 to 56 inclusive.

I kindly request online readers to follow the link https://doi.org/10.1026/1612-

5010/a000315

3.3 Study 3

Kittler, C., Stenzel, L., Jekauc, D., & Stoll, O. (2021). Implementation of an App-Based

   Blended Mindfulness Intervention in a Bundesliga Youth Academy Targeting

   Goalkeepers: A Case Study. *Case Studies in Sport and Exercise Psychology, 5*(1), 95–

   105. https://doi.org/10.1123/cssep.2021-0006

This study was published by the journal *Case Studies in Sport and Exercise
Psychology and by Christoph Kittler in his dissertation titled *Entwicklung und Evaluation
eines achtsamkeitsbasierten Trainingsprogramms zur Leistungssteigerung im Sport.*

Kittler, C., (2022). *Entwicklung und Evaluation eines achtsamkeitsbasierten

   Trainingsprogramms zur Leistungssteigerung im Sport* [Doctoral Dissertation,

   Humboldt University of Berlin]. https://edoc.hu-berlin.de/handle/18452/25866

In the printed version of the dissertation, the publication follows on pages 58 to 68 inclusive.

   I kindly request online readers to follow the link https://doi.org/10.1123/cssep.2021-
   0006

3.4 Study 4

Stenzel, L., Konsemüller, M., Tan, S., Röcken, M., Borgmann, S., Thomsen, N., & Stoll, O.

(2021). An App-Based Loving-Kindness Training to Facilitate Compassion, Team

Cohesion, and Fairness. *Zeitschrift für Sportpsychologie, 28*, 149–160.

https://doi.org/10.1026/1612-5010/a000345

This study was used by Moritz Konsemüller as a master thesis, which was supervised

by Shu Ling Tan and Lukas Stenzel.

Konsemüller, M. (2021). *An App-Based Loving-Kindness Training to Facilitate Compassion,*

Team Cohesion, and Fairness: A Pilot Study [Unpublished master thesis]. Institute of

Sport Science, Westfälische Wilhelms-University Münster.

In the printed version of the dissertation, the publication follows on pages 70 to 81 inclusive.

I kindly request online readers to follow the link https://doi.org/10.1026/1612-

5010/a000345

3.5 Study 5

Stenzel, L., Röcken, M., & Stoll, O. (2022). *Implementing and Evaluation of an App-Based Blended Mental Training in an Organizational Context* [First version manuscript]. Institute of Sport Science, Martin-Luther-University Halle-Wittenberg.

Implementing and Evaluation of an App-Based Blended Mental Training in an Organizational Context

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the project and is still a customer and cooperation partner of Mindance. The presented app is

also available to other research teams on request for (empirical) study purposes.

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Abstract

The current paper introduces an app-based blended mental training evaluated within a German health insurance company ($N = 114$). The training lasted eight weeks and combined three workshops and the use of an app. The workshops served as psychoeducation and motivation sessions. The customized app consisted of one mental training course based on the adaptive coping with emotions model and various single mental techniques. The experimental and control group completed different questionnaires before and after the training. The outcome evaluation revealed that the training helped to improve stress, mindfulness, and self-compassion; however, it did not affect well-being. Additionally, the process evaluation demonstrated that neither the training time with the app nor the number of attended workshops moderated the founded effects, suggesting other important moderator variables for the founded effects.

Keywords: App, Mental Training, Blended Learning

Introduction

Work stress contributes to the development of several physical illnesses and mental disorders (Ganster & Rosen, 2013), such as coronary heart disease (Kivimäki et al., 2012) and depression (Madsen et al., 2017). German health insurance reports demonstrated that mental ill-health[1] is the second most important reason for sick leave in Germany (e.g., Allgemeine Ortskrankenkasse, 2021). Personal suffering and economic costs are associated with mental ill-health (Kersemaeker et al., 2018). Wittchen and Jacobi (2005) calculated that the quality of life is approximately one standard deviation unit lower when experiencing a mental disorder (Wittchen & Jacobi, 2005). Brenscheidt et al. (2017) estimated that mental ill-health causes a loss of 16.8 billion euros in gross value added and 9.5 billion euros in lost productivity in Germany (Brenscheidt et al., 2017).

Work stress and associated mental ill-health often result from an imbalance between work demands and an employee's mental and physical resources (Bakker & Demerouti, 2007). In accordance, interventions either focus on reducing stress-related work demands through job redesign and organizational development and/or focus on individual responses through improving a person's coping resources (Giga et al., 2003; van der Klink et al., 2007).

App-Based Blended Mental Training

Mental training, also known as psychological skills training, is an individual-focused intervention (Kersemaeker et al., 2018; Vealey, 2007). Mental training describes the acquisition of psychological skills in terms of the desired ability or outcome (e.g., reduced stress) through systematic and repeated practice of mental techniques (e.g., progressive muscle relaxation). Mental training can either focus on one single technique or combine

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[1] We use the term mental ill-health to summarize mental disorders and mental health issues.

several techniques into a multimodal intervention. Previous studies indicated that within a workplace context, mental training techniques and a combination of them can improve perceived stress, mindfulness, self-compassion, emotional regulation, and well-being (Buruck et al., 2016; Giga et al., 2003; Engel et al., 2021; Holman et al., 2018; Richardson & Rothstein, 2008; Sundram et al., 2016; Vonderlin et al., 2020). For example, loving-kindness meditation (LKM) fostered self-compassion in entrepreneurs (Engel et al., 2021). Progressive muscle relaxation reduced stress in automotive assembly-line workers (Sundram et al., 2016), and mindfulness techniques improved well-being in various workplace settings (Vonderlin et al., 2020).

Smartphones and their downloadable software applications (apps) offer a powerful delivering mechanism for mental training techniques to empower greater access, lower cost, and immediate support (de Korte et al., 2018; Howarth et al., 2018; Price et al., 2014). Despite many mental ill-health apps using science to advertise, evidence-based research is scarce, particularly in the work context (Donker et al., 2013; Larsen et al., 2019; Payne et al., 2015). However, initial apps delivering mental training demonstrated promising results (Bostock et al., 2019; Coelhoso et al., 2019; Hwang & Jo, 2019; Kersemaekers et al., 2018; Weber et al., 2019). For example, the results of Bostock et al. (2019) and Coelhoso et al. (2019) demonstrated that meditation apps, mainly based on mindfulness and compassion techniques, can reduce stress and improve well-being. Additionally, Weber et al. (2019) found that the study app, which employed self-monitoring features and cognitive behavioral– based and mindfulness-based techniques, can reduce stress and facilitate well-being. Furthermore, an app based on mindfulness techniques and psychoeducation evaluated by Hwang and Jo (2019), the results indicated that the app fostered self-efficacy, stress, and well-being; however, depression and anxiety were not affected.

The optimal dosage of mental training apps is still an open question. There may be no simple linear relationship such as more mental training is better and less is worse (Britton, 2019; Sahdra et al., 2017). In a study with outside-of-a-workplace context by Clarke and Draper (2020), daily training with the mindfulness app Calm was shown to not be essential, and intermittent training could also lead to positive effects. Additionally, they reported that training with Calm could even decrease users' well-being. By contrast, the results of Bostock et al. (2019) and Weber et al. (2019) in a workplace context suggested a positive dose-response relationship between user engagement with the app and outcome variables (e.g., well-being). Thus, more research is needed to analyze the dose-response relationship of app-based mental training.

Mental training apps can be implemented as a stand-alone service (e.g., Bostock et al., 2019; Weber et al., 2019) or as a blended intervention (Kersemaekers et al., 2018). Blended interventions combine digital and online media with traditional analogous methods, such as workshops or face-to-face meetings (Friesen, 2012). Blended interventions can improve the participants' motivation, mood, and overall educational experience (Bonk & Graham, 2005; Lozano-Lozano et al., 2020). Moreover, personal contact can account for the therapeutic alliance and/or peer support (Torous et al., 2018). For example, Kersemaeker et al. (2018) used a blended mental training approach, combining a meditation app with workshops. The outcome evaluation of Kersemaeker et al. (2018) demonstrated reduced stress and improved well-being after the intervention.

Adaptive Coping with Emotions Model

The present paper introduces a multimodal app-based blended mental training based on the adaptive coping with emotions model (ACE). The ACE assumes that a functional emotional regulation arises from the situation-dependent interaction among several skills,

which can be described in a simplified way as a step-by-step emotional regulation sequence (Berking & Whitley, 2014; see Figure 1).

Figure 1

Emotional regulation sequence of the ACE (adapted from Berking & Whitley, 2014)
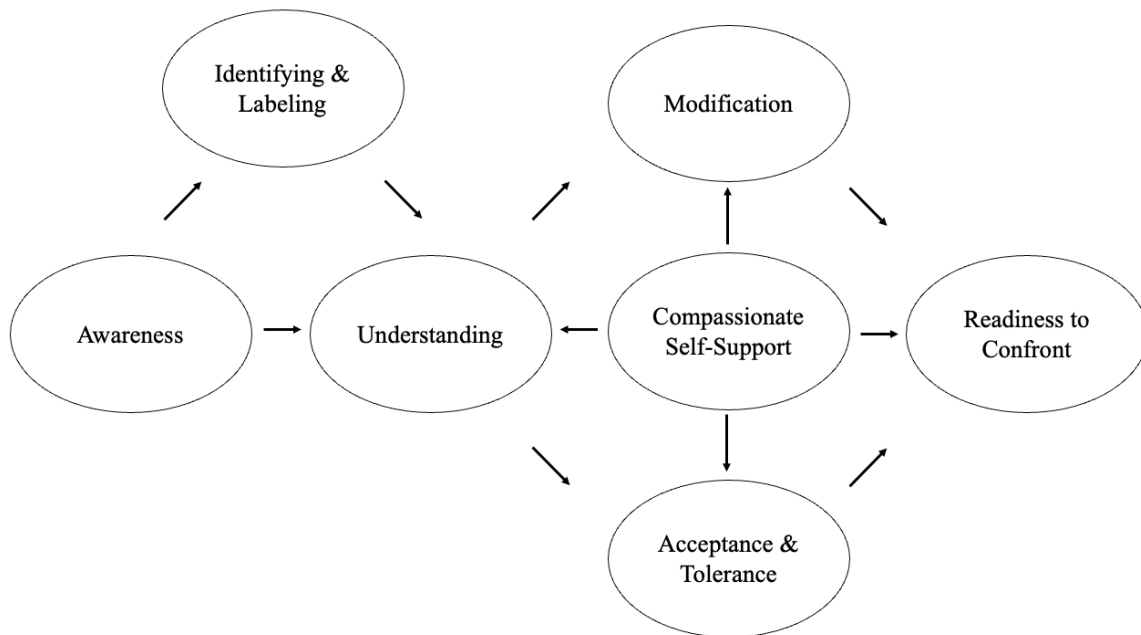
Awareness describes the skill to perceive emotional states consciously. *Identifying and labeling* enable a person to match emotions with the appropriate semantic categories (e.g., "This feeling I am experiencing is sadness"). The skill *understanding* allows a person to identify relevant causes and maintaining factors of emotion and clarify whether an emotion can be changed. If emotion can be changed, the skill *modification* involves actively regulating the quality, intensity, and/or duration of emotions. By contrast, *acceptance and tolerance* encourage a person to accept emotions if a modification is not possible or will come at a too high price, combined with the awareness that emotions are temporal experiences. *Readiness to confront* describes the ability to approach and confront a situation that may trigger negative emotions.

All of these skills can increase emotional suffering in the short term (Berking &

Whitley, 2014). For example, identifying and labeling emotions with a semantic category

such as fear and sadness can lead to distressing emotions related to these words. Therefore,

compassionate self-support involves stabilizing the mood, enabling the individual to

persistently use the above mentioned skills that are aversive in the short term but necessary

for sustained emotional relief in the long term.

