

Aus der Klinik für Pädiatrie m.S. Onkologie und Hämatologie der Medizinischen Fakultät  
Charité – Universitätsmedizin Berlin

DISSERTATION

šUntersuchung psychometrischer und physiologischer Wirkungen anthroposophischer Therapien  
aus dem Bereich der Mind-Body Therapien

Zur Erlangung des akademischen Grades  
Doctor rerum medicarum (Dr. rer. medic.)

Vorgelegt der Medizinischen Fakultät  
Charité – Universitätsmedizin Berlin

von

Jenny Lena Kanitz

aus Berlin

Datum der Promotion: 05. Juni 2016

# Inhaltsverzeichnis

<b>1</b>	<b>EINLEITUNG</b>	<b>1</b>
<b>2</b>	<b>FRAGESTELLUNG</b>	<b>3</b>
2.1	Studie 1: kontrollierte, zweiarmige Eurythmietherapie Studie	4
2.2	Studie 2: randomisierte, dreiarmige, einfach verblindete Rhythmische Massagestudie	4
2.3	Studie 3: randomisierte, dreiarmige Eurythmietherapie Studie	4
<b>3</b>	<b>METHODIK</b>	<b>4</b>
3.1	Studiendesign	4
3.2	Messinstrumente	5
3.3	Statistik und qualitative Datenauswertung	10
<b>4</b>	<b>ERGEBNISSE</b>	<b>12</b>
<b>4.1</b>	<b>Studie 1:</b>	<b>12</b>
4.1.1	Stresscopingstrategien und gesundheitsbezogene Lebensqualität	12
4.1.2	Fatigue	13
4.1.3	Herzfrequenzvariabilität	13
4.1.4	Chronobiologischer Zusammenhang zwischen EYT und Nachtschlaf	14
4.1.5	Compliance und Durchführbarkeit	14
<b>4.2</b>	<b>Studie 2</b>	<b>15</b>
4.2.1	Körperliche und psychische Befindlichkeit	15
4.2.2	Cortisol im Speichel	15
4.2.3	Compliance und Durchführbarkeit	15
<b>4.3</b>	<b>Studie 3</b>	<b>15</b>
4.3.1	Charakterisierung der subjektiven Interventionseffekte	15
<b>5</b>	<b>DISKUSSION</b>	<b>16</b>
<b>6</b>	<b>LITERATURVERZEICHNIS</b>	<b>21</b>
	<b>EIDESSTATTLICHE VERSICHERUNG</b>	<b>25</b>
	<b>ANTEILSERKLÄRUNG</b>	<b>26</b>

<b>AUSGEWÄHLTE PUBLIKATIONEN.....</b>	<b>29</b>
<b>Kanitz JL, Pretzer K, Reif M, Voss A, Brand R, Warschburger P, Längler A, Henze G, Seifert G. The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults. Complementary Therapies in Medicine (2011) 19, 2476255.....</b>	<b>29</b>
<b>Kanitz JL, Pretzer K, Reif M, Witt K, Reulecke S, Voss A, Längler A, Henze G, Seifert G. The impact of eurythmy therapy on fatigue in healthy adults ó A controlled trial. European Journal of Integrative Medicine (2012), Vol. 4, Issue 3, e2896e297.....</b>	<b>39</b>
<b>Seifert G, Kanitz JL, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Heart Rate Variability by Eurythmy Therapy After a 6-Week Eurythmy Therapy Training. Integrative Cancer Therapies (2012), 11(2), p. 1116119. ....</b>	<b>49</b>
<b>Seifert G, Kanitz JL, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Circadian Rhythm of Heart Rate Variability by Eurythmy Therapy Training. Evidence-Based Complementary and Alternative Medicine (2013), Article ID 564340, 9 pages .....</b>	<b>59</b>
<b>Kanitz JL, Reif M, Rihs C, Krause I, Seifert G. A randomised, controlled, single-blinded study on the impact of a single rhythmical massage (anthroposophic medicine) on well-being and salivary cortisol in healthy adults. Complementary Therapies in Medicine (2015), 23, p. 685 - 692. ....</b>	<b>69</b>
<b>Berger B, Bertram M, Kanitz JL, Pretzer K, Seifert G. šLike Walking into an Empty Roomö: Effects of Eurythmy Therapy on Stress Perception in Comparison with a Sports Intervention from the Subjects÷ Perspective ó A Qualitative Study. Evidence-Based Complementary and Alternative Medicine (2015), Article ID 856107, 11 pages.....</b>	<b>78</b>
<b>LEBENS LAUF .....</b>	<b>90</b>
<b>KOMPLETTE PUBLIKATIONS LISTE .....</b>	<b>91</b>
<b>DANKSAGUNG .....</b>	<b>94</b>

## ZUSAMMENFASSUNG

In den letzten Jahren konnten wichtige Fortschritte wie erhöhte Überlebensraten in der pädiatrischen Onkologie verzeichnet werden. Dadurch rückten komplementäre Therapien wie Mind-Body Therapien (MBT) zur Reduzierung unerwünschter Nebenwirkungen und Stärkung eigener Ressourcen zunehmend in den Fokus der Forschung. Gegenstand der hier vorliegenden publikationsbasierten Promotion ist die quantitative und qualitative Untersuchung der Wirkungen zweier Anthroposophischer Therapien (AT) auf ausgewählte Zielparameter aus dem Bereich der MBT Forschung. Hierfür wurden gesunde, erwachsene Probanden im Rahmen von drei durchgeführten Studien im kontrollierten Vergleich nach sechs Wochen (Eurythmietherapie vs. Kontrollgruppe), im randomisierten Vergleich sequentiell über den Verlauf einer einmaligen Intervention (Rhythmische Massage vs. Scheinmassage) oder nach sieben Wochen (Eurythmietherapie vs. Steppaerobic) untersucht. Die Ergebnisse zeigen, dass Eurythmietherapie zu einer nachweislichen Verbesserung der gesundheitsbezogenen Lebensqualität, Stresscopingstrategien<sup>1</sup>, Fatigue<sup>2</sup> und einer höheren Herzgesundheit<sup>3, 4</sup> führt (Studie 1). Die Befindlichkeit und Cortisol im Speichel verändern sich nicht nachweislich über den Verlauf einer Rhythmischen Massage im Vergleich zu einer Scheinmassage<sup>5</sup> (Studie 2). Die qualitative Auswertung zeigt<sup>6</sup>, dass die EYT Gruppe, nicht jedoch die Steppaerobic Gruppe, zu einer veränderten Wahrnehmung derjenigen Faktoren kommt, die zuvor als Stressursachen erlebt wurden, was eine wesentliche Voraussetzung für einen besseren Stressumgang ist. Bewegung allein kann insofern nicht als hinreichende Intervention zur Stressreduktion angesehen werden. Diese Arbeit liefert wichtige Hinweise für die spezifischen Wirkungen zweier Anthroposophischer Therapien und bestärkt deren Bedeutsamkeit als erfolgsversprechende MBT.

## Abstract

In the last decades, there has been considerable progress in investigating pediatric oncology research including increased survival rates. Complementary Therapies such as Mind-Body Therapies (MBT) to reduce side effects and promote stress coping strategies are therefore warranted. The subject of this Promotion is to assess the effect of two anthroposophic therapies (AT) on health-related quality of life, stress coping strategies, fatigue, well-being as well as salivary cortisol and heart rate variability. Within a third trial interviews were conducted and analyzed by content analysis and phenomenologically. Therefore, healthy adults participated in a controlled Trial of six weeks (Eurythmy Therapy vs. Control Group) or two randomized Trials to assess immediate effects (Rhythmical Massage vs. Sham massage) or after seven weeks (Eurythmy Therapy vs. Step Aerobics). Results suggest, that EYT can lead to an improvement of health-related quality of life, stress coping strategies and heart rate variability (Study 1). Well-being and salivary cortisol did not differ statistically significant after one RM compared to SM but there is a trend towards more alertness after RM that still needs to be validated (Study 2). The qualitative Study revealed that EYT but not Step Aerobics can create an independent perceptual space, which permits a reevaluation of external stressors and inner resources. To conclude, AT as part of MBTs may have clinical potential to prevent stress and associated disorders in healthy individuals and possibly in patients with chronic diseases.

## Abkürzungen

AM	Anthroposophische Medizin
ANOVA	Varianzanalyse ( <i>engl.</i> analysis of variance)
ANS	Autonomes Nervensystem
AT	Anthroposophische Therapien
AVEM	Fragebogen zum arbeitsbezogenem Verhaltens- und Erlebensmuster
Bf-S	Befindlichkeitsfragebogen
B-L	Beschwerdeliste
CAM	komplementäre und alternative Medizin ( <i>engl.</i> complementary and alternative medicine)
EKG	Elektrokardiogramm
ET	Ergometertraining
EYT	Eurythmietherapie
HF	high frequencies
HRV	Herzfrequenzvariabilität ( <i>engl.</i> heart rate variability)
LF	low frequencies
MANOVA	multivariate Varianzanalyse ( <i>engl.</i> multivariate analysis of variance)
MBT	Mind-Body Therapien
MDBF	Multidimensionaler Befindlichkeitsfragebogen
MFI	multidimensionaler Fatigue Fragebogen ( <i>engl.</i> multidimensional fatigue inventory)
RA	Rhythmische Massage mit Aromatherapie
RM	Rhythmische Massage
SA	Steppaerobic
SCS	Stresscopingstrategien
SF-36	<i>engl.</i> Medical Outcome Study (MOS) Short Form Questionnaire
SM	Scheinmassage
TICS	Trier Inventar zum chronischen Stress
ULF	ultra low frequencies
VLF	very low frequencies

# 1 Einleitung

In den letzten 20 Jahren erhöhte sich die Überlebensrate von Kindern und Jugendlichen nach einer onkologischen Erkrankung in Deutschland auf 80%<sup>7</sup>. Gleichzeitig führen Chemotherapie, Chirurgie und ggfs. Bestrahlung zu lebensbeeinträchtigenden Nebenwirkungen und Spätfolgen. Bei Kindern mit Gehirntumoren wurden u.a. neuromotorische, kognitive (z.B. Aufmerksamkeit, Konzentration, Gedächtnis, Verarbeitungsgeschwindigkeit) und psychische (z.B. reduzierte Lebensqualität, erhöhtes Stresserleben und Fatigue) Langzeitfolgen berichtet<sup>8, 9</sup>. Die therapeutischen Ansätze aus der komplementären und alternativen Medizin (CAM) dienen speziell der supportiven Begleitbehandlung, Reduzierung unerwünschter Nebenwirkungen und Stärkung eigener Ressourcen und erhielten zunehmendes Interesse. 35% der Familien mit einem an Krebs erkrankten Kind nutzen CAM<sup>7</sup>, woran sie vielfältige Hoffnungen und Erwartungen knüpfen<sup>10</sup>. Auch in der gesunden Bevölkerung stießen die positiven Wirkungen von CAM auf großes Interesse, insbesondere vor dem Hintergrund der zunehmenden Gesundheitskosten<sup>11</sup>.

