Supplementary Data: Impact of a mental training program for pediatric cancer patients after allogeneic hematopoietic stem cell transplantation or high-dose chemotherapy – results of a randomized controlled trial

Short title: Mental training after pediatric HSCT

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Psychooncological care and novel mental training

The patients of both the TG and the CG were offered the standard psychooncological care that includes social or psychological counseling with social workers, systemic therapists, or other professionals (e.g., art therapists). In addition, the patients of the TG received a novel and specifically developed mental training program consisting of 14 one-hour training sessions that include elements of sports psychology, resource activation, motivational training, and resilience enhancement. The training program focuses on the four major strategies: influencing anxiety, especially reducing recurrence anxiety, increasing motivation, clear goal orientation by stopping negative thoughts, increasing self-confidence, and making one's own decisions. In the first session, medical history and personal goals of the patient are assessed. In the following sessions, patients learn several techniques to strengthen their concentration, attentiveness, stress management and emotional control and -regulation. Negative and anxious thoughts and are analyzed and reframed, and personal abilities and strengths are explored. Then, the comprehensive concept of mental strength is introduced and linked to previously learned techniques through using a currently existing problem of the patients, for which an individual mental training cycle is established. The last sessions focus on motivation for further development and reflection on the progress patients made during the program. A short summary of each session is followed below.

*Session 1 – Medical history and personal goals*

The first session focusses on the distress screening of the patient, i.e. the assessment of the current psychological, somatic and social distress and their relevance in the context of the current social and medical circumstances, and the patients’ biographic development. After the anamnestic part of the session, the patient is asked to define future joint goals for the period after the successful therapy. These goals shall be visualized in form of a collage containing also a time frame and involved persons. The goals shall be separated into operational and process goals. The formulation and the pursuit of these goals form the basis for the upcoming mental training (Bücher, 2011; Caby & Caby, 2017; Storch, 2009; Eberspächer, 2012a; Eberspächer, 1993; Wendisch & Neher, 2003; Beckmann-Waldenmayer & Beckmann, 2012; Brand, 2010b; Engbert et al., 2011a; Heimsoeth, 2015h).

Session 2 – Concentration and attention.

During this session, the patient learns how to fade out the internal and external influences and how to absolutely focus on the current task and its realization. After giving brief instructions, the patient is requested to juggle during the session, but also to continue exercising at home. The most important part of juggling is the correct throwing technique, not the catching, i.e. the patient needs to focus on acting rather than reacting. By learning how to juggle, the patient learns how to focus on the moment, how to cope with the fear of failure and how to develop a calm state of mind and strategic foresight. The patients are taught that all innovative progress is naturally accompanied by repeated failures, and that these many failures are a necessary prerequisite for the one success. Furthermore, the patients learn how to be independent from external influences and concentrate internal and external attention. The patients acquire competences in subjective, objective and kinesthetic visualization, and routines to better focus and concentrate. The concentration exercises can be complemented with speed stacking, dobble (concentration card game), or kendama (Japanese skill game). (Wessels, 1994; Birbaumer et al., 2010; Gabler, 1992; Gabler, 2000; Nideffer & Sagal, 2002; Ottmann, 2000; Roth, 2003; Schippke & Roth, 1999; Heimsoeth, 2016; Heimsoeth, 2015l; Engbert et al., 2011d; Alfermann & Stoll, 2005e; Bernatzky, 2009; Draksal, 2016; Nimz, 2012; Zentgraf & Munzert; Weigelt, 2014b; Weigelt, 2014a; Wulf, 2009)

Session 3 – Attentiveness and emotional control

This session aims on practical tools to gain emotional control by attentiveness, acceptance and empathy. Basic concepts of dysfunctional cognition, underlying consumptions, maladaptive life rules, automated negative thoughts are explained and discussed with the patient. A behavioral action plan and a behavioral needs analysis is used to create a specific and effective emotional coping strategy for the patient, that is able to disrupt dysfunctional behaviors. Personal resources of the patient are assessed, specifically activated and utilized in order to increase the patient’s self-efficacy and promote useful emotions such as pride and confidence. The patient develops concepts for emotion regulation, creating distance, gaining self-consciousness, and influencing their own positive and negative emotions. (Eisenmann & Lammers, 2017; Brand, 2010a; Lazarus, 1991; Engbert et al., 2011b; Heimsoeth, 2015k; Baumann, 2018; Nitsch & Hackfort, 1979; Schwarzer, 2000; Lazarus, 2000b; Lazarus, 2000a; Jones, 2003; Uphill et al., 2008; Thomas et al., 1999; Karageorghis & Terry, 2011; Crocker et al., 2015; Meyer et al., 2003).