Affect Regulation Training

The affect regulation training (ART) is based on the conceptualization of the ACE

employing various (combined) mental techniques (e.g., progressive muscle relaxation

combined with cognitive-behavioral techniques) to develop ACE-based skills (Berking &

Whitley, 2014). Several findings showed that ART reduces symptoms of different mental

disorders within clinical samples (e.g., Berking et al., 2008; Berking et al., 2013). However,

studies with workplace samples are rare. The results of Berking et al. (2010) indicated that

ART improves the skills acceptance and tolerance of police officers. In the context of nursing

homes, Buruck et al. (2016) revealed that the ART improves emotional regulation skills,

particularly acceptance, tolerance, and modification, and overall well-being

Study Objectives and Hypotheses

Based on the ACE and the ART (Berking & Whitley, 2014), the present paper

introduces a multimodal-blended mental training that combines an app with workshops. The

blended intervention has been developed specifically for the workplace and was evaluated

within a health insurance company in Germany, Allgemeine Ortskrankenkasse Plus (AOK

Plus). AOK Plus asked for an app-based intervention to improve mental health and

performance within their personnel. The intervention used different mental techniques such

as mindfulness and cognitive-behavioral exercises. We combined and chained the techniques into a systematic emotional regulation training and sequence.

The study included an outcome and process evaluation (Llewelyn et al., 2016). The client and supplier defined stress, mindfulness, self-compassion, emotion regulation, and well-being as success indicators for the outcome evaluation. Regarding the outcome evaluation, we expected the intervention group will have lower stress levels and higher levels of mindfulness, self-compassion, emotion regulation, and well-being at the posttest than at the pretest. By contrast, we expected no changes between the pretest and posttest for the control group. Consequently, we hypothesized significant between-group differences at the posttest. Regarding the process evaluation, we collected data about user engagement with the app and the number of workshops attended. Based on the research about optimal training dosage outlined above, we explored the following research question without a concrete hypothesis: are the founded effects more intense the more the participants engaged with the intervention components (app and workshops)?

Method

Participants

The intervention took place within AOK Plus, which has approximately 7,000 employees. In total, data from 114 employees were analyzed. The experimental group consisted of 52 participants, and the waitlist control group had 62 participants. Due to the company's data collection principles, we were not allowed to analyze age and gender. However, the average age of the 7,000 employees was known to be approximately 45 years, and approximately 80% are women.

Intervention

The intervention lasted eight weeks and combined three workshops and the use of an app. The workshops served as psychoeducation and motivation sessions. Additionally, the workshops gave participants the opportunity to ask questions and support each other. The app allowed the participants to practice the taught mental techniques.

App

We used the digital infrastructure of the *Mindance* app and ensured that the app only included the relevant intervention components (Mindance GmbH, 2021). The customized app consisted of one mental training course and single mental techniques. The techniques were audio-guided instructions. The mental training course techniques took 15 minutes, and the single mental techniques took approximately 3–10 minutes. Participants were encouraged to perform the exercises in a sitting position.[2] Participants were motivated to practice a mental training course technique every day and use single mental techniques as a "quick fix" during the workday (Wyatt et al., 2014). Participants were allowed to use the app during working hours and could set daily push notifications as a reminder for training.

Mental Training Course. The mental training course is firmly based on the ART (Berking & Whitley, 2014; Buruck et al., 2016); however, the intervention was adapted to the workplace context. In line with the ART, the different mindfulness components were introduced as separated skills attention, de-identification, and acceptance (Berking & Znoj, 2006; Bishop et al., 2004; Kabat-Zinn, 1990; Walach et al., 2006). However, unlike ART, other mental training techniques were also used. For example, the mindfulness technique body scan was used to reduce stress rather than progressive muscle relaxation (Coelhoso et al., 2019; Vonderlin et al., 2020) because mindfulness also simplifies applying other skills

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[2] The concrete German instructions and English translations for every mental technique are available here: https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186

(e.g., labeling; Berking & Znoj, 2006; Chiesa et al., 2013). Additionally, LKM was used to increase the effects on self-compassion and was divided into the skills self-kindness and sense of common humanity (Germer & Neff, 2019; Neff, 2003).

In total, the mental training course was delivered in four modules: presence, meta-perspective, regulation, and compassion. Each module took two weeks and focused on different skills. The skills taught via mental techniques within the modules can be seen as a systematic emotional regulation training and sequence. Figure 2 summarizes this sequence.

Figure 2

Emotional regulation sequence
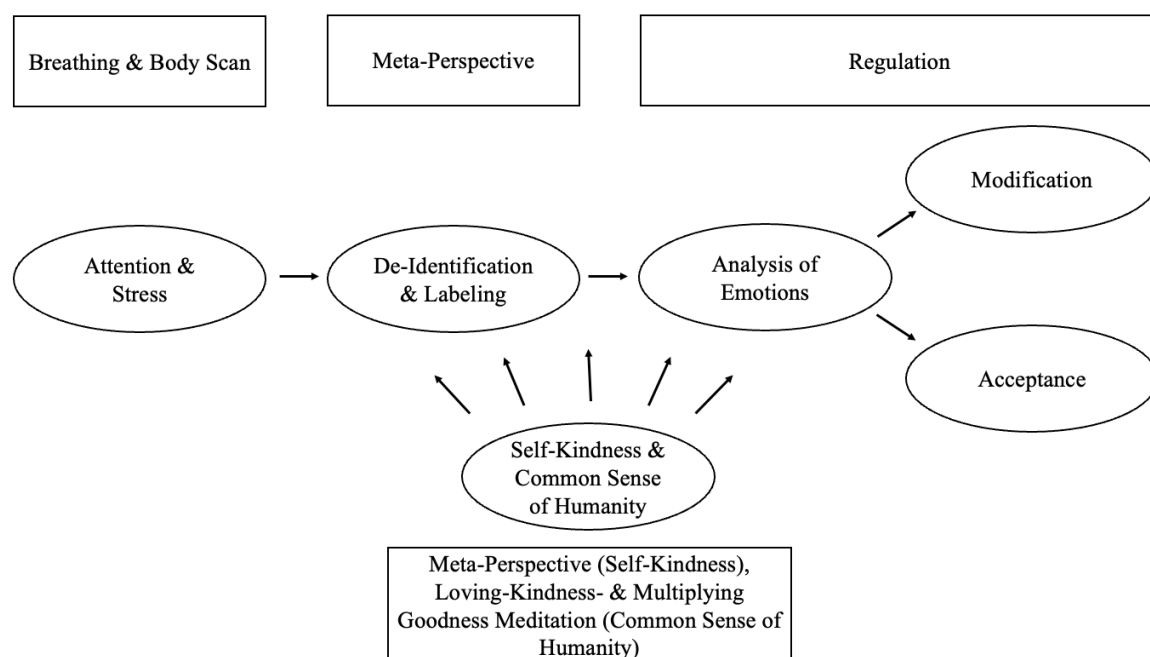
Note. The skills are structured as a systematic emotional regulation sequence. The ellipses denote the skills, and the quadrilaterals denote the techniques to develop these skills.

Presence. The presence module focuses on the skills attention (Tang et al., 2007) and stress (Bostock et al., 2019). Participants should improve attentional faculties (directing attention, sustained attention, and monitoring) to stay or return to the present moment (Singer

et al., 2016). Additionally, participants were taught to use mental techniques to reduce stress

(Coelhoso et al., 2019). The Presence module and its skills (attention and stress) are the

preconditions for intentionally cultivating the other skills in subsequent modules because the

target to be processed (e.g., emotions) have to be taken consciously into the focus of attention

(Singer et al., 2016). Furthermore, it is essential to reduce stress in an emotionally triggered

situation to facilitate functional emotional regulation strategies and avoid dysfunctional ones

(Berking & Whitley, 2014). Thus, the learned skills in this module can be seen as the first

step of an emotional regulation process (Berking & Whitley, 2014; Öst, 1987; Singer et al.,

2016; Figure 2).

The app's core mental techniques are breathing meditation and body scan, combined

into one technique (Kabat-Zinn, 1990). The basic instruction for breathing meditation is to

observe sensations of breathing and to count breaths mentally. During the body scan,

participants direct their attention to the body's various sensations, starting from the toes and

ending at the head.

Meta-Perspective. The meta-perspective module focuses on de-identification,

labeling, and self-kindness (Berking & Whitley, 2014; Germer & Neff, 2019; Hatzigeorgiadis

et al., 2009; Singer et al., 2016). Here, *de-identification* describes the skill to observe

thoughts and emotions unjudgementally as fleeting mental events within ourselves, combined

with specific bodily sensations. This helps a person to see emotions and thoughts as not

identical to who one is, which can help resist the urge to avoid negative emotions (Berking &

Whitley, 2014; Singer et al., 2016). *Labeling* is the ability to tag thoughts and emotions with

short descriptions to create a mental representation. For example, with the awareness that the

current emotional state with its specific bodily sensations can be labeled as "anger", one can

use the knowledge about anger and consciously figure out ways to regulate the emotion

(Berking & Whitley, 2014). The skill *self-kindness* enables people to be kind toward

themselves through warm and friendly self-talk that acknowledges difficult situations and

emotions, offers support, and reminds them that they have already successfully coped with

similar challenges (Berking & Whitley, 2014; Germer & Neff, 2019). The skills of the meta-

perspective module can be seen as the second step of a systematic emotional regulation

process (Figure 2).

The mental technique delivered by the app is named meta-perspective, as is the

module. The technique still included breathing meditation and the body scan in a shorter

version at the beginning. Afterward, participants remember a negative and a positive

situation, observe the associated thoughts and emotions through a nonidentified perspective,

and use labels to classify the content of their thoughts and emotions (Berking & Whitley,

2014; Hayes et al., 2004). Using this technique, participants can create compassionate self-

talk, for example, "It's okay that I feel this way" (Germer & Neff, 2019; Hatzigeorgiadis et

al., 2009).

Regulation. The regulation module focuses on the skills analysis of emotions,

acceptance*,* and modification of emotions (Berking & Whitley, 2014; Hayes et al., 2004)*.* The

skill *analysis of emotions* aims to identify the causes and maintaining factors of an affective

state, for example, whether an internal or external situation triggers it, thereby making it

easier to clarify whether an affective state can be changed or cannot be changed (Berking &

Whitley, 2014). The skill *acceptance* is based on the de-identification skill and encourages a

more profound understanding that emotions are temporal and the willingness to tolerate even

undesired emotions to achieve important personal goals (Hayes et al., 2004). The skill

modification of emotion is the ability to actively regulate the content, intensity, and/or

duration of negative emotions (Berking & Whitley, 2014). The regulation module can be seen

as the final step of systematic emotional regulation training (Figure 2).

The core mental technique delivered by the app is named regulation, as is the module. The technique still included the previously taught techniques breathing meditation, body scan, and meta-perspective in a shorter version. However, after remembering a negative situation, participants are guided through a step-by-step cognitive behavioral–based problem-solving process (Berking & Whitley, 2014; D'Zurilla & Nezu, 2010). First, they analyze the emotions by exploring the context, expectation, and appraisal pattern. Second, the participants are invited to set a regulation goal and brainstorm possible measures to achieve that. Third, participants create a concrete plan and mentally put the plan into action. Fourth, participants evaluate the outcome.

Compassion. The compassion module focuses on further improving (self-)compassion skills by developing an awareness of common humanity and compassion for others. *Compassion for others* is the ability to be sensitive to others' suffering but not be overwhelmed by it, combined with a deep desire to alleviate that suffering (Singer et al., 2016). A *sense of common humanity* denotes the understanding that our experiences, such as emotions, are part of the human condition and are shared with all people rather than feeling isolated (Germer & Neff, 2019; Neff, 2003). However, results suggested that compassion and self-compassion are not significantly related (López et al., 2018); both constructs can be cultivated through LKM (Engel et al., 2021; Hutcherson et al., 2008; Weibel et al., 2016; Weng et al., 2013).

The app's core mental techniques were LKM (Fredrickson et al., 2008; Singer et al., 2016) and multiplying goodness meditation (Tan, 2012). In LKM, the participants were guided to activate intentions and feelings of connection, warmth, and kindness via themselves, an imagination of a close person, a stranger, a person with whom they face a problematic relationship, and, finally, all humans using sentences such as "May you be happy." The multiplying goodness meditation is based on LKM (Tan, 2012). Here,

participants were invited to become aware of strengths and positive attitudes (goodness) of

their own and others. Then, they were guided to imagine breathing in that goodness,

multiplying that goodness, and then breathing out that goodness to other persons and the

common humanity.