Es lassen sich vier Kategorien von CAM unterscheiden. Dies sind körperbasierte Therapien (z.B. Massage), Therapien auf der Basis alternativmedizinischer Systeme (z.B. Homöopathie oder traditionelle chinesische Medizin), biologisch basierte Behandlungen (z.B. Kneipp oder Diäten) und Mind-Body Therapien (MBT)<sup>11</sup>. MBT haben das Ziel, die Interaktion zwischen Gehirn, Psyche, Körper und Verhalten zu unterstützen. Bekannte MBT sind Entspannungsübungen, Hypnose, Meditation, Yoga, Tai Chi, Qigong und Autogenes Training. In einer ersten Überblicksarbeit zu MBT in der pädiatrischen Onkologie konnte unsere Arbeitsgruppe Integrative Medizin in der pädiatrischen Onkologie (AG IMO) feststellen, dass MBT in bisherigen Studien kaum Nebenwirkungen aufweisen und in allen Stadien der onkologischen Behandlung eingesetzt werden können<sup>12</sup>. Des Weiteren zeigte sich, dass sie kostengünstig sind, positive Auswirkungen auf die Selbstwirksamkeit haben, zu gesünderen Copingstrategien (Bewältigungsmechanismen) im Umgang mit der Erkrankung führen und die Eigenaktivität der Patienten nachhaltig mobilisieren können<sup>12</sup>. Gleichsam gibt es bislang wenige systematische Untersuchungen dieser Therapieformen.

Die vorliegende Arbeit widmet sich den Anthroposophischen Therapien (AT) aus dem Setting der Anthroposophischen Medizin (AM). Die AM gehört zu den dritthäufigsten eingesetzten CAM in der pädiatrischen Onkologie<sup>13</sup> und beinhaltet neben den AT zahlreiche anthroposophische Arzneimittel. Die drei AT, wozu die Eurythmietherapie (EYT) als Weiterentwicklung der künstlerischen Eurythmie, die Rhythmische Massage (RM) und die Anthroposophische Kunsttherapie zählen, lassen sich den MBT Therapien zuordnen. Ähnlich

wie andere MBT postulieren sie einen engen Zusammenhang zwischen dem Körper (Šphysischer Leib→), den vitalen Kräften (ŠÄtherleib→), der Seele (ŠÄstralleib→) und dem Geist (Šch-Organisation→)<sup>14</sup>. Ein weiterer gemeinsamer Schwerpunkt mit anderen MBT liegt auf der Betonung der aktiven Beteiligung des Menschen, indem der Organismus bei der eigenen Gesundwerdung und -erhaltung von innen heraus im Sinne der Salutogenese nach Antonovsky<sup>15</sup> unterstützt werden soll. Erste Untersuchungen weisen auf gesundheitserhaltende und -fördernde Wirkungen der AT hin. Im Rahmen einer ersten Pilotstudie konnten wir zeigen, dass sieben Kinder mit Gehirntumoren nach einer sechsmonatigen Eurythmietherapie im Bereich der kognitiven und neuromotorischen Funktionsfähigkeit profitieren konnten<sup>16</sup>. In einer weiteren Pilotstudie mit fünf Kindern bei denen ADHS diagnostiziert wurde, konnten Verbesserungen in der Konzentrationsfähigkeit und motorischen Fähigkeit nach EYT berichtet werden<sup>17</sup>. Weitere Untersuchungen für das Erwachsenenalter stellten Verbesserungen nach sieben bis max. 29 Eurythmietherapie Sitzungen fest. Diese bezogen sich auf verschiedene Krankheitsbeschwerden (v.a. Schmerzen und Depression)<sup>18</sup>, die gesundheitsbezogene Lebensqualität<sup>19</sup> sowie die psychomentele Belastung und vegetative Balance (Blutdruck, Puls- und Atemfrequenz)<sup>20</sup>. Eine Untersuchung wies auf eine verbesserte Körperwahrnehmung im Selbstbild<sup>21</sup> und eine Reduzierung des Syndroms ŠCancer Related Fatigue÷ und Schlafqualität<sup>22</sup> hin. Neun Patienten bei denen eine Hypertonie diagnostiziert wurde, zeigten zwar keine Reduzierung des Bluthochdrucks, jedoch Verbesserungen in der Lebensqualität nach sechs Monaten EYT<sup>23</sup>. Eine weitere Untersuchung erfasste nach der Durchführung mehrerer AT vergleichbare Erfolge auf Schmerzsymptome wie nach einer konventionellen Physiotherapiebehandlung<sup>24</sup>. Eine weitere Arbeit unserer Arbeitsgruppe erfasste erstmalig systematisch einen Zusammenhang zwischen den Wirkungen der EYT und der Herzfrequenzvariabilität<sup>25</sup>. Während der Nachruhephase zeigte sich nach EYT ein Abfall der niedrigen Frequenzbereiche bei gleichzeitigem Anstieg der hohen Frequenzbereiche (LF/HF), was für einen Anstieg der vagalen Aktivität und damit einhergehender Entspannung nach der EYT spricht. Hieraus wurde geschlussfolgert, dass EYT die Herzfrequenzvariabilität stimulieren bzw. zu mehr Rhythmus führen kann. Positive Wirkungen der Rhythmischen Massage (RM) wurden berichtet für verschiedene Krankheitsbeschwerden (v.a. Schmerzen und Depression)<sup>18</sup>, eine Verbesserung der gesundheitsbezogenen Lebensqualität<sup>26</sup>, der Schmerz Wahrnehmung und dem Schmerzgang<sup>27</sup>. Obgleich der erfolgsversprechenden Ergebnisse weisen diese Studien methodische Schwächen auf. Zum einen wurden die Therapien als zusätzliche Option mit variierender Häufigkeit in einem umfassenden Therapiepaket mit Anthroposophischer Medikation oder anderen AT untersucht<sup>28</sup>. Rückschlüsse auf die spezifische Bedeutsamkeit der einzelnen AT sind daher kaum

möglich. Zum anderen wurden Vorerfahrungen der Probanden mit der AM entweder nicht erhoben oder bei der Auswertung nicht berücksichtigt, weshalb ein erwünschtes Antwortverhalten nicht ausgeschlossen werden kann.

Eine häufig diskutierte Herausforderung für die Erforschung der AT ist der zunehmende Reduktionismus in der Wissenschaft<sup>11,28</sup> mit der Fokussierung auf quantitative Daten. Vertreter der in den 1960er Jahren entstandene Psychosomatik<sup>11</sup> wiesen darauf hin, dass die Erfassung rein quantitativer Daten nur eingeschränkt hilfreich sei bei der Erfassung der latenten therapeutischen Wirkungen und verwiesen u.a. auf Edmund Husserl<sup>29</sup>, der eine theoriefreie und beschreibende Lehre der Phänomene forderte (sogenannte Phänomenologie). Eine erste strukturphänomenologische Untersuchung<sup>30</sup> zur Rhythmischen Einreibung wurde bereits durchgeführt. Anhand von 13 Experteninterviews konnten drei typische Reaktionsmuster (Lösen, Wiedereinssein, Neuvermögen) festgestellt werden. Die Autoren schlussfolgerten, dass diese drei Reaktionsmuster für eine positive Krankheitsbewältigung unerlässlich seien und die Rhythmische Einreibung somit ein Auslöser für die dem Körper immanente, salutogenetische Entwicklung darstellen könnte.

Obgleich bisherige Studien im Bereich der AT genannte Interpretationsschwierigkeiten aufweisen, deuten erste quantitative und phänomenologische Untersuchungen auf ein Potential hin, einige der aktuellen Versorgungsprobleme des Gesundheitssystems sowohl in der erkrankten, als auch in der gesunden Bevölkerung entgegenwirken zu können. Hierzu zählen zum Beispiel Stress, Bewegungsmangel sowie die chronische Dysbalance zwischen Anstrengung und Entspannung bzw. Erholung. Die Verringerung der Diskrepanz zwischen großer Nachfrage, erfolgsversprechenden Wirkungen und andererseits eingeschränkter wissenschaftlicher Studienlage, war die Hauptmotivation für diese Arbeit.

## **2 Fragestellung**

Das Ziel dieser Arbeit war es, ausgewählte, postulierte funktionsspezifische Wirkungen der AT zunächst bei gesunden Probanden unter dem Aspekt des Erklärens (explorative Fragestellung) mithilfe von Fragebögen im Prä- Postvergleich (Studie 1) und sequentiell über den Verlauf (Studie 2) zu erheben. Weiterhin wurden hormonelle Parameter (Cortisol im Speichel, Studie 2) und indirekt die Funktion des autonomen Nervensystems mithilfe von Herzfrequenzvariabilitätsmessungen erhoben (Studie 1&2). Unter dem Aspekt des Verstehens (phänomenologische Fragestellung) wurden in einer dritten, randomisierten Studie qualitative

Leitfadeninterviews durchgeführt (Studie 3). Im speziellen sollten dabei folgende Fragestellungen untersucht werden:

### **2.1 Studie 1: kontrollierte, zweiarmige Eurythmietherapie Studie**

Zeigen Probanden nach sechs Wochen Eurythmietherapie 1) gesündere Stresscopingstrategien, eine verbesserte gesundheitsbezogene Lebensqualität und 2) eine Reduzierung in Fatigue, als Probanden aus einer Kontrollgruppe ohne Intervention über denselben Zeitraum? Lässt sich ein Zusammenhang zwischen Fatigue und Veränderungen in der Herzfrequenzvariabilität im Prä-Postvergleich feststellen? Führen sechs Wochen Eurythmietherapie 3) zu einer Veränderung der Herzfrequenzvariabilität (HRV) und 4) welchen Einfluss spielt hierbei die Tag-Nachtaktivität? 5) Wie beurteilten die Probanden ihre Teilnahme an der Studie und wie ist deren Compliance zu bewerten?

### **2.2 Studie 2: randomisierte, dreiarmige, einfach verblindete Rhythmische Massagestudie**

Welchen Einfluss hat eine Rhythmische Massage (mit und ohne Aromatherapie) auf 1) die körperliche und psychische Befindlichkeit und 2) hormonelle Parameter (Cortisol im Speichel) bei gestressten Probanden im Vergleich zu einer Scheinmassage im sequentiellen Verlauf? 3) Wie beurteilten die Probanden ihre Teilnahme an der Studie und wie ist die Compliance zu bewerten?