Session 4 – Relaxation and stress management

During this session the patients learns different techniques for stress reduction, such as a stress-reducing breathing-technique, visualizing techniques to gain inner peace and motivation, and avoidance of specific stressors or stress intensifiers. The patient learns about different forms of stress, stressors, and stress factors, the influence of stress on performance, coping strategies, the internal and external self-regulation in the context of stress situations, and the functional mechanism of relaxation processes and techniques, as well as activation techniques. (Engbert et al., 2011b; Alfermann & Stoll, 2005d; Alfermann & Stoll, 1996; Eberspächer, 1993; Gotwals et al., 2012; Lazarus, 1966; Lazarus & Folkman, 1984; Lazarus & Launier, 1981; Stoll & Ziemainz, 2003; Heimsoeth, 2015g; Brand, 2010a; Lindemann & Lindemann, 1989; Eberspächer, 2002; Stoll, 2003; Buchmann, 1974; Eberlein, 1992; Jacobson & Wirth, 2011; Vaitl & Petermann, 2009; Lindemann & Lindemann, 1995)

Session 5 – The power of thought

Thoughts determine our action and our action determines our behavior. Our behavior forms our life and our environment. Constantly repeating negative thoughts such as “I cannot do this” or “I am not good enough” lead to stress, anxiety or tension. In this session, the patients learn that a passive and negative attitude can be replaced by positive imagination, clear thoughts and productive patterns of belief and thought. Furthermore, the patients learn practical tools to stop constant dwelling on negative thoughts and rumination and to create an active and positive mindset. Major goal is to integrate the control of the inner dialogue as a crucial part of mental strength, by means of positive soliloquies and affirmations, stopping of negative thoughts, reconditioning of beliefs and reframing (Heimsoeth, 2015e; Engbert et al., 2011h; Heimsoeth, 2016; Müller & Neisser, 2004; Coué, 1998; Schwarz, 1998; Kelly et al., 2008; Peden et al., 2005; Sedlak, 1988; Stumm & Pritz, 2000; Breuninger, 1996; Tyron, 1996; Peale, 1987; Peale, 1991; Conoley & Garber, 1985; Emmelkamp & Kwee, 1977; VandenBos & Association, 2015).

Session 6 – Emotion regulation

Major focus of this session is the conveyance of method competence in psychooncological interventions to activate resources and increase stability and resilience. The patients learn basic concepts of neuroplasticity and neurobiological connections, of the individual design of the personal psychoeducation, and body-mind-awareness. They learn specific techniques for immediate stress-reduction, resource activation, attentional deployment, cognitive change or emotional self-regulation (e.g. ABC-PLEASE: Accumulate positive experiences, build mastery by being active in activities, cope ahead, preparing an action plan, researching, and rehearsing, physical illness treatment and prevention, low vulnerability to diseases, eating healthy, avoiding mood-altering drugs, sleep healthy, exercise regularly) (Diegelmann & Isermann, 2016; Cole et al., 1994; Thompson, 1994; Niven et al., 2009; Burman et al., 2015; Leventhal et al., 1998; Koole, 2009; Zeman et al., 2006; Linehan, 2014; Campbell-Sills & Barlow, 2007; Urry, 2010; Kanske et al., 2011; Nolen-Hoeksema & Morrow, 1993; Sheppes et al., 2011; Borkovec et al., 1983; Gross & John, 2003; Ayduk & Kross, 2010; Samson & Gross, 2012).

Session 7 – Self-awareness and self-confidence

In this session, the patients explore their personal abilities and strengths. They are asked to discuss their personal competences, what they think of themselves and what qualities close friends and family members would attribute to them. At the end of the sessions, the patients are surrounded by their personal “circle of strength” and are asked to choose their most important or meaningful qualities and to discuss their decision. This form of strength development leads to increased self-efficacy and confidence and is a major prerequisite for personal success. The patients learn the connection between self-confidence, performance and their self-image, as well as between self-confidence, personal energy and the implementation of their individual strengths. They create their own anchors of positive memories, and formulate their individual winning formula (Heimsoeth, 2015j; Engbert et al., 2011e; Perry & Werner, 2009; Branden & Pott, 2015; Coudevylle et al., 2011; Grawe, 2004; Jünemann, 2015; Lohaus & Vierhaus, 2015; Morf & Koole, 2014; Mummendey, 2006; Brown et al., 2001; Fleming & Courtney, 1984; Potreck-Rose, 2017; Potreck-Rose, 2014; Potreck-Rose & Jacob, 2007; Waibel, 2017; Schütz, 2005; Wirth, 2012).