Single Mental Techniques. The single mental techniques aimed to support the

participants in keeping the psychological balance between stress and relaxation during the

day. The techniques could be seen as a "quick fix" when, for example, facing an upcoming

business presentation (Clarke & Draper, 2020; Wyatt et al., 2014). The techniques utilize

different breathing and relaxation exercises, mindfulness meditations, and imaginations

(Barnow, 2014; de Niet, 2009; Kabat-Zinn, 1990; Vealey, 2007). The participants had access

to 15 single mental techniques.[3]

Workshops

Instead of 8–9 workshops recommended with the ART (Berking & Whitley, 2014),

we employed three workshops (Buruck et al., 2016). All workshops had a duration of 2 hours

and 30 minutes.[4] At the beginning of the first workshop, participants completed the pretest.

Then, the mental training course and the single mental techniques, combined with their

positive effects on the psychological and neuronal levels, were presented (Vealey, 2007;

Davidson et al., 2004; Tan, 2012). For example, the course explained how mindfulness

techniques could affect the stress reaction by influencing the amygdala, prefrontal cortex, and

hypothalamus (Berking & Whitley, 2014). At the end of the first workshop, the participants

could download the app, and the app's functions were explained.

After four weeks, participants attended the second workshop. Then, participants had

the opportunity to ask questions about the mental techniques. Afterward, participants could

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[3] The concrete German instructions and English translations for every single mental technique are available
here: https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186
[4] The presented Powerpoint slide in German language and English translations for every workshop are available
here: https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186

support each other by finding time slots to use the app. In doing so, the workshop instructor asked about good and bad lessons learned about app usage. Then, it was explained how stress and emotions arise and how the taught mental techniques improve emotional regulation, for example, by avoiding maladaptive patterns such as suppression (Berking & Whitley, 2014).

After another four weeks, participants attended the last workshop. It summarized how the mental techniques support emotional regulation (Berking & Whitley, 2014). Moreover, it explained how to transfer a compassionated attitude to meetings and difficult conversations (Tan, 2012). Lastly, participants completed the posttest.

Procedure

The intervention was advertised in the company's internal social network, including two different starting points (experimental vs. waitlist control group) and the information that the interventions would be evaluated by self-report measures. The advertisement did not inform about workshops. Participants could sign in by choosing a convenient starting point. After the experimental group's intervention was completed, the waitlist control group had access to the app; however, they did not participate in workshops. All participants were blind to the hypotheses and goals of the study.

Pretest and posttest (see outcome measures) for the experimental group was completed via paper-pencil questionnaires at the beginning of the first workshop and the end of the last workshop. If participants were unable to attend a workshop, they had the opportunity to complete the questionnaires online via a SurveyMonkey link (SurveyMonkey Inc, 1999). The pretest and posttest of the waitlist control group took place simultaneously via the online portal SurveyMonkey. All procedures followed the ethical standards of the responsible institution, the company, and the American Psychological Association's ethical

principles of psychologists and code of conduct and its later amendments or comparable

ethical standards (American Psychological Association, 2017).

Outcome Measures

Well-Being

The German version of the World Health Organization (five) well-being questionnaire

(WHO-5) is a scale to measure positive aspects of subjective well-being by the experience of

positive emotions over the last two weeks with five items (Topp et al., 2015; WHO, 1998).

The five items ask participants how often they felt in a joyful mood, relaxed, active, or fresh

and whether their day was filled with things of interest to them using a 6-point Likert scale

from 0 (none of the time) to 5 (all of the time). Internal consistency of the WHO-5 in our

sample was high for the pretest (α =.85) and the posttest (α =.89).

Emotional Regulation

The German Self-Report Measure for the Assessment of Emotion Regulation Skills

(SEK-27) measured participants' ability to cope with negative emotions in the last week

(Berking & Znoj, 2008). The SEK-27 is based on the ART (Berking & Whitley, 2014;

Berking & Znoj, 2006; Buruck et al., 2016) and combined nine skills (awareness, sensation,

clarity, understanding, acceptance, tolerance, readiness to confront, compassionate self-

support, and modification) to a total score. Each skill is recorded by three items using a 5-

point Likert scale from 0 (not at all) to 4 (almost always). Internal consistency for the total

score of the SEK-27 in our sample was high for the pretest (α =.92) and the posttest (α =.93).

Mindfulness

The German short version of the Freiburg Mindfulness Inventory (FMI-14) measures

trait-mindfulness with 14 items (Buchheld & Walach, 2002; Walach et al., 2006). Participants

rated the items on a 4-point Likert scale from 1 (rarely) to 4 (almost always). Internal

consistency of the FMI-14 in our sample was high for the pretest ($\alpha = .86$) and the posttest ($\alpha = .88$).

Self-Compassion

The German short-version of the Self-Compassion Scale (SCS-D) measured self-compassion and combined six subscales (self-kindness, self-judgment, common humanity, isolation, mindfulness, overidentification) to a total score (Hupfeld, & Ruffieux, 2011). Each subscale consisted of two items using a 5-point Likert scale from 1 (almost never) to 5 (almost always). Internal consistency of the SCS-D in our sample was high ($\alpha = .87$) for pretest and high ($\alpha = .88$) for posttest.

Stress

The German short-version of the Perceived Stress Questionnaire (PSQ) measured stress and combined four subscales (demands, tension, lack of joy, and worries) to a total score (Fliege et al., 2005). Each subscale consisted of five items using a 4-point Likert scale ranging from 1 (almost never) to 4 (almost all the time). Internal consistency of this questionnaire in our sample was high for the pretest ($\alpha = .93$) and the posttest ($\alpha = .94$).

Process Measures

At the posttest, we asked participants to state how many workshops they had attended. Moreover, we recorded user engagement in terms of clicked exercises and training time with the app. Participants used the same anonymous username for the app and the questionnaires to match training time with the app and outcome measures.

Results

Outcome Results

A total of 114 employees participated in the study. The intervention group consisted of 52 participants, and the control group had 62 participants. Due to missing questionnaires, 55 participants (intervention group, 25; control group, 30) were not analyzed according to outcome results. Thus, the intervention group consisted of 27 participants and the control group of 32.

A multivariate analysis of variance (MANOVA) with time as a within-subject variable (pretest vs. posttest) and group (experimental vs. control) as a between-subject factor was calculated to evaluate the outcomes. We detected 4 univariate (checked via box plots) and 0 multivariate (checked via Mahalanobis distances, $\chi^2 > 20.515$; $p < .001$) outliers. The outliers were retained for further analyses due to the small sample.[5] In the control group, the normal distribution assumption was violated for the pretest and posttest of the SEK-27 and the posttest of the FMI-14. In the intervention group, the normal distribution assumption was violated for the posttest of the WHO-5, but repeated measures MANOVA is considered robust to violation of the normal distribution assumption (Berkovits et al., 2000). Although no multicollinearity was observed, a linear relationship was identified between the variables. Table 1 contains the means and standard deviations of the outcome variables by group.

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[5] Analyses without outliers can be found here:
https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186
Overall, main and interaction effects differed only slightly between the sample with and without outliers.

Table 1

Mean and Standard Deviation of the Outcome Variables

Variable	Intervention group (*n* = 27)		Control group (*n* = 32)	
	M (*SD*) T1	*M* (*SD*) T2	*M* (*SD*) T1	*M* (*SD*) T2
Well-being	12.37 (4.86)	14.81 (4.73)	11.97 (5.23)	12.66 (4.82)
Emotional regulation	2.37 (.49)	2.60 (.48)	2.47 (.49)	2.44 (.47)
Mindfulness	2.40 (.44)	2.69 (.43)	2.49 (.45)	2.45 (.42)
Stress	2.48 (.54)	2.18 (.48)	2.53 (.55)	2.53 (.56)
Self-compassion	2.87 (.67)	3.38 (.66)	3.01 (.63)	2.95 (.58)

Note. Analysis included all participants with completed questionnaires ($n_{intervention}$ = 27, $n_{control}$ = 32); those with incomplete questionnaires were not included (intervention, 52; control, 62).

Table 2 shows the results of the repeated measures MANOVA. Because not all variables were normally distributed, we used Wilks' lambda to interpret the results. The results demonstrated a significant main effect for time and a significant main interaction effect. A significant interaction was identified for all scales except the WHO-5.

Table 2

Results of the Repeated Measures MANOVA

Effect	Wilk's Λ	df	F	η²	p
Main effect time	.79	5	2.87	.21	.023
Well-being		1	8.57	.13	.005
Emotional regulation		1	4.79	.08	.033
Mindfulness		1	7.55	.12	.008
Stress		1	8.07	.12	.006
Self-compassion		1	11.26	.17	.001
Main effect group	.94	5	.71	.06	.616
Well-being		1	1.20	.02	.279
Emotional regulation		1	.07	.00	.791
Mindfulness		1	.54	.01	.464
Stress		1	2.39	.04	.128
Self-compassion		1	.91	.02	.345
Interaction effect time*group	.74	5	3.65	.26	.007
Well-being		1	2.70	.05	.106
Emotional regulation		1	7.83	.12	.007
Mindfulness		1	12.83	.18	.001
Stress		1	8.75	.13	.004
Self-compassion		1	18.01	.24	>.001

Note. Analysis included all participants with completed questionnaires ($n_{intervention}$ = 27, $n_{control}$ = 32); those with incomplete questionnaires were not included (intervention, 52; control, 62).

Pairwise comparisons showed that the intervention group significantly improved in the variables of emotional regulation, mindfulness, stress perception, and self-compassion between the pretest and the posttest (Table 3). By contrast, the control group showed no significant improvement. Furthermore, the intervention group showed significantly better posttest scores on mindfulness, stress perception, and self-compassion than the control group (Table 3).

Table 3

Results of Pairwise Comparisons

Variable	Time	M_{diff} (Intervention group – control group)		Group	M_{diff} (T2 – T1)	
Emotional regulation	1	−.10	[−.36;.16]	Intervention	.24**	[.10; .38]
	2	.16	[−.08;.41]	Control	−.03	[−.16; .10]
Mindfulness	1	−.09	[−.32;.15]	Intervention	.29**	[.15; 42]
	2	.24*	[.02;.46]	Control	−.04	[−.16; .09]
Stress	1	−.04	[−.33;.24]	Intervention	−.31**	[−.46; −.15]
	2	−.36*	[−.63; −.08]	Control	.01	[−.14; .15]
Self-compassion	1	−.14	[−.48; .20]	Intervention	.51**	[.31; .71]
	2	.43*	[.11; .75]	Control	−.06	[−.24;.12]

Note. Due to multiple comparisons, α was adjusted according to the Bonferroni method.

* $p <.05$; ** $p <.001$.

Process Results

User Engagement App

Eight out of 52 participants in the intervention group did not use the app at all. The 44 participants who used the app trained for an average duration of 261.65 minutes ($SD =$ 236.61) and executed 1027 techniques ($M = 22.32$; $SD = 18.69$; including 958 mental training course techniques and 69 single mental techniques). In the mental training course, they exercised 468 techniques ($M = 10.17$; $SD = 5.17$) of the presence module, 168 techniques ($M = 3.65$; $SD = 6.95$) of the meta-perspective module, 261 techniques ($M = 5.67$; $SD = 6.32$) of the regulation module, and 61 techniques ($M = 1.32$; $SD = 3.39$) of the compassion module.

Of the 27 participants in the intervention group with completed pretests and posttests, 25 used the app and trained for an average of 367.09 minutes ($SD = 230.34$). They executed 764 techniques ($M = 30.56$; $SD = 18.55$; including 719 mental training course techniques and 45 single mental techniques). In the mental training course, they exercised 306 techniques ($M = 12.24$; $SD = 3.90$) of the presence module, 153 techniques ($M = 6.12$; $SD = 8.30$) of the meta-perspective module, 209 techniques ($M = 8.36$; $SD = 5.88$) of the regulation module, and 51 techniques ($M = 2.04$; $SD = 4.06$) of the compassion module.

Of the 25 participants in the intervention group with missing values, 21 used the app and trained for an average of 136.12 minutes ($SD = 178.48$); 2 participants did not use the app. They completed 263 techniques ($M = 12.52$; $SD = 13.69$; including 239 mental training course techniques and 24 single mental techniques). In the mental training course, they exercised 162 techniques ($M = 7.71$; $SD = 5.51$) of the presence module, 15 techniques ($M =.71$; $SD = 3.05$) of the meta-perspective module, 52 techniques ($M = 2.48$; $SD = 5.36$) of the regulation module, and 10 techniques ($M =.48$; $SD = 2.18$) of the compassion module.