### **2.3 Studie 3: randomisierte, dreiarmige Eurythmietherapie Studie**

Wie lassen sich 1) die subjektiven Interventionseffekte der Eurythmietherapie Gruppe im Vergleich zu der Steppaerobic Gruppe inhaltsanalytisch (Wahrnehmung) und phänomenologisch (hypothetische Aufdeckung latenter Sinnzusammenhänge) charakterisieren?

## **3 Methodik**

### **3.1 Studiendesign**

#### **Studie 1: kontrollierte, zweiarmige Eurythmietherapie Studie**

68 gesunde Probanden erhielten über einen Zeitraum von sechs Wochen zweimal pro Woche eine Gruppenstunde EYT à 45min zzgl. 15min Nachwirkzeit. Eine Kontrollgruppe aus 22 gesunden Probanden wurde anschließend aus demselben Kollektiv ausgewählt und nahm an einer Fragebogenerhebung zu denselben Messzeitpunkten teil. Die Datenerhebung erfolgte in beiden Gruppen vor Beginn der sechswöchigen Intervention und direkt im Anschluss. Zusätzlich

wurden zu denselben Messzeitpunkten bei 30 Probanden (23 Frauen, 7 Männer) aus der EYT Gruppe, 24 Stunden- Elektrokardiogrammmessungen durchgeführt.

### **Studie 2: randomisierte, dreiarmlige, einfach verblindete Rhythmische Massagestudie**

Von 123 gestressten Probanden (Einschlusskriterium: TICS Fragebogen  $t > 50$ ) wurden 118 Probanden nach einer computergenerierten, Geschlechter ausgeglichenen Blockrandomisierung über drei Interventionen verteilt: Rhythmische Massage mit Aromatherapie (RA, 43 Probanden), RM ohne Aromatherapie (RM, 37 Probanden) oder Scheinmassage nach standardisiertem Vorgehen (SM, 38 Probanden)<sup>31</sup>). Die Probanden wussten lediglich, dass sie an einer von drei Massageformen teilnahmen. Um eventuelle Deckeneffekte auszuschließen, fand unmittelbar vor jeder Massage eine standardisierte, psychosoziale Stressinduktion statt<sup>32</sup>.

### **Studie 3: randomisierte, dreiarmlige Eurythmietherapie Studie**

Von 263 gescreenten Probanden wurden 121 nach einer computergenerierten, Geschlechter ausgeglichenen Blockrandomisierung über drei Gruppen verteilt: Eurythmietherapie (EYT; 54 Probanden), Steppaerobik (SA, 52 Probanden) oder für eine erste Pilotstudie anthroposophische Kunsttherapie (15 Probanden). Die Interventionen fanden über einen Zeitraum von sieben Wochen zweimal wöchentlich statt. Zusätzlich wurden alle Probanden um die Teilnahme an einem narrativen Leitfadeninterview nach Beendigung der Therapien gebeten. Daran nahmen insgesamt 36 Probanden der EYT-Gruppe und 39 Probanden der SA-Gruppe teil. Die psychometrischen Daten werden noch veröffentlicht.

## **3.2 Messinstrumente**

Die Zielparameter wurden auf der Grundlage der Anthroposophischen Theorie und der thematisch überschneidenden Mind-Body Therapieforschung ausgewählt. Die für die Veröffentlichungen relevantesten Erhebungsinstrumente werden im Folgenden kurz dargestellt.

### **Stresscopingstrategien (Arbeitsbezogenes Verhaltens- und Erlebensmuster AVEM<sup>33</sup>)**

Mit dem Fragebogen AVEM werden Erlebens- und Verhaltensweisen eines Menschen im Hinblick auf berufliche Anforderungen und Belastungen erfasst. Der Fragebogen geht auf den salutogenetischen Ansatz von Antonovsky zurück, der Ressourcen als gesund erhaltende Bedingungen von Gesundheit versteht<sup>15</sup>. Der AVEM erfasst elf theoretisch begründete Skalen. Eine faktorenanalytische Strukturierung ließ erkennen, dass diese elf Skalen drei umfassenden

inhaltlichen Dimensionen zugeordnet werden können. Dies sind das *berufliche Arbeitsengagement*, die *psychische Widerstandskraft gegenüber beruflichen Belastungen* und die *berufsbegleitenden Emotionen*. Eine weitere Auswertungsmöglichkeit und Interpretationshilfe ist die Erfassung einer prozentualen Musterzugehörigkeit. Das G-Muster (*Gesundheit*) spiegelt die Zusammensetzung gesundheitsförderlicher Verhaltens- und Erlebensmerkmale wider. Das S-Muster (*Schonung*) stellt eine Merkmalszusammensetzung dar, die durch Schonung gegenüber Arbeit und Arbeitsbelastungen gekennzeichnet ist. Das Risikomuster B steht für eine Merkmalskombination, die in der Literatur als *Burnout-Phänomen* bekannt geworden ist<sup>34</sup>. Das Risikomuster A (*Anstrengung*) spiegelt jene Eigenschaften wider, die als *extreme Arbeitshaltung* umschrieben werden können. Untersuchungen<sup>35</sup> zeigen deutliche Zusammenhänge zwischen den Risikomustern (A und B) in Bezug auf psychische und körperliche Beschwerden sowie Krankentage. Der Vorteil des AVEM liegt in der effektiven Frühdiagnostik zur gezielten Nutzung und Förderung von Entwicklungschancen und damit einer wirksameren Prävention.

### **Gesundheitsbezogene Lebensqualität (Medical Outcome Study -Short Form, MOS SF-36<sup>36</sup>)**

1993 definierte die World Health Organization<sup>37</sup> Gesundheit nicht mehr nur als Abwesenheit von Krankheit, sondern bezog neben physischen auch psychische und soziale Merkmale mit ein. Hieraus entstand ein breites Forschungsfeld mit mehr als 600 Erhebungsinstrumenten weltweit<sup>38</sup>. Der SF-36 erhebt krankheitsübergreifend und unabhängig vom aktuellen Gesundheitszustand die gesundheitsbezogene Lebensqualität<sup>36</sup>. Er ist das einzige international eingesetzt und validierte Instrument und erfasst acht Primärskalen, die sich konzeptuell den zwei Sekundärskalen *Körperliche Gesundheit* (4 Primärskalen: *Körperliche Funktionsfähigkeit*, *Körperliche Rollenfunktion*, *Körperliche Schmerzen*, *Allgemeine Gesundheitswahrnehmung*) und *Psychische Gesundheit* (4 Primärskalen: *Vitalität*, *Soziale Funktionsfähigkeit*, *Emotionale Rollenfunktion*, *Psychisches Wohlbefinden*) zuordnen lassen.

### **Fatigue (Multidimensional Fatigue Inventory, MFI<sup>39</sup>)**

Fatigue wird definiert als *unangenehmes Syndrom* welches ein komplettes Körpergefühl beschreibt das von Müdigkeit bis Erschöpfung reicht und nicht durch Schlafmangel erklärbar ist<sup>40</sup>. Bei Krebspatienten stellt Fatigue (*cancer related fatigue*) eines der meist beeinträchtigenden und schwer zu behandelnden Syndrome dar<sup>41, 42</sup>. In der Gesamtbevölkerung werden Prävalenzraten von 6.1 ó 11.4% berichtet<sup>43</sup>, die häufig einhergehen mit anderen psychischen Diagnosen und in 90% der Fälle medikamentös behandelt werden. Der Fragebogen

Multidimensional Fatigue Inventory (MFI) ist der meistverwendete Fatigue Fragebogen in der gesunden Bevölkerung in Europa<sup>44</sup>, besteht aus 20 Items und erfasst Informationen in fünf Bereichen (Šgeneral fatigueø Šphysical fatigueø Šreduced activityø Šreduced motivationø und Šmental fatigueø). Jede Skala kann separat interpretiert werden. Eine Veränderung um zehn Skalenpunkten wird als šsehr relevantø interpretiert<sup>45</sup>.

### **Befindlichkeit (Multidimensionaler Befindlichkeitsfragebogen, MDBF<sup>46</sup>)**

Befindlichkeitsmessungen dienen der Abbildung des gesamten Spektrums normaler und pathologischer Veränderungen des Wohlbefindens. Der MDBF erfasst drei bipolar konzipierte Dimensionen der aktuellen psychischen Befindlichkeit (Gute Stimmung ó Schlechte Stimmung; Wachheit ó Müdigkeit und Ruhe ó Unruhe) und besteht aus 24 Items. Für die zeitnahe Verlaufsmessung in unserer Studie wurden die drei Skalen mithilfe von zwei unterschiedlichen, parallelen Testhälften erhoben.

### **Hormonelle Parameter (Cortisol im Speichel)**

Stressreaktionen beginnen im Limbischen System und führen zu einer Ausschüttung der Hormone Noradrenalin und Adrenalin. Bei länger andauerndem Stress kommt es zu einer Daueraktivierung des Sympathikus und der Hypothalamus-Hypophysen-Nebennierenrinden-Achse (HPA-Achse), wodurch eine gesteigerte Freisetzung von Cortisol hervorgerufen wird. Ein dauerhaft erhöhter Cortisolspiegel kann zu einem Herabsetzen der persönlichen Belastbarkeit, Stresstoleranz und dem allgemeinen Wohlbefinden führen<sup>47</sup>. Cortisol wurde mithilfe einer Salivette® aus dem Speichel gewonnen und anschließend im endokrinologischen Labor der Charité ó Universitätsmedizin ausgewertet.

### **Herzfrequenzvariabilität (HRV)**

Die Herzfrequenzvariabilität ist eine Messgröße der autonomen Funktion des Herzens und quantifiziert die Variationen des zeitlichen Abstandes zwischen zwei Herzschlägen. Sie kann beständig momentanen Erfordernissen angepasst werden durch autonome physiologische Regulationswege innerhalb eines komplexen Regelsystems, an dem eine vertiefte Atmung, Körperlage, Alter, Geschlecht, Trainingszustand, Belastungen, Tageszeit, Temperaturregulation, Stoffwechsel, arterielle und kardiopulmonale Baroreflexe sowie psychomentale Einflüsse beteiligt sind. Ein gesunder Organismus ist u.a. durch eine optimale reaktive rhythmische Anpassungsfähigkeit gekennzeichnet, die er im Wechsel von ergotropen Prozessen (vom Sympathikus gesteuert) und trophotropen Prozessen (vom Parasympathikus bzw. Nervus Vagus

gesteuert) durchläuft. Der diagnostische Nutzen der HRV erstreckt sich von der Früherkennung und Prognosebeurteilung pathologischer Prozesse bis hin zur Gesundheits- und Leistungsdiagnostik. Die Bedeutung des Rhythmischen Systems in der Anthroposophischen Medizin ist unbestritten, jedoch noch unzureichend wissenschaftlich untersucht.