Session 8 – Coping with anxiety

The fear of progress or relapse of the malignant disease belongs to the most common and most distressing emotional burdens of pediatric oncologic patients. Aim of this session is not the absence of fear but rather the utilization of fear as a signal and a motive for self-care and increase or maintenance of the quality of life. The patients learn that they are not helplessly dependent on their emotions but are able to influence this state of mind. They explore their individual anxiety triggers, coping strategies, including e.g. an “anxiety emergency kit”, the “anxiety body scan” and exercises for emotional self-control and affect regulation. The patients create their own action plan to avoid or interrupt anxiety overload. This action plan is complemented by practical interventions such as an anxiety diary, a “solution suitcase” or relaxation exercises (Heimsoeth, 2015c; Brand, 2010a; Engbert et al., 2011c; Terry, 1990; Caby & Caby, 2011; Boon et al., 2013; Boos, 2019).

Sessions 9 and 10 – Mental strength I and II

The key to success is to be prepared and take the opportunity when it is given. During this session, the patients are given an overview of the concept of mental strength is. They define an ideal performance state and deepen their previously learned techniques to gain mental strength (e.g. visualization, breathing techniques, positive thinking, set achievable goals). The selection of the techniques depends on their individual preferences and abilities. The session further contains the application of the “mental model” using a currently existing problem of the patients and the assessment of their individually available qualities and competences that may help to solve it (Kalueff und Zimbardo, 2007. The patients learn about the self-concept of the “entirety of all self-assessments” (Mummendey, 2006), and shall become empowered to avoid loss of control and to pursue a constantly positive development. In this context, the patients learn how to strengthen their self-efficacy. The central idea that shall be transmitted is that change and winning begins in the mind (Engbert et al., 2011f; Alfermann & Stoll, 2005a; Heimsoeth, 2015i; Amler et al., 2009; Baumann, 2018; Eberspächer, 2012b; Eberspächer, 1992; Frester & Wörz, 2003; Heimsoeth, 2013; Heimsoeth, 2015b; Heimsoeth, 2015a; Loehr & Kiel, 1991; Loehr, 2001; Wörz, 2011).

Session 11 – Mental training cycle

During this session, the patients apply the previously acquired mental training methods on a currently existing problem. They are asked to create awareness for their current situation and their future goals concerning the problem, taking their individual qualities and competences into account. They formulate their specific needs, personal values, their future vision and define interim goals and the long-term goal, they want to achieve. Using this specific problem (e.g. how to find back into their school life) they learn the four phases of the mental training cycle and create their individual training plan. (Alfermann & Stoll, 2005c; Heimsoeth, 2015f; Heimsoeth, 2016; Amler et al., 2009; Baumann, 2018; Eberspächer, 2012a; Eberspächer, 1992; Frester & Wörz, 2003; Heimsoeth, 2013; Heimsoeth, 2015b; Heimsoeth, 2015a; Loehr & Kiel, 1991; Loehr, 2001; Wörz, 2011).

Sessions 12 and 13 – Motivation I and II

Winners have all one thing in common: they have a clear, interesting, and positive goal and the absolute determination to realize it. They are driven by their motivation and inner passion, that both are supported by their self-confidence and the unshakeable conviction that they will have success. Successful people reach their goals not least because of their discipline, also concerning the control of their thoughts, their courage and their determination. The inner motivation is the motor for success and expression of a deep longing for happiness. Especially one’s personal life motives express a particular motivating power. During these sessions, the patients are asked to follow the questions: What do I want to accomplish? How do I accomplish these goals? How do I integrate more fun and happiness into my life? How am I able to reach my best performance? How do I plan my future? How can I optimize my inner state of mind during difficult times and situations? How can I motivate myself? What are my intrinsic and extrinsic motivations? How do I keep up my motivation? How do I cope with failure? How do I achieve long-lasting success? They are requested to set achievable personal goals and to create a specific vision of the way to fulfil these goals. Finally, the patients learn that the key for success is continuity and patience and that happiness isn’t just a matter of luck but something that is controllable and learnable step by step (Brand, 2010a; Engbert et al., 2011g; Alfermann & Stoll, 2005b; Heimsoeth, 2015d; Heimsoeth, 2016; Schmidt & Walinsky, 2021; Niermeyer & Seyffert, 2011; Beckmann & Elbe, 2011; Heckhausen & Heckhausen, 2010; Zuckerman et al., 1978; Weiner, 2009; Rheinberg et al., 2018; Rudolph, 2013).

Session 14 – Recap and final discussion

This session focusses on the reflection of the last weeks and months, the presentation and analysis of the searching, change and development processes of the patients, their strengths and awareness, their attentiveness and presence in the current moment, their hopes and visions for the future. The patients are encouraged to follow their own path that lies in front of them to fulfil their dreams.

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