Workshops

On average, the 52 participants in the intervention group took part in 2.26 of the three workshops (*SD* =.59). Nine participants attended all workshops. The 27 participants in the intervention group with completed pretests and posttests attended an average of 2.23 workshops (*SD* =.59).

Participants did not mention difficulties with using the app in the workshops. A question that occurred often was if it is necessary to close the eyes, which is not required. It is also possible to focus on a point in the room.

Moderation Analysis App

To determine whether training time has a moderating effect on the improvements of the intervention group, a moderation analysis with training time as a moderator variable was calculated for the variables with significant interaction (emotional regulation, mindfulness, stress, and self-compassion). Before analysis, the sample was screened for multivariate outliers. One participant for each scale, except for mindfulness, was detected as an outlier. The outliers were retained for further analyses due to the small sample.[6] The regression residuals in the analysis of the self-compassion scale were heteroskedastically distributed. For this reason, a robust standard error (HC3) was used. No significant moderating effect of training time was found for any variables (Table 4–7).

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[6] Analyses without outliers can be found here:
https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186. Overall, effects differed only slightly between the sample with and without outliers.

Table 4

Results of the Moderation Analyses for Emotion Regulation

	Postintervention emotion regulation	
	B_x	$SE(B_x)$
Preintervention emotion regulation	.70**	.18**
Training time	−.00	.00
Preintervention * training time	.00	.00
R^2	.44	
F	5.42*	

* p < .05, **p < .001.

Table 5

Results of the Moderation Analyses for Mindfulness

	Postintervention mindfulness	
	B_x	$SE(B_x)$
Preintervention mindfulness	.67*	.18*
Training time	−.00	.00
Preintervention * training time	.00	.00
R^2	.40	
F	4.71*	

* p < .05, **p < .001.

Table 6

Results of the Moderation Analyses for Perceived Stress

	Postintervention perceived stress	
	B_x	$SE(B_x)$
Preintervention perceived stress	.63*	.17*
Training time	−.00	.00
Preintervention * training time	.00	.00
R^2	.41	
F	4.81*	

*$p < .05$, **$p < .001$.

Table 7

Results of the Moderation Analyses for Self-Compassion

	Postintervention self-compassion	
	B_x	$SE(B_x)$
Preintervention self-compassion	.58*	.27*
Training time	.00	.00
Preintervention * training time	.00	.00
R^2	.36	
F	1.74	

*$p < .05$, **$p < .001$.

Moderation Analysis Workshops

To examine the influence of workshop attendance on the improvements in the intervention group, a moderation analysis with the number of workshops as a moderator variable was calculated for each of the four scales with a significant interaction effect. For the emotional regulation scale, one outlier was detected. The outlier was retained for further analyses due to the small sample.[7] The regression residuals for the scales of emotional regulation, mindfulness, and self-compassion were heteroskedastically distributed, and robust standard error (HC3) was used. No scales showed a significant moderation effect for the number of workshops attended (Table 8–11).

Table 8

Results of the Moderation Analyses for Emotion Regulation

	Postintervention emotion regulation	
	B_x	$SE(B_x)$
Preintervention emotion regulation	.49*	.15*
Workshops	.05	.16
Preintervention * workshops	−.22	.52
R^2	.35	
F	4.00*	

*$p < .05$, **$p < .001$.

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[7]Analyses without outliers can be found here: https://osf.io/23exc/?view_only=a82ef39222d44bc5a60e250b0030f186. Overall, effects differed only slightly between the sample with and without outliers.

Table 9

Results of the Moderation Analyses for Mindfulness

	Postintervention mindfulness	
	B_x	$SE(B_x)$
Preintervention mindfulness	.30	.34
Workshops	.03	.15
Preintervention * workshops	−.82	.79
R^2	.41	
F	4.89*	

*$p < .05$, **$p < .001$.

Table 10

Results of the Moderation Analyses for Perceived Stress

	Postintervention perceived stress	
	B_x	$SE(B_x)$
Preintervention perceived stress	.51*	.15*
Workshops	−.20	.14
Preintervention * workshops	−.00	.30
R^2	.38	
F	4.59*	

*$p < .05$, **$p < .001$.

Table 11

Results of the Moderation Analyses for Self-Compassion

	Postintervention self-compassion	
	B_x	$SE(B_x)$
Preintervention self-compassion	.38	.19
Workshops	.34	.23
Preintervention * workshops	.08	.39
R^2	.30	
F	2.72	

*$p < .05$, **$p < .001$.

Discussion

The current paper introduced an app-based mental training intervention and the blended implementation process within a big German health insurance company. The outcome evaluation revealed that the intervention did not significantly influence well-being. However, comparing posttest and pretest scores, the intervention group had improved mindfulness, emotional regulation, stress, and self-compassion levels, whereas the control group did not show any changes. Moreover, the intervention group had higher self-compassion and mindfulness levels and lower stress levels than the control group at the posttest. Thus, we conclude that the intervention helped to improve stress, mindfulness, and self-compassion in the studied sample; however, it did not affect well-being. Emotional regulation was positively influenced, but only low level, and no significant difference in the posttest was found between groups. In the future, randomized control trials with larger samples are needed to make reliable, evidence-based conclusions about the present intervention's outcome effects.

The process evaluation revealed that participants practiced primarily mental techniques from the presence module, which is also part of the meta-perspective and regulation modules. The compassion techniques were rarely performed. This tends to suggest that the mindfulness exercises breathing and body scan might be crucial for the founded effects.

The German version of the WHO-5 is a scale to measure positive aspects of subjective well-being by the experience of positive emotions. Even if the frequency of experienced positive emotions did not increase, the participants gathered emotional regulation skills such as mindfulness. We assume that this should also affect the long-term well-being measured by the WHO-5.

The level of user engagement with the app can be compared with other app-based interventions in the working context (Bostock et al., 2019; Weber et al., 2019). In a study by Weber et al. (2019), of the 347 participants assigned to the intervention group, 137 did not use the study app. Bostock et al. (2019) showed that within an 8-week intervention period, participants completed, on average, only 16.6 ($SD = 12.9$) mindfulness meditations out of a possible 45. Using a blended mental training that combined a meditation app with in-person workshops, Kersemaekers et al. (2018) revealed a high user engagement. Over the 10-week study period, participants reported that they meditated on average 45.7 minutes per week ($SD = 343$). This result could be based on methodical flaws because it is derived from self-reports, and only 269 participants out of 425 reported their meditation time. Here, 44 out of 52 participants who used the app trained for an average of 261.65 minutes ($SD = 236.61$) and executed 1027 techniques ($M = 22.32$; $SD = 18.69$; including 958 mental training course techniques and 69 single mental techniques) over the intervention period. Thus, we conclude that the app's user engagement was moderate.

Despite this engagement, the training time with the app did not moderate the founded effects. This finding can be aligned with other results showing that there may be no simple linear relationship, such as more mental training is better and less is worse (Britton, 2019; Clarke & Draper, 2020; Sahdra et al., 2017; Stenzel et al., 2021). Instead of a linear one, the relationship could be non-monotonic, inverted U-shaped, or completely individualized (Britton, 2019; Sahdra et al., 2017). It might be beneficial for a mental training app to motivate users to reach an optimal practice time instead of maximal or daily training. For example, it could be worthwhile if participants were encouraged to create a detailed action plan of when, where, and how to perform the mental techniques (Schwarzer, 2008).

The attended workshops also did not affect the outcome variables. Both results of the moderation analyses might indicate other important moderator variables for the founded effects. It might be that the opportunity to use the app during the working day also influences the working culture (Giga et al., 2003; van der Klink et al., 2007). For example, allowing people to use the app during the workday may have improved the value placed on mental health in the company culture and reduced stigma toward mental ill-health. Thus, the intervention could be seen not solely as an individual-focused intervention but instead contained even components of organizational development (Giga et al., 2003; van der Klink et al., 2007).

This practical paper has some limitations. First, we were not allowed to collect age and gender based on a data protection decision of the company. Second, although we used a multimethod data collection principle (digital and/or paper-pencil), there were many missing questionnaires, resulting in a small outcome evaluation sample. For future research, we suggest using additional reminders to prompt participants to complete the questionnaires. Third, we did not collect and analyze which single mental techniques were used; however this could be a piece of essential information in which situation participants need support

during their day. Fourth, it would have been interesting to collect data about the skill compassion for others (see module compassion), for example, via the compassion for others scale (Pommier, 2010). However, we decided together with AOK Plus to focus on the effects of self-compassion. Besides subjective measures using questionnaires, it would be worthwhile to collect other possible covariables (e.g., context variables focusing on organizational development) and add more objective measures such as cortisol level or blood pressure. For the future, we also suggest using a multimethod design applying qualitative feedback to disentangle the crucial intervention components in more detail and specifically shed light on *how* the intervention works. Fifth, we did not test the control group a third time because this was not included in the overall project due to cost.

The paper's strengths are the holistic description of the app-based intervention and the execution in a real-life setting. The additional online material gives concrete insights into the used mental training techniques, which can also be used by other coaches and trainers. Moreover, the intervention was evaluated regarding the outcome and process variables, the results of which indicate how and why the intervention worked. Finally, we hope that our paper motivates more evidence-based research regarding the vast and growing number of mental health apps in the work context.

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4 General Discussion

The five studies utilized app-based blended PSTs within sports and business contexts. All the studies contained an outcome evaluation and a process evaluation. These four sport studies mark the beginning of app-based PST research in sports. Study 1 was the first application of a specific sports psychology app with collection and analysis of quantitative and qualitative data. The outcome evaluation indicated a significant increase in concentration, self-efficacy, and more frequent recovery after the intervention within a group of youth soccer players. The qualitative feedback recommends adding motivational functions to a PST app and creating time slots in the athletes' demanding schedules for using the app. Study 2 introduced a 6-week, app-based blended PST where various traditional and third-wave CBT techniques are combined to support the U19 handball national team of Germany. Study 2 highlighted the opportunity for data collection via apps and for subsequent PST individualization. Study 3 described the implementation of an app-based blended mindfulness intervention at a German Bundesliga youth academy to improve the goalkeepers' attention. A significant development in the players' attention scores over time was found. The qualitative data implied that players need more assistance with time management and more thorough education on the app. The authors stated no crucial drawbacks of the online sessions compared with face-to-face workshops. Study 4 added LKM to the PST sports literature. The outcome results suggest that it is questionable whether the current short-term, app-based LKM training is suitable to fostering interpersonal skills such as compassion, team cohesion, and fairness of soccer players in the context of a youth soccer academy. LKM was rated as good as the progressive muscle relaxation and should motivate future research to use modified LKM intervention targeting other outcome variables. Business-focused Study 5 developed and evaluated a new app-based blended emotion regulation training that also combines traditional and third-wave CBT techniques within a German insurance company.

The evaluation suggests that this particular training improves stress, mindfulness, and self-compassion.

The studies' strengths were the quantitative and/or qualitative process evaluations, which reveal whether and why the respective PST apps are or are not used in the real-life settings. Based on that data, practical suggestions for future app development and implementation were presented. The studies obtained lessons from the particular rather than the general, including the theoretically based reflection of the researchers personally involved in the intervention development. Thus, the generalizability of the presented results is limited. The discussions should be read as interpretive approaches that enrich future research.

The studies' limitations were the small samples and the lack of RCTs. Future research should include four groups: a control group, an app-only group, a workshop-only group, and blended group. Such a study design could disentangle the influence of the different intervention parts for a detailed user engagement analysis that reveals which intervention part best motivates the practice of mental training techniques.

4.1 Differences Between Sport and Business Results

Because the app-based blended PSTs were all different concerning content and structure, it is difficult to compare the studies. Nevertheless, it is noticeable that the app usage within the business-focused Study 5 was moderate compared with low usage within the sports-focused Studies 1–4. This might be based on age and gender differences with the target groups. Even if we were not allowed to analyze age and gender precisely in the Study 5, it is known that the average age of the 7,000 employees within the insurance is approximately 45 years, and approximately 80% are women. Thus, in the business Study 5, the participants were primarily older and more female than those in the sport-focused Studies 1–4, which specifically examined youth male athletes. This result of low usage among

younger participants is surprising because individuals between the ages of 18 and 34

reportedly check their smartphones every hour, even when they wake up in the middle of the

night (Lookout Mobile Security, 2012). Thus, it could be that older app users utilized their

smartphones less frequently but in a more targeted fashion, such as to perform a mental

technique.