Im Rahmen dieser Arbeit wurde die HRV erfasst mithilfe eines 1-Kanal Elektrokardiogramms (EKG; Medikorder MK3, TOM-Medical, Graz, Austria). Der Abstand zwischen zwei R-Zacken (NN-Intervall) der Herzschläge, wurde aus dem Elektrokardiogramm mittels Brustelektroden ermittelt. Zwei Elektroden wurden in der rechten und linken Medioklavikularlinie, jeweils in Höhe des Brustbeinwinkels, und eine dritte über der Herzspitze angebracht. Abgeleitet wurde zwischen der Elektrode über der Herzspitze und der linken Medioklavikularlinie, die dritte Elektrode diente als Referenzelektrode. Zur Bestimmung der HRV liegen verschiedene Auswertungsverfahren (zeitbezogene, frequenzbezogene und nichtlineare) vor. Diese Methoden hängen entscheidend von der Qualität der Daten der NN-Intervalle ab, weshalb eine manuelle Identifizierung von Artefakten und Extrasystolen stattfand.

#### Zeitbezogene Größen (time domain)

Bei der zeitbezogenen Messung werden die Intervalle der Herzaktion in ungeordneter Reihenfolge über die Zeit gemessen und daraus Mittelwerte (NN- Intervall), die Standardabweichung aller erfassten NN-Intervalle (SDNN) sowie die Quadratwurzel des quadratischen Mittelwertes der Summe aller Differenzen zwischen benachbarten NN-Intervallen (RMSSD) berechnet. Die zeitbezogenen Parameter werden hauptsächlich der vagalen Aktivität zugeschrieben<sup>48</sup>.

#### Frequenzbezogene Größen/ Spektral-Analyse der HRV (frequency domain)

Die Modulation der Herzfrequenz enthält wesentliche Informationen zu den Regulationsmechanismen des kardiovaskulären Systems, weshalb die Zerlegung der Herzfrequenz in seine Frequenzkomponenten und Zuordnung zu physiologischen Korrelaten von wissenschaftlichem und klinischem Interesse ist. Eine Auswertungsmöglichkeit ist die Fast Fourier Transformation (FFT) zur Umwandlung zeitbezogener (Herzfrequenzabstände) in frequenzbezogene Daten. Aus den kontinuierlichen Veränderungen, der Spektraldichteverteilung oder Energiedichteverteilung (power) können Frequenzbereiche und daraus abgeleitet folgende Größen berechnet werden: Die High frequency (HF) umfasst Schwankungen mit Periodendauern von 2.5 - 7 Sekunden (0,15 - 0,4 Hertz) und gilt als Marker der parasympathischen Aktivität. Die HF wird am stärksten durch vagale Aktivität beeinflusst<sup>48</sup> und

ist mit der Atmung assoziiert<sup>49</sup>. Die Interpretation der Slow frequency (LF), welche Schwankungen mit Periodendauern von 7 ó 25 Sekunden (0,04 - 0,15 Hertz) umfasst, ist uneindeutiger. Man geht von einer Kombination aus sympathovagalen Einflüssen und Baroreflexsensitivität aus. Das Verhältnis von LF und HF (LF/HF) wird häufig als Index der sympathovagalen Balance verwendet. Hierzu werden die zeitlichen Abstände von einem Herzschlag zum nächsten mit sich selbst multipliziert und alle so errechneten Zahlen eines Frequenzbereiches summiert. Weitere Frequenzbereiche wie die Very low frequency (VLF; 0,0033 ó 0,04 Hz) und die Ultra low frequency (ULF; < 0,0033 Hz) unterliegen stärker den autonomen regulatorischen Mechanismen wie der Thermoregulation (für VLF). Zusätzlich erfolgte die Normalisierung der LF- und HF-Komponenten (LF/P und HF/P) durch die Division mit der total power (P; Leistung im gesamten Spektrum von 0,00 ó 0,04 Hz) um den Effekt von Änderungen der total power auf LF/P und HF/P zu minimieren.

### Nichtlineare Größen

Zur Erfassung komplexer dynamischer Aspekte innerhalb der zeitbezogenen Größen wurden drei zusätzliche Auswertungsverfahren durchgeführt: die symbolische Größe, die Kurzzeit symbolische Größe sowie die Multiscale Entropy, welche ausführlich beschrieben werden<sup>50</sup>. Diese Methoden demonstrieren, dass eine gesunde HRV komplexer ist als eine pathologische HRV.

### **Fokussiertes Leitfadeninterview**

Das Ziel des fokussierten Leitfadeninterviews<sup>51</sup> ist die Erfassung der Wirkungen der untersuchten Intervention und die subjektive Verarbeitung von Bedingungen des eigenen Handelns. Während des Interviews sollten bestimmte Kriterien erfüllt werden: Nichtbeeinflussung, zunehmende Strukturierung der Fragen, Herausarbeitung der Spezifität, Erfassung eines breiten Spektrums, Tiefgründigkeit und Schaffen eines personellen Bezugsrahmen. Alle Interviews wurden aufgezeichnet und anschließend transkribiert. Folgende Stimulusfragen wurden in die Auswertung eingeschlossen:

1. Welche Erwartungen hatten Sie persönlich an die Teilnahme an dieser Studie?
NF*: Welche positiven/ negativen Erwartungen hatten Sie an die Intervention?
2. Wie war Ihre Stressbelastung vor Beginn der Intervention?
NF: Kritische Lebensereignisse?
NF: Hätten sie alternative Wege zur Stressbewältigung eingeschlagen?
5. Haben Sie während der Intervention Veränderungen in Bezug auf Stress wahrgenommen?

NF: Können Sie besser mit Stress umgehen / haben Sie neue Strategien & Techniken entwickelt? NF: Wenn ja, welche?
6. Sind Ihnen durch die Intervention Verhaltensmuster aufgefallen, die Sie sonst nicht wahrgenommen haben?
7. Wie erklären Sie sich die Veränderungen?
NF: Intervention/ mittels der Teilnahme an einer Studie (Versorgung, Beachtung)/ Sport, Bewegung, Ruhe, Entspannung, Gruppe, Verantwortungsbewusstsein der Studienleitung gegenüber, eigene Motivation, Meditation/ Therapeut/ die Beziehung zum Therapeuten/ wichtige Ereignisse in der Zeit der Interventionen
8. Was bleibt Ihnen von der Intervention besonders im Gedächtnis? Was hat Ihnen die Intervention für die Zukunft gebracht?

(NF\*= Nachfrage; nur zu stellen, wenn keine eigenen Antworten kommen)

### 3.3 Statistik und qualitative Datenauswertung

Alle Daten wurden doppelt eingegeben, nach Fehlern überprüft und mit SPSS für Mac 17.0 (SPSS Inc., Chicago, IL, USA) (Studie 1) oder SAS/STAT Software (Version 9.1.3 of the SAS System for Windows; SAS Institute Inc., Cary, NC, USA) (Studie 2) analysiert.

#### Studie 1:

In einer ersten Sensitivitätsanalyse wurden Unterschiede zwischen der EYT Gruppe und der Kontrollgruppe zum ersten Messzeitpunkt untersucht. Hierzu wurden der  $\chi^2$  ó Unabhängigkeitstest und t-Test für unabhängige Stichproben auf statistische Signifikanz überprüft. Anschließend wurde der Frage nach Veränderungen der Zielvariablen über den Verlauf der Therapie zwischen der EYT Gruppe und der Kontrollgruppe nachgegangen. Hierfür wurden zweifaktorielle Varianzanalysen (ANOVA) mit Messwiederholung auf statistische Signifikanz geprüft. Für eine Berücksichtigung der Alpha-Fehler Adjustierung wurden anschließend über mehrere Dimensionen hinweg, multivariate Varianzanalysen (MANOVA) mit Messwiederholung auf statistische Signifikanz geprüft. Eine Bedingung für die zweifaktorielle ANOVA mit Messwiederholung ist die Normalverteilung der abhängigen Variablen. Dies wurde mithilfe von Histogrammen vorab geprüft und für alle Variablen des AVEM und für vier Skalen (š Vitalität, š psychisches Wohlbefinden, š soziale Funktionsfähigkeit, š körperliche Funktionsfähigkeit) des SF-36 festgestellt. Für die nicht normalverteilten Skalen des SF-36 wurde anschließend der Rangsummentest von Wilcoxon (für gepaarte Stichproben) und der U-Test von Wilcoxon, Mann und Whitney (für unabhängige Stichproben) verwendet. Insgesamt wurden fünf Tests durchgeführt (ein multivariater und vier nichtparametrische Tests), weshalb ein Bonferroni korrigiertes Alpha Level von 0.01 festgelegt wurde. Alle Tests wurden 2-seitig geprüft. Prä-Post Unterschiede wurden als standardisierte Effektstärken (SES) berechnet<sup>52</sup>. SES

größer als .80 wurden als  $\check{S}$ großø SES zwischen .50 und .79 als  $\check{S}$ mediumø und SES zwischen .20 und .49 als  $\check{S}$ kleinø bewertet. Für die Auswertung der HRV Daten wurden Langzeit EKGs von 23 Frauen ausgewertet. Die Daten wurden mittels Matlab (The Mathworks, Natick, MA, USA) und auf Empfehlungen der Task Force of the European Society of Cardiology<sup>53</sup> ausgewertet. Der nicht-parametrische Rangsummentest von Wilcoxon wurde für gepaarte Stichproben durchgeführt. Die Auswertung erfolgte auf der Basis der EKGs für jeden Probanden separat im Prä-Post Vergleich. Zur Erfassung der Korrelation zwischen Fatigue und ausgewählten HRV Daten wurden Pearson Korrelationen für jeden einzelnen Probanden aus der EYT Gruppe im Prä-Post Vergleich errechnet. Zur Berechnung der Tag- Nachtunterschiede wurde eine zweifaktorielle Varianzanalyse mit Messwiederholung (ANOVA) durchgeführt.