Another influential factor for moderate user engagement could be that the employees

were allowed to use the app during the workday. This may have helped the users find suitable

time slots to use the app. By contrast, the qualitative feedback of the sport studies (Study 1;

Study 3) stated that athletes did not have enough time, besides school and physical training,

to use the app regularly. Thus, youth athletes in particular should be provided additional time

management support.

4.2 Similarities Between Sport and Business Results

In the sport-focused Study 1 and business-focused Study 5, a moderation analysis was

executed. Both results revealed that user engagement with the respective PST app did not

moderate the founded outcome effects. Clarke and Draper (2020) demonstrated that daily

training with the mindfulness app Calm is not essential and that intermittent training can also

lead to positive effects. They even reported that more training with the Calm app can

decrease users' well-being. Instead of a linear relationship between training time and effects,

there could be a nonmonotonic, inverted U-shaped, or completely individualized relationship

(Britton, 2019; Sahdra et al., 2017; Strohmaier, 2020).

Although all of these studies used a blended implementation process, the process

results of all studies revealed that app user engagement is a perennial challenge with low

(sport-focused Studies 1–4) to moderate (business-focused Study 5) usage. Thus, in the below

section, the user engagement is embedded in the health action process approach (HAPA) to

derive multifaceted suggestions for future app-based blended PST design that enables

individualized and optimal PST app usage (Schwarzer, 2008, 2015, 2016).

4.3 The Health Action Process Approach Framework

The HAPA is a social-cognitive model that assumes that people go through various

stages before forming an intention and then deciding to execute and maintain an action.

Unlike other social cognition models (e.g., the theory of reasoned action or the theory of

planned behavior), the HAPA aims to bridge the intention-behavior gap (Abraham &

Sheeran, 2000). The intention-behavior gap is a common phenomenon where people do not

behave in line with their intentions (e.g., "I want to use a PST app"). The HAPA considers

various factors that translate intentions into action by describing behavior change as a two-

step process consisting of a motivational and a volitional phase (Schwarzer, 2008, 2015,

2016).

The motivational phase includes the goal setting process. A person shapes their

intention either to avoid risk behaviors or to adopt a new healthy action such as the mental

training technique of progressive muscle relaxation. The constructs of risk perception,

outcome expectation, and action self-efficacy are considered crucial in this process, as seen in

Figure 6 (Schwarzer, 2008, 2015, 2016).

Figure 6

Health Action Process Approach (adapted from Schwarzer, 2008, 2015, 2016)
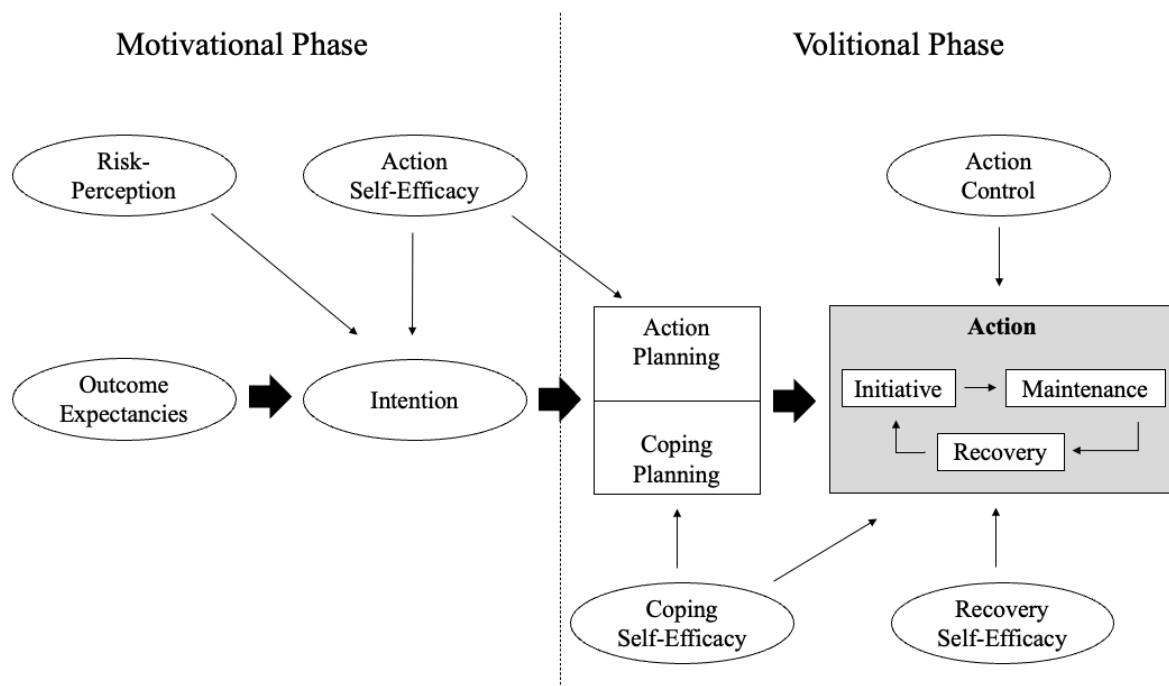
After an intention is formed, the volitional phase begins. The volitional phase includes the goal-pursuing process, in which a person translates the intention into action. This action then must be maintained and recovered if the person temporarily abandons the action. The constructs of coping and recovery self-efficacy, action and coping planning, and action control are crucial in this process (Schwarzer, 2008, 2015, 2016). The constructs involved in the HAPA are described and discussed below in the context of optimal user engagement with app-based blended PST.

4.4 Intention

Intention encompasses the direction and intensity of a person's motivation toward a target action (Fishbein & Ajzen, 1975). An intention is an indispensable predictor for subsequent action and can be seen as the "watershed" between initial goal setting and a subsequent goal pursuit phase (Schwarzer, 2008, 2015, 2016). Thus, an app-based blended

PST intervention must foster an intention toward PST, for example, via the risk perception construct.

4.5 Risk Perception

Risk perception includes the perceived quality and quantity of an individual's susceptibility to a health threat (Renner & Schupp, 2011; Schwarzer, 2008, 2015, 2016). Notably, the accuracy of people´s perceptions can be distorted. For example, people tend to judge their susceptibility to a disease as less than the susceptibility others have to a disease, known as the "optimistic bias" (Weinstein, 1987).

App-based blended PST interventions can communicate the threat of a mental illness to facilitate development of the intention to use PST as a preventive action (Giga et al., 2003; Purcell et al., 2019; van der Klink et al., 2007). Mental illness is a highly complex construct, and the various theoretical perspectives and methodological approaches make it difficult to state precise data about susceptibility (Heckers, 2015; Lundqvist & Andersson, 2021). In Germany, data revealed that more than one in four adults meet the criteria for a mental illness in any given year (Deutsche Gesellschaft für Psychiatrie und Psychotherapie, Psychosomatik und Nervenheilkunde e.V., 2022). Mental illnesses can lead to suicide, which is the fourth leading cause of death among the 15–19-year-old age group (World Health Organization, 2021), the target of this thesis's sports-focused app-based PSTs (Study 1 – 4).

In general, studies suggested that the prevalence of mental illnesses in athletes is comparable with levels found in nonathlete populations (Gorczynski et al., 2019; Rice et al., 2016). Health insurance reports stated that mental ill-health[1] is the second most common reason for sick leave in Germany (Allgemeine Ortskrankenkasse, 2021). Moreover,

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[1] We use the term mental ill-health to summarize mental illness and mental health issues.

Brenscheidt et al. (2017) estimated that mental ill-health causes a loss of 16.8 billion euros in gross value added and 9.5 billion euros in lost productivity.

Despite this alarming data, the utilized PST interventions did not use risk communication. The author suggests that this also should play a minor role in designing future PST interventions. Because results indicated that persuasive communication must allow individuals to draw on their individual resources to control health threats rather than focusing on the susceptibility to a health threat (Schwarzer, 2008, 2015, 2016), and the direct path from risk perception to intention is negligible if outcome expectancies are already well established (Schwarzer, 2008, 2015, 2016).

4.6 Outcome Expectancies

Outcome expectancies are influential beliefs behind the motivation to change (Bandura, 1997) that relate to the contingencies for social, physical, and psychological outcomes (Schwarzer, 2008, 2015, 2016). For example, one positive outcome expectancy is "If I use the PST app, then I will improve my self-confidence," and a negative outcome expectancy is "If I use the PST app, then others will think that I´m weak." Positive and negative outcome expectancies are essential in the phase when a person forms an intention by balancing the pros and cons of specific action outcomes.

4.6.1 Positive Outcome Expectancies

The researchers of the studies for this thesis fostered positive outcome expectancies by stating scientific facts. With sports-focused studies, they also used well-known external role models (e.g., Koby Bryant) as practical examples who presented the contingencies for PST outcomes. Qualitative feedback from Study 1 indicated that this was well-received, supporting Gatzmaga et al.'s approach (2020) where mental techniques are presented by

other athletes and the sports psychologist provides the scientific framework. This approach might also be worth utilizing within apps in the future.

Study 1 revealed that participants wanted picture and video content, so the mindfulness app headspace employs a promising approach. Headspace offers the category "Performance Mindset," which contains mindfulness techniques to improve skills focus, self-confidence, resilience, and pressure management (NBA Communications, 2019). Each skill is framed by pictures and a video interview with a basketball player sharing their personal experiences in building that skill and the outcome it has had on their performance. This approach could also be transferred into business with relevant role models.

Diagnostic individualization could further clarify the link between PST and positive outcomes. As in Study 2, a more complex initial diagnosis within the app using the measures of the outcome evaluations could help users develop personalized outcome expectancies, such as "I have competition anxiety, and the PST app can help me to deal with that." If diagnosis is performed in regular intervals, users can see their progress through PST, which consolidates this PST-outcome link (de Korte et al., 2018). The author suggests a time interval of 5 – 8 weeks, derived from the duration of well-established and systematic mindfulness interventions (Jekauc et al., 2017; Kaufman et al., 2017; Vonderlin et al., 2020).

4.6.2 Negative Outcome Expectancies

Individuals equate PST with clinical psychology interventions (Gee, 2010; Van Raalte et al., 1993), stigmatizing PST the same way clinical psychology services have been stigmatized (Corrigan, 2004). Thus, regardless of the context, stigmatization is a likely negative PST outcome expectancy (Clement et al., 2015; Greenwood & Anas, 2021; Gulliver et al., 2012; Hanisch et al., 2016; Moreland et al., 2018). Stigmatization can be defined as a process where a socially driven label (e.g., "not normal") leads to stereotyping, separation, status loss, and discrimination (Chow et al., 2020; Link & Phelan, 2001; Smith, 2007). For

example, a soccer player might anticipate being labeled "mentally weak" if they use a PST

app, a label which in turn could fosters a coach's doubts about performance ability and lead

to loss of playing time (Chow et al., 2020; DeLenardo & Terrion, 2014). Since coaches

believe that sports psychology is only for "problematic" athletes, such an anticipation seems

justified (Gee, 2010; Pain & Harwood, 2004; Ravizza, 1988).

In both sports and business, a crucial method for decreasing stigma is to improve PST

knowledge and literacy (Chow et al., 2020; Gee, 2010; Gray et al., 2020; Hanisch et al.,

2016; Pain & Harwood, 2004; Szeto et al., 2019a, 2019b). This can be achieved by

embedding PST in a general information campaign. Such a campaign should consider the

PST target group and the actors of the social-cultural context, such as coaches in a sport or

leading managers in a company context (Brustad & Ritter-Taylor, 1997; Vealey, 2007). The

campaign should define PST as enhancing performance and well-being (Vealey, 2007;

Weinberg & Gould, 2019) to reduce the stigma that it is only for those who have mental

health issues (Gee, 2010; Pain & Harwood, 2004; Ravizza, 1988). While PST can

preventively reduce the probability of mental illness (Giga et al., 2003; Purcell et al., 2019;

van der Klink et al., 2007), PST in sports and business is not a sufficient mental illness

treatment.

Although the goals of PST contrast those of clinical psychology, mental health and

mental illness should not be presented as distinct constructs because several results indicate

that visualization of a mental ill-health continuum reduces stigmatization (for a review, see

Peter et al., 2021). The continuum concept assumes one dimension ranging from severe

psychiatric symptoms to subclinical, light, or positive "symptoms." For example, anxiety can

range from an extreme disorder to a performance-increasing arousal level. Since every person

experiences anxiety at some point during their life, people in either of these situations can be

seen as having similar experiences of differing intensity, both of them thus remaining

"someone like us." Such a promoted feeling of "us" can reduce the stigma against mental illness, which makes it easier for everyone, no matter where they are on the continuum, to seek appropriate help (Peter et al., 2021).

4.7 Planning

Intentions are more likely to become behaviors when individuals create detailed plans in advance of striving for their goal (Schwarzer, 2008, 2015, 2016). To further develop the construct planning, a distinction is made between action planning and coping planning.

4.7.1 Action Planning

An action plan specifies when, where, and how one wants to pursue their goal (Gollwitzer, 1999; Sheeran et al., 2005): "On Wednesdays at 5 p.m., I will pack my sports stuff for the training, and then I will use the PST app for 5 minutes." The concrete time details and the presence of a situational cue (packing) can trigger the planned action (Gollwitzer & Sheeran, 2006).

Qualitative feedback from Study 1 and Study 3 indicate that athletes have less time for PST during the day. Thus, daily training in all studies might have represented an unrealistic and unattractive goal that promoted negative outcome experiences (e.g., "If I train with the PST app, I have less time for physical training."). Moreover, when a moderation analysis was executed in Study 1 and Study 5, the results revealed that user engagement with the respective PST app did not moderate the founded outcome effects. Thus, app-based blended PST might ideally allow for an individualized action plan. Users could specify their number of training sessions per week (1 to 7 days) and the duration of one session (5 to 30 minutes) and combine this with situational cues. Then, they could set individualized push notifications to remind them to train at specific times.

4.7.2 Coping Planning

Action plans face uncertainty that might prevent the user from executing their plan. This could be a loud atmosphere when listening to an audio-guided mental technique, an unexpected illness, or another such event. Coping planning accounts for such barriers by generating alternative plans for adopting and maintaining the new action (Kwasnicka et al., 2013; Schwarzer, 2008, 2015, 2016). Users imagine vivid scenarios that could prevent them from executing their intended actions. Then, they create one or more coping plans in a hierarchically structured way. Coping plans can employ a new target action (e.g., progressive muscle relaxation instead of autogenic training) or a new time (e.g., Monday instead of Wednesday). For example, a user could state, "If on Wednesdays at 5 p.m. my neighbor has drum lessons, then I will use headphones to execute the mental training technique; however, if my sister needs my headphones, then I will reschedule my mental training to 9 p.m." Such coping planning could be easily added to action planning within app-based blended PST.

4.8 Self-Efficacy

Perceived self-efficacy refers to a person's belief in their ability to successfully organize and execute actions required to attain certain goals (Bandura, 1997). The results of Study 1 revealed app users had significantly higher levels of self-efficacy compared to nonusers in the pretest. This supports the assumption that self-efficacy is an important construct to overcome the intention-behavior gap (Schwarzer, 2008, 2015, 2016). During the HAPA, different tasks must be mastered, and thus three types of self-efficacy are differentiated: action, coping, and recovery (Figure 6; Schwarzer, 2008, 2015, 2016). Action self-efficacy, also called task self-efficacy or preaction self-efficacy represents a person's optimistic beliefs about their ability to initiate a new action while still developing motivation to do so. Coping self-efficacy, also called maintenance self-efficacy, addresses a person's

optimistic beliefs about their ability to maintain the new action and cope with barriers during execution. Recovery self-efficacy describes a person's optimistic beliefs about their ability to return to an activity after being derailed (Schwarzer, 2008, 2015, 2016).

A person might be confident in their general ability to start using a PST app (i.e., high action self-efficacy) but not confident about maintaining usage long-term (i.e., low coping self-efficacy) or about resuming PST app use after a setback (i.e., low recovery self-efficacy). Although the HAPA is a stage model, it does contain several relevant reciprocal interactions (Schwarzer, 2008, 2015, 2016). For example, coping self-efficacy influences an action directly, which in turn affects future self-efficacy in terms of past performance.

4.8.1 Past Performance

Past performance that led to success is the most powerful way to build self-efficacy (Bandura, 1997; Lunenberg, 2011; Short & Ross-Stewart, 2009). Deriving from what the research has demonstrated, an app-based PST intervention should be customized so that users experience success, perceive their success as success, and attribute their success to their own action (Feltz et al., 2008; Maddux & Lewis, 1995; Short & Ross-Stewart, 2009).

In Study 1, Study 2, and Study 5, no mental technique was performed together within the workshops. In Study 3 and Study 4, one technique was executed using an audio file without the app. To promote action self-efficacy, it might be helpful for all participants to set up the app within the first workshop and perform an exercise using headphones to experience an early success. This procedure would also allow users to perform app-based planning components, thus strengthening action and coping self-efficacy (Bandura, 1997; Feltz et al., 2008; Short & Ross-Stewart, 2009).

Gamification approaches could also be applied to the app to better reveal successes as successes (Van Deutekom & Lewandowski, 2021). To promote each type of self-efficacy, medals and trophies could be awarded for completing the first exercise, for sticking to a

training schedule, and for returning after a long break. Moreover, visualization of training time statistics combined with individual diagnosis at regular intervals could help the user attribute successes to past performed mental techniques (Sardi et al., 2017).

4.8.2 Phase-Specific Support

If the responsible psychologist has access to training time statistics, for example, via a dashboard that fits current data protection guidelines; then the psychologist could surmise in which HAPA phase a person is and tailor their analog support to phase-specific needs (Schwarzer, 2008, 2015, 2016). For example, a person who has never used the app should be motivated through outcome expectations, psycho-educated in app use, and targeted with action planning components to foster action self-efficacy (Feltz et al., 2008; Short & Ross-Stewart, 2009). A person who has not used the app for an extended time could be targeted with solution-oriented coaching techniques to develop a recovery plan and enhance recovery self-efficacy. A person who uses the app regularly should be guided to attribute their success to their actions, rather than external circumstances, for example, via coaching techniques such as reframing (Cropley et al., 2007; Høigaard & Johansen, 2004; Ruchti et al., 2020).

4.8.3 Vicarious Experience

Identifying individuals who have used the app consistently or have started using it again after a lapse can provide vicarious experiences. Vicarious experiences influence self-efficacy beliefs by transferring competencies from a model in terms such as "If they can do it, so can I" (Bandura 1997; Feltz, 1994). The model must be perceived as similar in age, sex, status, or competence (Bandura 1997; Short & Ross-Stewart, 2009). For example, an athlete of a soccer team who recovers their app use could present their experiences to their teammates to increase recovery self-efficacy. Similarly, in the motivational phase, role models used on the app should have specific similarity components to the user as extracted

from personal information. If the role model is perceived as an unrealistic upward comparison, self-efficacy beliefs could deteriorate instead (Short & Ross-Stewart, 2009).

4.8.4 Feedback

Feedback is another aspect that can improve self-efficacy (Bandura, 1997; Feltz et al., 2008). Feedback describes gathered information regarding some aspects of a person's task performance (Kluger & DeNisi, 1996). Some points already mentioned in this thesis could also be summarized under feedback. For example, an individual diagnostic could be seen as outcome feedback, whereas training time tracking could provide process feedback (Short & Ross-Stewart, 2009). Another variant of process feedback could be the quality of mental training execution. Quality of mental technique execution is likely crucial for possible PST effects. A PST app user will not cultivate mindfulness if they simply run the app without listening or if they fall asleep during practice. However, research about PST quality is limited in its perspective as it mainly focuses on mindfulness (e.g., Goldberg et al., 2020). One related feedback measure is the Practice Quality-Mindfulness Questionnaire (Del Re et al., 2013). Relaxation technique quality could also be assessed via biofeedback methods, such as heart rate monitoring (Blumenstein et al., 1995, 2002). These types of feedback could inform the user about short-term progress and affect maintenance self-efficacy (Bandura, 1997; Feltz et al., 2008).

Another potentially helpful type of feedback for self-efficacy is positive normative feedback (Pfeifer et al., 2020). Normative feedback provides information on a person's performance compared to others (Hartwell & Campion, 2016). An example of positive normative feedback is "Your PST app training time is above the average training time of your team." Several studies indicated that positive normative feedback – even when it is false feedback – facilitates self-efficacy, whereas negative normative feedback deteriorates self-efficacy (Brown et al., 2012; Dahling & Ruppel, 2016; Eden & Zuk, 1995; Pfeifer et al.,

2020; Weinberg et al., 1979). The qualitative results of Study 3 suggested that normative feedback could increase user engagement. However, this result should be interpreted cautiously because the related survey question was stated as "How would you feel and how would you react if the app showed you that the other players in the team train more or less than you on average?", not distinguishing between positive and negative normative feedback. False-positive feedback is not recommended, as any discovery of the deception will harm the psychologist-client relationship (Bandura, 1997; Dunn & Holt, 2003; Lambert & Barley, 2001; Petitpas et al., 1999; Richards & Simpson, 2015).

4.9 Action

PST-related actions themselves can be divided into initiation, maintenance, and recovery actions (Schwarzer, 2008, 2015, 2016). Initiation describes a newly adopted action. Maintenance stands for the continuous and sustainable execution of an action. Recovery is the process where a setback is managed and an action that was stopped for a short time is executed again (Schwarzer, 2008, 2015, 2016). The discussed studies did not differentiate between initiation, maintenance, and recovery actions, only collecting users' exercise time (mm:ss) and click rates over the intervention period. Future research should define user engagement more broadly and examine the extent to which specific intervention components affect initiation, maintenance, and recovery.

4.10 Action Control

While planning is useful before action execution, action control describes a self-regulatory strategy where ongoing behavior is continuously tracked and evaluated (Schwarzer, 2008, 2015, 2016). Action control contains awareness of standards (e.g., "I'm

aware of my PST schedule") and self-monitoring (e.g., "I consistently track and assess the mental techniques I have performed").

Study 2 particularly indicated how app features could facilitate action control. Users reported how they liked the performed technique using a 5-step Likert scale ranging from *very bad* to *very good*. However, it might be worthwhile if users could also respond to the question "How do you feel regarding your PST goal?" before and after performing a mental technique. If a user, for example, has low recovery levels and sets a goal to increase these levels, a PST app could recommend progressive muscle relaxation (Jacobson, 2006). If the user responds negatively after executing the technique, the app could then replace progressive muscle relaxation with autogenic training (Schultz et al., 2010).

In the long term, these data can be used to reduce techniques that do not suit the user. For example, if a user has a high level of competition anxiety, a PST app could offer them the imagination "Image of Calm" and the self-talk "Relaxation Mantra," as seen in Study 1. These exercises could be randomly selected for an initial user. However, if the user has already used the app and has rated self-talk techniques poorly and imagination techniques very good, these data could be used, and the app would offer the user the imagination "Image of Calm."

User-skill-technique-time interactions should also be considered. Just because a technique is not ideal for a user in developing a specific skill at a certain point in time, this does not mean that this technique is always unideal for that specific skill development. Moreover, it does not imply that this technique is not suitable for other skills development, even though the correlation should be increased. From time to time, the app should disregard previous data and again randomly offer a possible technique.

4.11 Outlook

In the previous sections, the author recommended several measures, such as app features and analog support components, rooted in the HAPA to enable optimal PST app usage. Future research should use RCTs to analyze which measures and which combination of measures lead to optimal usage and PST outcomes. These results should be used to establish guidelines for app development and the holistic implementation of PSTs. To achieve this, app developers and (sport) psychologists should collaborate when developing PST apps. Possible PST implementation guidelines should be flexible and provide hints so that the sports psychologist can adapt the app to the context and individual needs of the users.

Future research is necessary to determine which psychological skills can be trained particularly well or bad with an app. For example, Study 1 and Study 3 indicated that the skill attention could be an effective target for app-based blended PST, and Study 4 that app-based blended LKM is unsuitable for fostering team cohesion.

In the future, apps could also be connected with other technologies, such as virtual reality glasses (Bedir & Erhan, 2021). Virtual reality glasses can fool the human brain's predictive coding mechanism and give a real sense of presence in a virtual space and/or body (Riva et al., 2019). For example, the first promising result indicated that virtual reality–based imagery is more efficient in terms of shot performance (curling, bowling, archery) and imagery skills than visual motor behavior rehearsal combined with video modeling (Bedir & Erhan, 2021). Results from the clinical psychology project "EMMA" supports the potential benefit (Baños et al., 2008). In EMMA's world, a traumatized person can enter many different places and situations with the goal of confronting fearful aspects of the trauma and acquiring adaptive regulatory strategies with the support of the therapist. This basic idea from the psychotherapeutic field could also be applied to the practice of sport psychology. Thus, athletes could go through virtual realities, not only critical game situations but also positively

occupied places and situations, which allow them, for example, to achieve the psychological qualities of the IZOF.