### **Studie 2:**

Die Items der einzelnen Fragebögen wurden zu Summenwerten zusammengefasst. Fehlende Werte wurden nach den jeweiligen Richtlinie der Fragebögen durch Durchschnittswerte (Bf-S, MDBF) oder den Mindestwert ersetzt (B-L). Bei mehr als zwei fehlenden Items wurde die Skala als  $\check{S}$ fehlendø definiert. Die Werte vom Cortisol im Speichel wurden log-transformiert zur Anpassung an die Normalverteilung. Für die Überprüfung der Hypothese wurde ein allgemeines lineares Modell berechnet. Hierfür wurden die Differenzen zwischen T2 und T3 als abhängige Variablen sowie die Intervention (Scheinmassage, Rhythmische Massage mit Aromaöl oder Rhythmische Massage ohne Aromaöl) als  $\check{S}$ fester Faktorø berechnet. Da für zwei Fragebögen statistisch signifikante Unterschiede zur Baseline gefunden wurden, wurde die Analyse modifiziert indem die Baselinewerte für jede Gruppe als Kovariate in das Modell übertragen wurde. Zusätzlich zu dem gerichteten Trendtest wurden exemplarische post-hoc Tests für gepaarte Stichproben durchgeführt. Jeder Vergleich wurde mit einem zweiseitigen Alphafehler Level bei 5% ausgewertet. Weil keine einzelnen primären Parameter definiert wurden und keine confirmatorische Fragestellung gestellt wurde, fand keine Adjustierung für multiples Testen statt. Zur statistischen Bewertung vom Cortisol im Speichel wurde ein allgemeines lineares Modell mit der Kovarianzstruktur als Vorgabewert der zusammengesetzten Symmetrie berechnet, wobei die vier Messzeitpunkte modellierend als lineare Änderungen über die drei ersten Zeitpunkte und als Post-Messung in das Modell übernommen wurden ( $\check{S}$ 1 ø 0 ø 0.5 ø 0.5ø).

### **Studie 3:**

Alle Interviews wurden wörtlich transkribiert und inhaltsanalytisch-hermeneutisch sowie leibphänomenologisch ausgewertet. Hierfür wurden zunächst sämtliche Antworten aus dem personenbezogenen Kontext gelöst und nach Fragen sortiert. Die Auswertung erfolgte getrennt, wurde anschließend abgeglichen, kontrovers diskutiert und komplementär zusammen getragen. Bei der inhaltsanalytisch-hermeneutischen Datenanalyse wurden die Codes nach der offenen und axialen Kodierung<sup>54, 55 56</sup> gruppiert, paraphrasiert, reduziert und im Anschluss daran im Hinblick auf die Fragestellung interpretiert. Dabei ging es um die Erschließung von objektiven Sinnzusammenhängen auf der Grundlage des vorliegenden Textes. Die leibphänomenologische Analyse erfolgte methodisch ähnlich wie die hermeneutische über offenes und axiales Kodieren. Bei diesem Ansatz geht es um die Resonanz, die Eurythmie beim Studienteilnehmenden auslöst bzw. um die Wechselwirkungen zwischen Körper, Bewusstsein und Umwelt.

## **4 Ergebnisse**

Die Ergebnisse werden in Bezug auf die oben genannten Fragestellungen dargestellt (unter 2.1 - 2.3).

### **4.1 Studie 1:**

#### **4.1.1 Stresscopingstrategien und gesundheitsbezogene Lebensqualität**

Zur Baseline zeigten 64% der Probanden aus der EYT Gruppe eine riskante SCS (ŠB - Burnoutø oder ŠA - Anstrengungø). Über den Verlauf der EYT Intervention wechselten insgesamt 24% der Probanden zu einer gesünderen SCS (ŠG - Gesundheitø oder ŠS - Schonungø). In der Kontrollgruppe fand kein Wechsel zu einer gesünderen SCS statt. Die Musterveränderungen lassen sich insbesondere mit Verbesserungen in der Dimension Šemotionale Distanzierungsfähigkeit÷ erklären, wozu die Skalen šZufriedenheit mit der Arbeitø, šZufriedenheit mit dem Lebenø und šErleben sozialer Unterstützungø zählen. Bezogen auf die gesundheitsbezogene Lebensqualität zeigten sich statistisch signifikante Verbesserungen für die EYT Gruppe, jedoch nicht für die Kontrollgruppe. In der Sekundärskala Škörperliche Gesundheit÷ (Primärskalen: Škörperliche Rollenfunktionø Škörperliche Schmerzenø) sowie den Primärskalen ŠVitalitätø und Špsychischen Gesundheitø zeigten sich klinisch relevante Punktwerteänderungen von mindestens acht Skalenwertpunkten. Die deutlichsten Verbesserungen (> 15 Skalenwertpunkte) zeigten sich jedoch in der Sekundärskala Špsychische

Gesundheit÷, wozu die Primärskalen Šemotionale Rollenfunktionø und Šsoziale Funktionsfähigkeitø zählen.

#### **4.1.2 Fatigue**

Nach sechs Wochen zeigte die EYT Gruppe im Vergleich zur Kontrollgruppe weniger Fatigue in allen fünf Skalen (Ø 9 Skalenwertpunkte), wohingegen die Kontrollgruppe mehr Fatigue berichtete (Ø 7 Skalenwertpunkte). In einer zweiten Analyse wurden die Fatigue Werte derjenigen 23 EYT Probanden, die an den HRV Messungen teilnahmen, korreliert mit den HRV Daten zur Baseline und nach sechs Wochen (Faktor: Zeit). Hier zeigte sich eine negative Korrelation zwischen dem Abfall in Šgeneral fatigueø und dem Anstieg der Šhigh frequenciesø (HF/P) und Abfall der Šlow frequenciesø ((ULF+VLF+LF)/P) nach sechs Wochen EYT. Dieser Zusammenhang unterstützt die Hypothese, dass EYT zu einer Reduktion von Fatigue bei gleichzeitig entspannterem HRV Muster (Erhöhung der parasympathetisch gesteuerten Šhigh frequencies÷) führt. Die Reduzierung von Šmental fatigueø korrelierte mit einem Anstieg der LF/P und Abfall der (ULF + VLF)/P. Ein Anstieg der LF/P kann auf eine Erhöhung der sympathovagalen Aktivität und Baroreflexsensitivität hindeuten. Der Abfall von ULF und VLF, welche Marker für die körperliche Aktivität sind, könnte im Zusammenhang stehen mit weniger Nachtaktivität bzw. einem tieferen und entspannteren Schlaf<sup>57</sup>, was wiederum eine Erklärung für die Reduzierung der mentalen Müdigkeit sein kann. Diese Hypothese wurde in einer zusätzlichen Sensitivitätsanalyse untersucht (siehe 4.1.4). Zusammenfassend zeigten Probanden nach sechs Wochen EYT eine Erhöhung der Herzfrequenzvariabilität die mit einer Reduktion von Fatigue korreliert war.

#### **4.1.3 Herzfrequenzvariabilität**

Nach sechs Wochen EYT zeigte sich eine statistisch signifikante Veränderung der autonomen Regulation. Besonders der Anstieg der normalisierten Šlow frequenciesø (LF/P) und Šhigh frequenciesø (HF/P) im Vergleich zur Baseline könnte auf einen positiven Trainingseffekt der EYT hinweisen. Die LF/HF zeigte einen abfallenden Trend, was auf eine erhöhte vagale Aktivität hindeutet, jedoch nicht signifikant war. Die normalisierten Šultra lowø und Švery low frequenciesø [(ULF + VLF)/P und (ULF + VLF + LF)/P] und die nicht normalisierten Šultra low frequenciesø (ULF) fielen statistisch signifikant ab. Dies deutet auf eine verringerte Aktivität des renin-angiotensin system (RAS), der Thermoregulation und der vasomotorischen Aktivierung hin, welches Indikatoren für die körperliche Aktivität sind. Der symbolische Dynamics Index pW321 zeigte einen statistisch signifikanten Anstieg nach sechs Wochen im Vergleich zur

Baseline, was ebenfalls für eine Erhöhung der autonomen Regulation bei gleichzeitig entspannterer körperlicher Aktivität spricht.

#### **4.1.4 Chronobiologischer Zusammenhang zwischen EYT und Nachtschlaf**

Die Ergebnisse der Fragebögen deuten auf eine Reduzierung in Fatigue, eine Verbesserung der gesundheitsbezogenen Lebensqualität und gesündere Stresscopingstrategien hin. Eine mögliche Erklärung für diese Verbesserungen könnte die veränderte Tag- Nacht Herzfrequenzvariabilität sein, welche in einer zusätzlichen Sensitivitätsanalyse untersucht wurde. Hierzu wurden die EKG Daten im Hinblick auf Veränderungen über die  $\checkmark$ Zeit $\emptyset$  ( $\checkmark$ vor EYT $\emptyset$  vs.  $\checkmark$ nach 6 Wochen EYT $\emptyset$ ), über die  $\checkmark$ Phase $\emptyset$  ( $\checkmark$ Tag 10:00 ó 14:00h $\emptyset$  vs.  $\checkmark$ Nacht 00:00 ó 04:00h $\emptyset$ ) sowie mögliche Interaktionen untersucht. Es zeigte sich, dass der Tag-Nacht Kontrast mit einer Erhöhung der vagalen Aktivität (HF) in der Nacht nach der EYT stärker wurde. Zudem fielen die ULF und VLF nach der EYT in der Nacht ab, was für weniger Aktivität und daher entspannteren Schlaf spricht. Während der Nacht erhöhte sich die Komplexität der HRV, insbesondere in den nichtlinearen Größen pW232 (stat. sign.  $\checkmark$ nach EYT $\emptyset$ ), pTH7 (stat. sign.  $\checkmark$ vor EYT $\emptyset$ ), mean\_huegel (stat. sign. ,nach EYT $\rightarrow$ ), scale 2 (stat. sign.  $\checkmark$ nach EYT $\rightarrow$ ) und scale 20 (stat. sign.  $\checkmark$ vor EYT $\rightarrow$ ). Zusammenfassend zeigte sich nach der sechswöchigen EYT Intervention ein stärkerer Tag-Nachtkontrast in der vagalen Aktivität (erhöhte Variabilität der HF nach der EYT) und in der komplexen autonomen Regulation. Diese Erhöhung der Komplexität der Herzfrequenz könnte für eine bessere und erholsamere Nachtphase sprechen, welche wiederum die verringerte Fatigue, die gesündere Stresscopingstrategien und verbesserte gesundheitsbezogene Lebensqualität erklären könnte.