It is important that a sports psychology app provide privacy policies transparently, and sport psychologists must be competent in using apps to ensure compliance with these privacy policies (Watson II et al., 2017). Given the rapid pace of technological and legal changes, this may soon be a challenge. Mandatory continuing education and certificates for sport psychologists could be a quality assurance measure here.

5 General Conclusion

The studies of this cumulative dissertation employed different app-based blended PSTs within the context of sports and business. The process results revealed that app user engagement is a perennial challenge with low (Studies 1–4) to moderate (Study 5) usage. Thus, the general discussion offers several measures, such as app features and analog support components, rooted in the HAPA to enable optimal PST app usage. This includes video content, diagnostic individualization and decreasing stigma of PST to address outcome expectations. Moreover, individualized action and coping plans could be helpful to foster app usage. Perceived self-efficacy could be fostered by past performance, gamification approaches, phase-specific support, vicarious experiences, and feedback mechanisms. Moreover, data about user-skill-technique-time interactions could help the user to find suitable techniques. Future research should use RCTs to analyze and evaluate which combination of measures is most effective in increasing the effectiveness of app-based blended PST.

6 Deutsche Zusammenfassung

Sportpsychologisches oder mentales Training (MT; im englischen bekannt unter psychological skills training; kurz: PST) beschreibt das systematische und regelmäßige Training zur Entwicklung psychologischer Fertigkeiten mit dem Ziel die Leistungsfähigkeit und/oder das Wohlbefinden zu fördern (Vealey, 2007; Weinberg & Gould, 2019). In der Literatur wird zwischen psychologischen Qualitäten, psychologischen Fertigkeiten und psychologischen Techniken unterschieden (z. B. Holland et al., 2010, Zakrajsek & Blanton, 2017).

Psychologische Qualitäten sind Merkmale oder Eigenschaften, die Individuen in unterschiedlichem Ausmaß erleben (z. B. hohes oder niedriges Selbstvertrauen). Psychologische Fertigkeiten sind die Fähigkeiten einer Person, psychologische Qualitäten zu regulieren (z. B. ein hohes Selbstvertrauen aufrechterhalten). Eine psychologische Fertigkeit kann die Anwendung und Ausführung einer anderen Fertigkeit begünstigen bzw. unterstützen und kann in mehrere Fertigkeiten unterteilt werden. Beispielsweise kann die Fertigkeit Emotionsregulierung als eine Interaktionssequenz mehrerer anderer Fertigkeiten betrachtet werden. Dies beginnt mit der Fertigkeit der emotionalen Wahrnehmung und endet mit der Fertigkeit, einen emotionalen Zustand zu akzeptieren oder zu verändern (siehe Studie 5; Berking & Whitley, 2014).

Psychologische Techniken sind die Verfahren, die Personen einsetzen, um psychologische Fertigkeiten zu entwickeln (z. B. Selbstgespräche). Eine einzelne psychologische Technik kann verschiedene psychologische Fertigkeiten fördern, je nach Inhalt oder Anwendung der Technik. So kann beispielsweise die Imagination je nach Inhalt das Selbstvertrauen oder die Entspannung verbessern. Gleichzeitig können auch verschiedene psychologische Techniken angewandt werden, um dieselbe psychologische Fertigkeit zu erreichen. Zum Beispiel kann die Progressive Muskelentspannung (PMR) oder das Autogene

Training eingesetzt werden, um Stress zu reduzieren und Entspannung zu fördern (Kellmann et al., 2018; Vealey, 2007).

Die Verbindung von Sport und Wirtschaft

Sportpsychologinnen und Sportpsychologen führen PST Interventionen nicht nur im Kontext des Sports durch, sondern auch im Kontext der Wirtschaft, da die handelnden Personen in den beiden Kontexten ähnliche Fertigkeiten beherrschen sollten, um entsprechende Herausforderungen bewältigen zu können (Bar-Eli, 2018; Fletcher, 2010; Foster, 2002; Gordon, 2007; Jones, 2002; Lloyd & Foster, 2006; Hays, & Brown, 2004). Nach Jones (2002) sollten sich Leistungssportler:innen und Führungspersonen in der Wirtschaft gleichermaßen mit fünf psychologischen Fertigkeiten auseinandersetzen: Emotionsregulation, Führungs-, Team- (z. B. Kohäsion), Kommunikations- (z. B. Einzelcoaching) und Problemlösungsfähigkeit (z. B. im Umgang mit organisatorischen Problemen). Foster (2002), Gordon (2007) und Lloyd und Foster (2006) diskutieren darüber hinaus fünf psychologische Techniken, die sich nachweislich wirksam vom Sport auf die Wirtschaft übertragen lassen: Imagination, Routinen, Selbstgespräche, Entspannungstechniken und Techniken zur Aufmerksamkeitssteuerung.

In dieser Dissertation werden Achtsamkeits- und (Selbst-)Mitgefühlstechniken im Sport und in der Wirtschaft angewendet. Die kumulative Arbeit umfasst vier Studien, in denen Achtsamkeitsübungen eingesetzt wurden. In den sportbezogenen Studie 1 und Studie 3 verwendeten die Forschenden Achtsamkeitstechniken wie die Objektmeditation und erfassten die Aufmerksamkeit vor und nach der Intervention von Fußballspielern. In der sportbezogenen Studie 2 wurde ein systematischer Achtsamkeitskurs, bestehend aus verschiedenen Achtsamkeitstechniken (z.B. Body Scan) vorgestellt. Der Kurs zielte darauf ab die Aufmerksamkeit und Emotionsregulation zu verbessern. In ähnlicher Weise wurden in

der wirtschaftsbezogenen Studie 5 Achtsamkeitstechniken (z.B. Atemübungen) innerhalb eines sequentiellen Emotionsregulationstrainings beschrieben.

Obwohl Mitgefühl und Selbstmitgefühl nicht signifikant miteinander verbunden sind (López et al., 2018), können beide Konstrukte durch die Liebende-Güte-Meditation (LKM) kultiviert werden (Engel et al., 2021; Hutcherson et al., 2008; Weibel et al., 2016; Weng et al., 2013). Die LKM wurde in dieser Arbeit in der sportbezogenen Studie 4 und der wirtschaftsbezogenen Studie 5 eingesetzt. In Studie 4 evaluierten die Forscherinnen und Forscher, ob eine LKM-basierte Intervention das Mitgefühl den Teamzusammenhalt und die Fairness von Fußballspielern beeinflusst. Die wirtschaftsbezogene Studie 5 befasste sich mit der LKM im Kontext der Emotionsregulation. Die LKM sollte in diesem Zusammenhang das Selbstmitgefühl fördern, um die Anwendung von möglicherweise kurzfristigen aversiven Emotionsregulationsstrategien zu ermöglichen und langfristig eine gesunde und konstruktive Emotionsregulation gewährleisten.

App-basierte blended Interventionen

Die meisten PST-Interventionen wurden von Psycholog:innen Face-to-Face durchgeführt (Richardson et al., 2008; Vealey, 2007). Face-to-Face PSTs sind jedoch räumlich und zeitlich unflexibel und mit hohen Kosten verbunden (Gulliver et al., 2012; Moreland et al., 2018). Apps können helfen diese Nachteile zu reduzieren. Apps können einerseits PST Interventionen komplett digitalisieren (z. B. Bostock et al., 2019; Rist & Pearce, 2017) oder mit analogen Komponenten und persönlichem Kontakt kombiniert werden (z. B. Cogan, 2019; Kersemaekers et al., 2018). Eine solche Kombination wird als „blended" bezeichnet. Ong et al. (2015) und Fitzpatrick et al. (2018) stellen potenzielle Vorteile von App-basierten blended Interventionen im Vergleich zu rein analogen Interventionen dar: Niedrigere Kosten, geringere zeitliche Einschränkungen für Psychologinnen und

Psychologen, die Wartezeit zwischen dem ersten Face-to-Face-Kontakt und der anschließenden fortlaufenden Unterstützung wird minimiert und die Klientinnen und Klienten können räumlich und zeitlich die Techniken selbstbestimmt üben.

Eigenständige bzw. komplett digitalisierte App-basierte PSTs leiden hingegen unter niedrigen Nutzungsraten. Weber et al. (2019) berichten, dass nur 137 von 347 Teilnehmenden die Studien-App nutzen. Bostock et al. (2019) fanden heraus, dass die Versuchspersonen innerhalb eines 8-wöchigen Interventionszeitraums im Durchschnitt nur 20.75 Minuten pro Woche trainierten. Kersemaekers et al. (2018) führten dagegen ein blended PST durch, das eine audiogeführte Achtsamkeits-App mit Workshops kombinierte, und erzielten damit eine höhere Nutzungsrate als Bostock et al. (2019). Während der 10 Wochen gaben die Teilnehmenden an, 45.70 Minuten pro Woche zu trainieren. Dieses Ergebnis könnte jedoch auf methodische Mängel zurückzuführen sein, da es aus Selbstberichten abgeleitet wurde und nur 269 von 425 Personen ihre Trainingszeit angaben.

Komplett digitalisierte App-basierte PSTs fokussieren sich insbesondere auf audiogeführte Techniken ohne persönlichen Kontakt, wodurch keine Beziehung zwischen Nutzer:in und Psychologin oder Psychologe entstehen kann. Unabhängig von den genutzten Techniken ist aber die Beziehung zwischen Psychologin oder Psychologe und Klient:in entscheidend für positive PST-Ergebnisse (Dunn & Holt, 2003; Lambert & Barley, 2001; Petitpas et al., 1999; Richards & Simpson, 2015). Eine solche (therapeutische) Beziehung ist gekennzeichnet durch Mitgefühl, Wärme und durch Möglichkeiten für die Klientinnen und Klienten, sich auszudrücken (Lloyd & Trudel, 1999; Tod & Andersen, 2005).

Studien

In den Studien in dieser Arbeit wurden neu entwickelte App-basierte blended PST-Interventionen im Sport- und Wirtschaftskontext eingesetzt. Alle Studien enthalten eine

Ergebnis- und eine Prozessevaluation. Ziel dieser Studien ist es den Inhalt verschiedener PST-Apps und ihre Kombination mit Workshops zu beschreiben. Im Zuge der Ergebnisevaluation wurden Fertigkeiten vor und nach den Interventionen gemessen und diskutiert. Durch die Prozessevaluationen sollte die Nutzungsrate mit PST-Apps in realen Situationen erfasst und praktische Vorschläge für die zukünftige App-Entwicklung und Implementierung abgeleitet werden.

Studie 1 beschreibt den Inhalt und die Umsetzung einer App-basierten blended PST Intervention mit einer Gruppe von Sportlern in einem Fußball Nachwuchsleistungszentrum. In einem Prä-Post-Design erfassten die Autorin und die Autoren Aufmerksamkeit, Wettkampfangst, Erholung, Stress und Selbstwirksamkeit. Es zeigte sich eine signifikante Verbesserung von Aufmerksamkeit, Selbstwirksamkeit und Erholung. Allerdings zeigten die Athleten nach der Intervention keine Unterschiede in Bezug auf Wettkampfangst und Stress. Die Trainingszeit mit der App war über neun Wochen kurz und moderierte die Effekte der Intervention nicht. Ein Vergleich zwischen aktiven Nutzern und Nichtnutzern legt nahe, dass die Workshops für die Intervention wichtiger sind als die App. Die qualitativen Rückmeldungen der Athleten empfehlen, dass die App um Motivationsfunktionen erweitert werden sollte.