#### **4.1.5 Compliance und Durchführbarkeit**

Die Hälfte der Probanden verfügte über Vorerfahrungen mit Anthroposophischen Therapien. Diese Variable stellte keinen moderierenden Faktor für die Bewertung der EYT dar. 13 Probanden aus der EYT Gruppe (19.1%) und drei aus der Kontrollgruppe (13.6%) beendeten die Teilnahme vor Abschluss der sechswöchigen Intervention. Alle Probanden, die an der EKG Erhebungen teilnahmen, führten die Studie bis zum Ende hin durch. Die Dropout Gruppe wies keine Unterschiede in Bezug auf persönliche oder psychometrische Daten auf und es wurden keine Nebenwirkungen berichtet. Nach Abschluss der EYT berichteten alle Probanden (n=55), dass sie subjektiv von der Intervention  $\checkmark$ profitiert $\rightarrow$  hätten. 53 Probanden würden die EYT  $\checkmark$ weiterempfehlen $\rightarrow$  und 52 würden  $\checkmark$ wieder teilnehmen $\rightarrow$ .

## 4.2 Studie 2

### 4.2.1 Körperliche und psychische Befindlichkeit

Zur Baseline zeigten alle Probanden normale Stresswerte im TICS Fragebogen ( $\emptyset$  t-Wert: 50). Aufgrund erhöhter Werte zum ersten Messzeitpunkt in der SM Gruppe für die Dimensionen 'Stimmung' und 'Aufmerksamkeit' (MDBF Fragebogen), wurden für alle Parameter Baseline adjustierte Berechnungen durchgeführt. Hierbei zeigten sich keine statistisch signifikanten Unterschiede zwischen den drei Gruppen über die Zeit in der körperlichen oder psychischen Befindlichkeit (MDBF, Bf-S, B-L). Jedoch zeigte sich ein nicht signifikanter Trend, wonach die RM und RA Gruppe eine bessere 'Stimmung' und mehr 'Aufmerksamkeit' zeigten nach der Intervention, wohingegen die SM niedrigere Werte aufwies. Die Annahme, dass zwischen der RA und der RM Gruppe ein geringerer Unterschied nach der Intervention feststellbar sein wird als zwischen der RA, RM und der SM, konnte in keiner Untersuchung bestätigt werden (gerichteter Trendtest).

### 4.2.2 Cortisol im Speichel

Während ( $T_{c1}$ ) des Trier Sozialen Stresstests (TSST) und im Anschluss ( $T_{c2}$ ), zeigten wie erwartet alle Probanden einen Anstieg von Cortisol im Speichel<sup>32</sup>. Nach der Intervention zeigten Probanden aus der RA und RM Gruppe einen leichten Anstieg im Vergleich zu der SM Gruppe, der jedoch nicht statistisch signifikant war.

### 4.2.3 Compliance und Durchführbarkeit

Kein einziger Proband verfügte über Vorerfahrungen mit der Rhythmischen Massage oder einer anderen AT. Kein Proband brach die Teilnahme an der Studie vorzeitig ab.

## 4.3 Studie 3

### 4.3.1 Charakterisierung der subjektiven Interventionseffekte

Die Ergebnisse der jeweiligen Analysezugänge ergänzen sich komplementär und zeigen auf, dass alle Probanden Effekte der Interventionen wahrnahmen. Sowohl die Steppaerobic (SA) Gruppe, als auch die EYT Gruppe berichteten von Entspannung durch die Intervention. Hierbei fiel auf, dass fast ausschließlich die Teilnehmenden der EYT Gruppe zu einer veränderten Wahrnehmung derjenigen Faktoren kommen konnten, die sie zuvor als Stressursachen erlebt hatten. Für die EYT Gruppe ergaben sich folgende Interpretationen der wesentlichen Auswertungskategorien: 'Ermöglichen einer produktiven therapeutischen Resonanz',

„Entstehung eines neuen Wahrnehmungsraumes“, „Neubewertung der überkommenen Wahrnehmung“ sowie „Emergieren neuer Handlungsoptionen“. Für die SA konnten keine solcher sinnstiftenden Kategorien als Folge der Intervention gefunden werden. Vielmehr stellte die Intervention die Teilnehmenden unter erhöhte körperliche und kognitive Anforderungen. Auffällig ist, dass vorrangig diejenigen eine subjektive Wirksamkeit der Interventionen konstatierten, die eine Veränderung der eigenen Wahrnehmung erlebt hatten: Diese stammten fast ausschließlich aus der EYT Gruppe. Die Bewegung allein kann insofern nicht als hinreichende Intervention zur Stressreduzierung angesehen werden.

## 5 Diskussion

Die vorliegende Arbeit liefert quantitative und qualitative Hinweise für die Wirkungen von zwei anthroposophischen Therapien bei gesunden Probanden. Zur Erfassung der postulierten ganzheitlichen und ressourcenaktivierenden Wirkungen wurden Zielparameter aus dem Bereich der MBT – Forschung ausgewählt und untersucht.

Die Vorhersehbarkeit und Stärkung von Stresscopingstrategien, bevor es zu Erkrankungen oder Risikoverhalten kommt, ist ein zentrales Anliegen der aktuellen Gesundheitsforschung<sup>58</sup>. Durch das frühzeitige Erkennen und daran anschließend rasche Handeln, kann späteren Erkrankungen vorgebeugt werden, weshalb MBT zur Förderung eines gesunden Stressumgangs zunehmende Bedeutung erlangten. Obwohl die Probanden als gesund in die erste Studie<sup>1</sup> eingeschlossen wurden, deutete sich bei 64% der Probanden ein gesundheitsgefährdender Stressumgang an. Für Therapiestudien zur Verbesserung von Stresscopingstrategien, scheint der AVEM demnach auch präventiv von Nutzen sein zu können. Bereits nach sechs Wochen EYT wiesen 23% der Probanden gesündere Stresscopingstrategien auf. Es zeigte sich, dass insbesondere die Dimension „Emotionale Distanzierungsfähigkeit“ und damit die Neubewertung der eigenen Situation durch die EYT gestärkt werden konnte. Diese spezifische Wirkung konnte in unserer dritten qualitativen Studie<sup>6</sup> weiter bestätigt werden. Die Probanden berichteten, dass durch die Eurythmietherapie ein eigenständiger Wahrnehmungsraum geschaffen wurde, der interne Möglichkeiten eröffnet, aktiv eine Distanz zu äußeren Stressoren herzustellen. Der innere Abstand, die Entschleunigung der eigenen Handlungen und das Innehalten ergeben den notwendigen Raum für die subjektive (Neu-) Bewertung der eigenen Ressourcen. Die Fähigkeit, sich von potentiellen Stressoren wie z.B. der Arbeit zu distanzieren, ist eine wichtige Voraussetzung für einen gesünderen Stressumgang. Wonach die erste Studie neben psychometrischen Daten Hinweise über spezifische Wirkungen der EYT mithilfe des AVEM

liefern konnte, wurde diese Annahme in der dritten Studie weiter untersucht. Diese Arbeit liefert somit neben psychometrischen Wirkungen, tiefere sinnzusammenhängende Hinweise über die spezifische Wirksamkeit der EYT.

Des Weiteren wurden in der ersten Studie die Wirkungen der EYT auf die gesundheitsbezogene Lebensqualität untersucht. Wie bereits für andere MBT gezeigt<sup>59-61</sup>, bildeten sich auch in unserer Studie insbesondere im Bereich der mentalen Gesundheit Verbesserungen durch die EYT ab. Studien berichten, dass bereits der Einsatz von Entspannungsverfahren ein signifikanter Prädiktor für Verbesserungen der SF-36 Skala psychische Gesundheit sein kann<sup>61, 62</sup>. Daher lässt sich nicht sicher sagen, welcher Teil der EYT im Rahmen unserer Untersuchung gewirkt hat. Die Wirkungen könnten sowohl auf die anschließende Ruhephase über 15min, der Meditation oder den Übungen zugeschrieben werden. Ebenfalls ließe sich eine sich gegenseitig verstärkende, synergistische Wirkung annehmen, wonach erst das Zusammenspiel der einzelnen Komponenten der EYT die Wirkung ausmacht. Neuere Studien sprechen für eine spezifische Wirkung der Körperbewegungen auf das subjektive Empfinden, wonach bereits die Qualität des Gehens (z.B. aufrechtes oder eingesunken Gangbild) einen Effekt auf die Befindlichkeit haben kann<sup>63</sup>. Diesen Fragestellungen gilt es in weiteren Wirksamkeitsstudien der EYT noch weiter nachzugehen.

Als weiterer Zielparameter wurde das Müdigkeitssyndrom Fatigue untersucht. Fatigue stellt in der Onkologie ein häufig begleitendes Syndrom dar, welches auch in der gesunden Bevölkerung vorkommt und zu erheblichen gesundheitsgefährdenden Folgen führen kann<sup>43, 44</sup>. Wir konnten zeigen, dass sechs Wochen EYT mit einer statistisch signifikanten Reduzierung von Fatigue einhergeht<sup>2</sup>. Diese Reduzierung stand in einem Zusammenhang mit einer Reduzierung der ULF und VLF in der Nacht, welche ein Marker für die körperliche Aktivität sind. Unsere Daten lassen vermuten, dass die Probanden einen ruhigeren und damit einhergehend entspannteren Schlaf hatten.

Die Ergebnisse der Herzfrequenzvariabilitätsmessung ergänzen und stützen die psychometrischen Daten und liefern erste mögliche Erklärungen der Wirkungszusammenhänge. Zum Beispiel weist die Erhöhung der parasympathetisch gesteuerten HF/P auf eine stärkere vagale Aktivität hin, was ein Zeichen für eine komplexere und damit gesündere HRV ist. Auch für andere MBT wie Tai Chi und Qigong wurde ein solcher Zusammenhang mit der HF/P berichtet und als wertvoller Beitrag der MBT gewertet<sup>64, 65</sup>. Eine weitere Frage dieser Studie war die Akzeptanz und Durchführbarkeit der EYT. Es zeigte sich eine sehr gute Compliance der Teilnehmer (81%) was als Hinweis für eine gute Zufriedenheit und Alltagspraktikabilität der EYT verstanden werden kann.

Die zweite Studie ist die weltweit erste randomisierte Studie zur Rhythmischen Massage. Obwohl keine Unterschiede zwischen der Scheinmassage und der RM im Hinblick auf körperliche und psychische Befindlichkeit und Cortisol festgestellt werden konnten, liefert sie Hinweise für die weitere Erforschung dieser Therapie. Durch die Randomisierung und Verblindung der Probanden konnte eine positive Erwartungshaltung als Einflussfaktor auf die Zielparameter, wie von anderen Autoren beschrieben<sup>66</sup>, reduziert werden. Ein weiteres Qualitätsmerkmal dieser Studie war der Einschluss einer aktiven Kontrollgruppe<sup>31, 67</sup>, wodurch die erfassten Wirkungen spezifisch der Intervention hätten zugeordnet werden können, da alle Probanden den gleichen Studienablauf durchliefen. Unsere Ergebnisse lassen vermuten, dass die spezifischen Wirkungen jedoch gering sind, und deshalb mit einer geringen Fallzahl schwer nachweisbar sind. Zwar berichteten Studien von einer Wirksamkeit nach einer einmaligen Massage<sup>67</sup>. Diese Studien hatten jedoch ebenfalls wesentlich größere Stichprobenzahlen. Es lässt sich daher annehmen, dass die Effekte zu klein sind, um sie mit der von uns veranschlagten Fallzahl nachweisen zu können. Diese Arbeit liefert somit Hinweise für die Fallzahlberechnung weiterer Studien zur RM. Andere Autoren weisen zudem auf die Herausforderung von Studiendesigns mit aktiven Kontrollgruppen hin, da die erwarteten Effekte von CAM Therapien häufig gering sind und empfehlen ebenfalls größere Fallzahlen<sup>68</sup>. Eine Wiederholung unseres Designs mit einer größeren Fallzahl wird daher empfohlen. Trotz der Randomisierung und Standardisierung des Versuchsaufbaus, zeigten sich Unterschiede in der Befindlichkeit zur Baseline. Eine Erklärung hierfür könnte das nicht verblindete Studienteam sein. Ein Versuchsleiter-Artefakt<sup>69</sup>, wonach positive Erwartungen oder Einstellungen des Versuchsleiters sich in Form einer selbst erfüllenden Prophezeiung auf das Ergebnis des Experiments auswirken können, kann nicht ausgeschlossen werden. Auch wenn das Studienteam so neutral wie möglich handelte, könnte eine höhere Anspannung an Tagen wo die Scheinmassage durchgeführt wurde, zu einer stärkeren Stressinduktion während des TSST geführt haben (T2). Der Versuchsleitereinfluss ist in Therapiestudien schwer zu kontrollieren und bedarf eines noch bedachtsameren Vorgehens während der Durchführung einer aktiven Kontrollgruppe. Neben methodischen Empfehlungen (größere Fallzahl, achtsamer Umgang des Studienteams mit der aktiven Kontrollgruppe), liefert diese Studie zudem nicht statistisch signifikante Hinweise für mögliche Wirkungen der RM. So zeigte sich über den Verlauf der RM und RA ein leichter Anstieg von Cortisol im Speichel. Zu dieser Beobachtung passt das Ergebnis, wonach Probanden aus der SM Gruppe tendenziell weniger Aufmerksamkeit (MDBF) nach der Intervention berichteten, während die RM und RA Gruppe einen leichten Anstieg verzeichnete, der als Hinweis für mehr Aktivität gesehen werden kann (nicht statistisch signifikant). Dieser Trend

wird unterstützt durch eine strukturphänomenologischen Untersuchung<sup>30</sup>, wonach Rhythmische Einreibung ein Auslöser für die dem Körper immanente salutogenetische Entwicklung im Sinne einer „Aktivierung“ darstellen kann. Auch dieser Annahme gilt es in weiteren Wirksamkeitsstudien gezielter nachzugehen.

Die dritte Studie liefert phänomenologische Hinweise für die Wirksamkeit der EYT. Während die leibphänomenologische Analyse die Resonanz des Körpers auf eine therapeutische Intervention herausarbeitet, verweist die hermeneutische Interpretation auf die Bedeutung, die dieses Resonanzphänomen für das Individuum hat. Es zeigte sich, dass Probanden sehr verschiedene Stressmodelle aufweisen (z.B. „Stress als ein Zuviel“, „Unfähigkeit sich abzugrenzen“, „Erhöhter Anspruch“, „Zu wenig eigene Ressourcen“). Die Möglichkeit, mithilfe von EYT gesündere Stresscopingstrategien zu fördern, konnte in unserer ersten Studie gezeigt werden und führte zu der Überlegung, dass die unterschiedlichen Stresskonzepte der Probanden einen Einfluss darauf haben, ob eine Intervention als stressreduzierend interpretiert werden kann oder nicht. Auffällig ist, dass vorrangig diejenigen eine subjektive Wirksamkeit der Interventionen konstatierten, die eine Veränderung der eigenen Wahrnehmung erlebt hatten: Diese stammen fast ausschließlich aus der EYT Gruppe. Ein weiteres Ergebnis dieser Studie ist, dass der EYT wie anderen MBT ein therapeutisches Konzept zugrunde liegt, dass die aktive Teilhabe der Übenden erfordert. Durchführung der Übungen, Vorstellungsbildung, Bewegungserleben, Gefühle, Willensimpulse und andere Perzeptionen werden nicht passiv erlebt, sondern aktiv hervorgebracht und machen so den eigenen Wahrnehmungsraum bewusst. Die aktiv durch die EYT erzeugte Selbstwahrnehmung ermöglichte scheinbar die Neubewertung äußerer Stressoren und innerer Ressourcen.

Ein methodischer Vorteil dieser Arbeit liegt darin, dass die jeweiligen AT getrennt voneinander untersucht wurden. Die Frage nach der spezifischen Bedeutsamkeit einzelner AT war lange Zeit ungeklärt. Diese Arbeit liefert erste Ergebnisse für die spezifische Bedeutsamkeit der EYT und der Rhythmischen Massage. So weisen die erste und dritte Studie auf die präventive, gesundheitsfördernde Wirkung der EYT hin und liefern erste Hinweise für die spezifische Wirksamkeit. Die Wirkung der RTM konnte nicht nachgewiesen werden, jedoch liefert das Design Hinweise für die weitere Erforschung dieser Therapieform. Ein weiterer Vorteil dieser Arbeit liegt in der Erfassung der Vorerfahrungen mit der AM als möglichen Einflussfaktor. Insbesondere bei einer geisteswissenschaftlich fundierten Therapie wie den anthroposophischen Therapien erscheint die Erfassung des anthroposophisch geprägten Hintergrundes als möglicher moderierender Einflussfaktor für die Bewertung der Therapie als sinnvoll. In bisherigen Studien hatten entweder alle Probanden Erfahrung mit AT, und könnten daher voreingenommen gewesen

sein, oder dieser Parameter wurde nicht erfasst. Schlussfolgernd liefert diese Arbeit einen wichtigen Beitrag zur Erforschung der häufig genutzten, erfolgsversprechenden und wenig erforschten AT. Obwohl die Probanden als gesund in die Studie eingeschlossen wurden, zeigten sich in ausgewählten krankheitsübergreifenden Parametern Verbesserungen, weshalb die Bedeutsamkeit der AT auch für die erkrankte Bevölkerung vermutet werden kann. Dies gilt es in weiteren Studien noch genauer zu betrachten.

## 6 Literaturverzeichnis

1. Kanitz JL, Pretzer K, Reif M, et al. The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults. *Complementary Therapies in Medicine*. Oct 2011;19(5):247-255.
2. Kanitz JL, Pretzer K, Reif M, et al. The impact of eurythmy therapy on fatigue in healthy adults-A controlled trial. *European Journal of Integrative Medicine*. Sep 2012;4(3):E289-E297.
3. Seifert G, Kanitz JL, Pretzer K, et al. Improvement of Heart Rate Variability by Eurythmy Therapy After a 6-Week Eurythmy Therapy Training. *Integrative Cancer Therapies*. Jun 2012;11(2):111-119.
4. Seifert G, Kanitz JL, Pretzer K, et al. Improvement of circadian rhythm of heart rate variability by eurythmy therapy training. *Evid Based Complement Alternat Med*. 2013;2013:564340.
5. Kanitz JL, Reif M, Rihs C, Krause I, Seifert G. A randomised, controlled, single-blinded study on the impact of a single rhythmical massage (anthroposophic medicine) on well-being and salivary cortisol in healthy adults. *Complement Ther Med*. Oct 2015;23(5):685-692.
6. Berger B, Bertram M, Kanitz J, Pretzer K, Seifert G. "Like Walking into an Empty Room": Effects of Eurythmy Therapy on Stress Perception in Comparison with a Sports Intervention from the Subjects' Perspective-A Qualitative Study. *Evidence-Based Complementary and Alternative Medicine*. 2015.
7. Kaatsch P, Spix C. *Jahresbericht 2008 des Deutschen Kinderkrebsregisters*. Mainz: Institut für Medizinische Biometrie, Epidemiologie und Informatik; 2009.
8. Mostoufi-Moab S, Grimberg A. Pediatric brain tumor treatment: growth consequences and their management. *Pediatr Endocrinol Rev*. Sep 2010;8(1):6-17.
9. Mulhern RK, Merchant TE, Gajjar A, Reddick WE, Kun LE. Late neurocognitive sequelae in survivors of brain tumours in childhood. *Lancet Oncol*. Jul 2004;5(7):399-408.
10. Laengler A, Spix C, Seifert G, Gottschling S, Graf N, Kaatsch P. Complementary and alternative treatment methods in children with cancer: A population-based retrospective survey on the prevalence of use in Germany. *Eur J Cancer*. Oct 2008;44(15):2233-2240.
11. Dobos G, Altner N, Lange S, et al. Mind-body medicine as a part of German integrative medicine. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*. Aug 2006;49(8):723-728.
12. Kanitz JL, Camus MEM, Seifert G. Keeping the balance - an overview of mind-body therapies in pediatric oncology. *Complementary Therapies in Medicine*. Apr 2013;21:S20-S25.
13. Langler A, Spix C, Edelhauser F, et al. Anthroposophic Medicine in Paediatric Oncology in Germany: Results of a Population-Based Retrospective Parental Survey. *Pediatric Blood & Cancer*. Dec 1 2010;55(6):1111-1117.
14. Kirchner-Bockholt M. *Grundelemente der Heil-Eurythmie*. 4 ed. Dornach: Verlag am Goetheanum; 1997.
15. Antonovsky A. *Unraveling the mystery of health. How people manage stress and stay well*. San Francisco: Jossey-Bass; 1988.
16. Kanitz JL, Pretzer K, Calaminus G, et al. Eurythmy therapy in the aftercare of pediatric posterior fossa tumour survivors-A pilot study. *Complementary Therapies in Medicine*. Apr 2013;21:S3-S9.
17. Majorek M, Tuchelmann T, Heusser P. Therapeutic Eurythmy-movement therapy for children with attention deficit hyperactivity disorder (ADHD): a pilot study. *Complement Ther Nurs Midwifery*. Feb 2004;10(1):46-53.
18. Hamre HJ, Becker-Witt C, Glockmann A, Ziegler R, Willich SN, Kiene H. Anthroposophic therapies in chronic disease: the Anthroposophic Medicine Outcomes Study (AMOS). *Eur J Med Res*. Jul 30 2004;9(7):351-360.
19. Hamre HJ, Witt CM, Glockmann A, Ziegler R, Willich SN, Kiene H. Eurythmy therapy in chronic disease: a four-year prospective cohort study. *BMC Public Health*. 2007;7:61.