Studie 2 stellt einen Überblick und eine Evaluation der App-basierten blended PST Intervention der deutschen männlichen U19-Handballnationalmannschaft vor und während der Weltmeisterschaft 2019 in Mazedonien dar. Die Intervention bestand aus einem dreistündigen psychoedukativen Face-to-Face-Workshop, einer App und einer begleitenden E-Mail-Kampagne. Die Funktionen der App ermöglichten eine Datenerhebung und anschließende Individualisierung der PST Intervention durch die betreuenden Personen, was jedoch aufgrund zu geringer Nutzung nicht realisiert werden konnte. Die Athleten füllten zu zwei Messzeitpunkten Fragebögen zu Emotionsregulation, Wettkampfangst, Erholung, Stress

und Selbstwirksamkeit aus. Die Variablen wiesen keine signifikanten Veränderungen zwischen den Messzeitpunkten auf. Die Prozessevaluation zeigt, dass die Trainingszeit mit der App gering war. Für die Zukunft empfehlen die Autorin und die Autoren, die Nutzung von Apps mit einem ausreichenden persönlichen Kontakt zu den Sportlerinnen und Sportlern zu verbinden.

Studie 3 beschreibt und evaluiert die Implementierung einer App-basierten blended Achtsamkeitsintervention in einem Fußball Nachwuchsleistungszentrum mit dem Ziel die Aufmerksamkeit von Jugendtorhütern zu verbessern. Eine Achtsamkeits-App wurde mit sechs Gruppenworkshops kombiniert. Ursprünglich war die Intervention mit sechs Face-to-Face-Workshops geplant. Durch Kontaktbeschränkungen infolge der COVID-19 Pandemie wurde nur der erste Workshop face-to-face durchgeführt, während die anderen fünf Workshops digital abgehalten wurden. Die Studienergebnisse deuten auf eine Verbesserung der Aufmerksamkeit der Torhüter durch die Intervention hin. Die erhobene Trainingszeit mit der App war gering, aber die Athleten berichteten, dass sie die Achtsamkeitsübungen oft ohne die audiogeführten Anleitungen der App durchführten. Die Autoren schildern, dass die Online-Workshops im Vergleich zu den Präsenzworkshops keine entscheidenden Nachteile aufwiesen.

Studie 4 verwendete ein quasi-experimentelles Design, bei dem die Experimentalgruppe eine LKM über einen persönlichen Workshop und über eine App praktizierte, während die aktive Kontrollgruppe die PMR praktizierte. Die Gruppen absolvierten einen Prä- und Posttest zur Messung von Mitgefühl, Fairness und Teamkohäsion. Gegensätzlich der Hypothese von der Autorin und Autoren gab es keine Interaktionseffekte. Die LKM-Gruppe zeigte nach der Intervention keine höheren Level in den Bereichen Kohäsion, Fairness und Mitgefühl als die Kontrollgruppe. Aus dem Vergleich der Trainingszeiten und der Bewertungen der Nutzer:innen zwischen LKM und PMR wurde

der Schluss gezogen, dass LKM von der Studienteilnehmenden ebenso akzeptiert wurde wie die PMR. Es erscheint lohnenswert die LKM zur Entwicklung anderer Fertigkeiten zu untersuchen. Dabei sollten zukünftige LKM-Interventionen mit umfangreichen Interaktionsanteilen und unter Berücksichtigung spezifischer Person-zu-Kontext-Interaktionen durchgeführt werden.

Studie 5 stellt ein App-basiertes blended Emotionsregulationstraining vor, das bei einer deutschen Krankenkasse evaluiert wurde. Das Training dauert acht Wochen und kombinierte eine App mit drei Face-to-Face-Workshops. Die Experimental- und die Kontrollgruppe füllten vor und nach dem Training verschiedene Fragebögen aus, die Stress, Achtsamkeit, Selbstmitgefühl, Wohlbefinden und Emotionsregulation erfassten. Das Training verbesserte die Emotionsregulation, die Achtsamkeit, das Selbstmitgefühl und verminderte den Stress. Die Variable Wohlbefinden wurde jedoch nicht beeinflusst. Die Trainingszeit der Nutzer mit der App war moderat.

Diskussion

Die fünf vorgestellten Studien stellen neue App-basierte blended PST Interventionen vor. Die Studien im Kontext des Sports markieren zudem den Beginn der App-basierten PST-Forschung im Sport. Studie 1 beschreibt die erste Anwendung einer auf den Sport zugeschnittenen PST-App, die mit einer Analyse quantitativer und qualitativer Daten einherging. Studie 2 unterstreicht die Möglichkeit der Datenerhebung über Apps und der anschließenden Individualisierung eines PST (auch wenn die Funktionen nicht ausreichend genutzt wurden). Studie 3 zeigt auf, dass Workshops ohne Nachteile auch digital stattfinden können. Studie 4 ergänzte die PST-Sportliteratur um LKM. In der Wirtschafts-Studie 5 wurde ein neues App-basiertes Training zur Emotionsregulation entwickelt und evaluiert.

Alle Studien enthalten eine Ergebnis- und eine Prozessevaluation. Die Prozessevaluationen geben Aufschluss darüber, warum die jeweiligen PST-Apps genutzt oder nicht genutzt wurden, sodass die Forschenden praktische Vorschläge für die künftige Entwicklung und Implementierung von Apps ableiten konnten. Die Studien ziehen ihre Lehren aus dem besonderen Anwendungsfall und nicht aus dem Allgemeinen, einschließlich der theoretisch fundierten Reflexion der Forschenden, die persönlich an der Entwicklung der Intervention beteiligt waren. Die Schlussfolgerungen durch die Studienergebnisse sind auf Grund der kleinen Stichproben und dem Fehlen von randomisierten Kontrollstudien begrenzt. Die Diskussionen sollten daher als Interpretationsansätze verstanden werden, die die zukünftige Forschung bereichern sollen.

Die Trainingszeiten in den Studien sind gering (Sportstudien) bis moderat (Wirtschaftsstudie) und deuten darauf hin, dass ein regelmäßiges und nachhaltiges Training mit PST-Apps eine Herausforderung darstellt. Der Health Action Process Approach (HAPA) stellt eine Möglichkeit dar Maßnahmen abzuleiten, die eine optimale Trainingszeit mit PST Apps ermöglichen (Schwarzer, 2008, 2015, 2016).

Der HAPA berücksichtigt verschiedene Faktoren, die dazu beitragen, dass Personen Intentionen (z.B. „Ich will eine PST App nutzen") bilden und anschließend in Handlungen (Nutzung der PST App) umsetzen. Dieser Prozess besteht gemäß dem HAPA aus einer motivationalen und einer volitionalen Phase (Schwarzer, 2008, 2015, 2016).

Die motivationale Phase umfasst den Zielsetzungsprozess. Eine Person formuliert ihre Intention, entweder Risikoverhaltensweisen zu vermeiden oder eine neue gesunde Handlung zu beginnen. Dieser Prozess wird durch die Konstrukte Risikowahrnehmung und Ergebniserwartung beeinflusst (Schwarzer, 2008, 2015, 2016). Innerhalb von App-basierten PST-Interventionen könnten die Risikowahrnehmung und Ergebniserwartung beispielsweise

über Videoinhalte, eine individuelle Diagnostik und die Verringerung der Stigmatisierung von PST beeinflusst werden, um so die Trainingszeit zu erhöhen.

Nachdem eine Intention gebildet wurde, beginnt die volitionale Phase. Die volitionale Phase umfasst den Zielverfolgungsprozess, bei dem eine Person die Absicht in eine Handlung umsetzt. Diese Handlung muss dann aufrechterhalten und gegebenenfalls wieder neu begonnen werden, wenn die Person die neue Verhaltensweise vorübergehend aufgibt. Das Konstrukt Planung beeinflusst diesen Prozess (Schwarzer, 2008, 2015, 2016). Zum Beispiel könnten individualisierte Handlungs- und Bewältigungspläne hilfreich sein, um die Nutzung mit PST-Apps zu fördern.

Die Selbstwirksamkeit beeinflusst sowohl die motivationale als auch die volitionale Phase. Innerhalb von App-basierten PST-Interventionen könnte die Selbstwirksamkeit positiv durch frühere Leistungen, Gamification-Ansätze, phasenspezifische Unterstützung, lebhafte Erfahrungen und Feedback-Mechanismen gefördert werden, um so die Trainingszeit zu fördern. Darüber hinaus könnten Nutzungsdaten helfen, geeignete Techniken für Nutzer:innen zu finden.

Ausblick

Zukünftige Untersuchungen sollten vier Gruppen umfassen: eine Kontrollgruppe, eine Gruppe, die nur die App nutzt, eine Gruppe, die nur den Workshop nutzt, und eine gemischte Gruppe. Ein solches Studiendesign könnte den Einfluss der verschiedenen Interventionskomponenten detailliert untersuchen und zeigen, welche Komponente in welchem Ausmaß zu den gefundenen Effekten beiträgt.

Diese Ergebnisse sollten genutzt werden, um Richtlinien für die App-Entwicklung und die ganzheitliche Implementierung von PSTs zu erstellen. Mögliche PST-

Implementierungsrichtlinien sollten flexibel sein und Hinweise geben, wie die App an den Kontext und die individuellen Bedürfnisse der Nutzer:innen angepasst werden kann.

Außerdem sollte zukünftige Forschung untersuchen, welche psychologischen Fertigkeiten mit einer App nicht oder besonders gut trainiert werden können. Studie 4 stellt zum Beispiel in Frage, ob Teamkohäsion mittels app-basierter LKM zu fördern ist. Studie 1 und Studie 3 deuten zum Beispiel darauf hin, dass die Aufmerksamkeit ein effektives Ziel für App-basiertes blended PST sein könnte.

Es ist außerdem unabdingbar, dass sportpsychologische Apps die Datenschutzrichtlinien transparent darstellen. Sportpsychologinnen und Sportpsychologen müssen bei der Nutzung von Apps kompetent sein, um die Einhaltung dieser Datenschutzrichtlinien zu gewährleisten (Watson II et al., 2017). Angesichts der raschen technologischen und rechtlichen Veränderungen könnte dies bald eine Herausforderung sein. Verpflichtende Fortbildungen und Zertifikate für Sportpsychologinnen und Sportpsychologen könnten hier eine Qualitätssicherungsmaßnahme sein.

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8 Declaration About Author Shares Within the Studies

The present doctoral thesis is a cumulative dissertation. It includes four peer-reviewed scientific articles published in national and international journals (three of them as the first author and one as the second author) and one scientific study protocol (as the first author). The publications and the study protocol were published in collaboration with the following co-authors (the current addresses have been removed for online publication.):

First Name	Last Name	Initials	Institution or Current Address
Oliver	Stoll	OS	
Melissa	Röcken	MR	
Simon	Borgmann	SB	
Henning	Thrien	HT	
Moritz	Konsemüller	MK	
Nils	Thomsen	NT	
Shu Ling	Tan	ST	
Christoph	Kittler	CK	
Darko	Jekauc	DJ	

My initials are LS. The contributions to the studies were as follows:

Study	Literature Research & Research Questions	Study & Intervention Design	Data Collection	Data Analysis	Discussion	First Version Manuscript
1	LS	LS	SB	LS, MR	LS	LS
2	LS	LS	LS, HT	LS, MR	LS	LS
3	CK, LS	CK, LS	CK	CK, LS	CK, LS	CK, LS
4	LS	LS	SB, NT	LS, MK, MR	LS, MK	LS, MK
5	LS	LS	LS	LS, MR	LS	LS

Oliver Stoll supervised all studies. The final version of the manuscript was prepared with the cooperation of all co-authors. All co-authors have agreed to the final version.

9 Eidesstattliche Erklärung

Ich erkläre hiermit wahrheitsgemäß, dass ich die vorliegende Dissertation selbstständig verfasst habe, keine anderen als die angegebenen Quellen und Hilfsmittel benutzt und die den genutzten Werken wörtlich oder inhaltlich entnommenen Stellen kenntlich gemacht habe. Die in dieser Dissertation inkludierten bereits veröffentlichten Studien, wie auch das Studienprotokoll sind in Zusammenarbeit mit den genannten Co-Autoren:innen entstanden, welche an der Studienplanung, -auswertung und Erstellung der entsprechenden Veröffentlichungen mitgewirkt haben. Des Weiteren habe ich diese Dissertation, eine in wesentlichen Teilen ähnliche oder eine andere Abhandlung nicht zuvor für eine staatliche oder andere wissenschaftliche Prüfung eingereicht. Außerdem habe ich zuvor nicht die gleiche Dissertation, eine in wesentlichen Teilen ähnliche oder eine andere Abhandlung bei einer anderen Hochschule als Dissertation eingereicht.

Berlin, den   28.11.2022

Unterschrift (Lukas Stenzel)