20. Fischer K, Rheingans H. Vergleichende Untersuchung einer künstlerisch-übenden mit einer konventionell aktiv-trainierenden Kurbehandlung an Herz- und Kreislaufkranken mit einer Herzinfarktgruppe. . *Erfahrungsheilkunde*. 1985;3:146-152.
21. Bräuner-Gülow G. Heileurythmie bei Magersucht im Jugendalter. Methodik zur Bewegungsanalyse. Aspekte zur Diagnostik, Bewegungstherapie und Forschungsstand. Zusammenfassung einer Pilotstudie von 2002-2005. . *Der Merkurstab*. 2006;59:512--524.
22. Kröz M, Fink M, Reif M, et al. Multimodal Therapy Concept and Aerobic Training in Breast Cancer Patients With Chronic Cancer-Related Fatigue. *Integrative Cancer Therapies*. 2012;12(4):301-311.
23. Zerm R, Lutnaes-Mast F, Mast H, Girke M, Kröz M. Effects of Eurythmy Therapy in the Treatment of Essential Arterial Hypertension: A Pilot Study. *Global Advances in Health and Medicine*. 2013;2(1):24-30.
24. Hamre HJ, Witt CM, Glockmann A, et al. Anthroposophic vs. conventional therapy for chronic low back pain: a prospective comparative study. *Eur J Med Res*. Jul 26 2007;12(7):302-310.
25. Seifert G, Driever PH, Pretzer K, et al. Effects of complementary eurythmy therapy on heart rate variability. *Complement Ther Med*. Jun 2009;17(3):161-167.
26. Hamre HJ, Witt CM, Glockmann A, Ziegler R, Willich SN, Kiene H. Rhythmical massage therapy in chronic disease: a 4-year prospective cohort study. *J Altern Complement Med*. Jul-Aug 2007;13(6):635-642.
27. Ostermann T, Blaser G, Bertram M, Michalsen A, Matthiessen PF, Kraft K. Effects of rhythmic embrocation therapy with solum oil in chronic pain patients: a prospective observational study. *Clin J Pain*. Mar-Apr 2008;24(3):237-243.
28. Bussing A, Ostermann T, Majorek M, Matthiessen PF. Eurythmy Therapy in clinical studies: a systematic literature review. *BMC Complement Altern Med*. 2008;8:8.
29. Husserl E, Held K. *Die phänomenologische Methode. Ausgewählte Texte* Vol 1. Berlin: Philipp Reclam jun; 1998.
30. Bertram M, Ostermann T, Matthiessen PE. [Investigation of the rhythmical embrocating according to Wegman/Hauschka]. *Pflege*. Aug 2005;18(4):227-235.
31. Patterson M, Maurer S, Adler SR, Avins AL. A novel clinical-trial design for the study of massage therapy. *Complement Ther Med*. Jun 2008;16(3):169-176.
32. Kudielka BM, Buske-Kirschbaum A, Hellhammer DH, Kirschbaum C. HPA axis responses to laboratory psychosocial stress in healthy elderly adults, younger adults, and children: impact of age and gender. *Psychoneuroendocrinology*. Jan 2004;29(1):83-98.
33. Schaarschmidt U, Fischer A. *Arbeitsbezogenes Verhaltens- und Erlebensmuster (AVEM)*. 3 ed. London: Pearson; 2008.
34. Burisch M. *Das Burnout-Syndrom (2. Auflage)*. Berlin; 1994.
35. Schaarschmidt U, Fischer AW. *Bewältigungsmuster im Beruf. Persönlichkeitsunterschiede in der Auseinandersetzung mit der Arbeitsbelastung*. Göttingen; 2000.
36. Bullinger M, Kirchberger I. *SF-36 Fragebogen zum Gesundheitszustand*. Göttingen: Hogrefe; 1998.
37. World, Health, Organization. WHOQoL Study Protocol. *WHO*. 1993(MNH7PSF/93.9.).
38. Lüthi H. Assessment: SF-36 - Lebensqualität transparent machen. *Ergopraxis*. 2009;02 (9):30-31.
39. Smets EM, Garssen B, Bonke B, De Haes JC. The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue. *J Psychosom Res*. Apr 1995;39(3):315-325.
40. Ream E, Richardson A. Fatigue: a concept analysis. *Int J Nurs Stud*. Oct 1996;33(5):519-529.
41. Curt GA. Impact of fatigue on quality of life in oncology patients. *Semin Hematol*. Oct 2000;37(4 Suppl 6):14-17.

42. Molassiotis A, Sylt P, Diggins H. The management of cancer-related fatigue after chemotherapy with acupuncture and acupressure: a randomised controlled trial. *Complement Ther Med*. Dec 2007;15(4):228-237.
43. Martin A, Chalder T, Rief W, Braehler E. The relationship between chronic fatigue and somatization syndrome: a general populations survey. *J Psychosom Res*. 2007;63(2):147-156.
44. Schwarz R, Krauss O, Hinz A. Fatigue in the general population. *Onkologie*. Apr 2003;26(2):140-144.
45. Osoba D, Rodrigues G, Myles J, Zee B, Pater J. Interpreting the significance of changes in health-related quality-of-life scores. *J Clin Oncol*. Jan 1998;16(1):139-144.
46. Steyer R, Schwenkmezger P, Notz P, Eid M. *Der Mehrdimensionale Befindlichkeitsfragebogen (MDBF)*. Göttingen: Hogrefe Verlag für Psychologie; 1997.
47. Hellhammer DH, Wust S, Kudielka BM. Salivary cortisol as a biomarker in stress research. *Psychoneuroendocrinology*. Feb 2009;34(2):163-171.
48. Hayano J, Sakakibara Y, Yamada A, et al. Accuracy of assessment of cardiac vagal tone by heart rate variability in normal subjects. *Am J Cardiol*. Jan 15 1991;67(2):199-204.
49. Frederiks J, Swenne GA, TenVoorde BJ, et al. The importance of high-frequency paced breathing in spectral baroreflex sensitivity assessment. *Journal of Hypertension*. Nov 2000;18(11):1635-1644.
50. Porta A, Guzzetti S, Montano N, et al. Entropy, entropy rate, and pattern classification as tools to typify complexity in short heart period variability series. *Ieee Transactions on Biomedical Engineering*. Nov 2001;48(11):1282-1291.
51. Merson RK, Kendall PL. Das fokussierte Interview. In: Hopf C, Weingarten E, eds. *Qualitative Sozialforschung*: Klett-Cotta; 1979:171-204.
52. Cohen J. *Statistical power analysis for the behavioral sciences*. 2 ed. Hillsdale, New Jersey: Laurence Erlbaum Associates; 1988.
53. Voss A, Kurths J, Kleiner HJ, et al. The application of methods of non-linear dynamics for the improved and predictive recognition of patients threatened by sudden cardiac death. *Cardiovasc Res*. Mar 1996;31(3):419-433.
54. Strübing J. Grounded Theory. Zur sozialtheoretischen und epistemologischen Fundierung des Verfahrens der empirisch begründeten Theoriebildung. In: Verlag S, ed. *Qualitative Sozialforschung*. 15; 2008.
55. Mayring P. *Qualitative Inhaltsanalyse, Grundlagen und Techniken*. Vol 2. Berlin; 2010.
56. Kelle U, Kluge S. *Vom Einzelfall zum Typus: Fallvergleich und Fallkontrastierung in der Qualitativen Sozialforschung*. 2 ed. Wiesbaden: Springer Fachmedien GmbH; 2010.
57. Hall M, Vasko R, Buysse D, et al. Acute stress affects heart rate variability during sleep. *Psychosom Med*. Jan-Feb 2004;66(1):56-62.
58. Koch S, Hillert A, Geissner E. [Diagnostic instruments for occupational stress experience and coping in psychosomatic rehabilitation]. *Rehabilitation (Stuttg)*. Apr 2007;46(2):82-92.
59. Esch T, Duckstein J, Welke J, Braun V. Mind/body techniques for physiological and psychological stress reduction: stress management via Tai Chi training - a pilot study. *Med Sci Monit*. Nov 2007;13(11):CR488-497.
60. Griffith JM, Hasley JP, Liu H, Severn DG, Conner LH, Adler LE. Qigong stress reduction in hospital staff. *J Altern Complement Med*. Oct 2008;14(8):939-945.
61. Smith C, Hancock H, Blake-Mortimer J, Eckert K. A randomised comparative trial of yoga and relaxation to reduce stress and anxiety. *Complement Ther Med*. Jun 2007;15(2):77-83.
62. Langhorst J, Mueller T, Luedtke R, et al. Effects of a comprehensive lifestyle modification program on quality-of-life in patients with ulcerative colitis: a twelve-month follow-up. *Scand J Gastroenterol*. Jun 2007;42(6):734-745.
63. Michalak J, Rohde K, Troje NF. How we walk affects what we remember: Gait modifications through biofeedback change negative affective memory bias. *Journal of Behavior Therapy and Experimental Psychiatry*. Mar 2015;46:121-125.

64. Chang RY, Koo M, Yu ZR, et al. The effect of t'ai chi exercise on autonomic nervous function of patients with coronary artery disease. *J Altern Complement Med.* Nov 2008;14(9):1107-1113.
65. Lee MS, Kim MK, Lee YH. Effects of Qi-therapy (external Qigong) on cardiac autonomic tone: a randomized placebo controlled study. *Int J Neurosci.* Sep 2005;115(9):1345-1350.
66. Kutner JS, Smith MC, Corbin L, et al. Massage therapy versus simple touch to improve pain and mood in patients with advanced cancer: a randomized trial. *Ann Intern Med.* Sep 16 2008;149(6):369-379.
67. Moyer CA, Rounds J, Hannum JW. A meta-analysis of massage therapy research. *Psychol Bull.* Jan 2004;130(1):3-18.
68. Witt CM, Schutzler L. The gap between results from sham-controlled trials and trials using other controls in acupuncture research-The influence of context. *Complementary Therapies in Medicine.* Apr 2013;21(2):112-114.
69. Rosenthal R, Fode KL. The Effect of Experimenter Bias on the Performance of the Albino-Rat. *Behavioral Science.* 1963;8(3):183-189.

## **Eidesstattliche Versicherung**

šIch, Jenny Lena Kanitz, versichere an Eides statt durch meine eigenhändige Unterschrift, dass ich die vorgelegte Dissertation mit dem Thema: šUntersuchung psychometrischer und physiologischer Wirkungen Anthroposophischer Therapien aus dem Bereich der Mind-Body Therapienš selbstständig und ohne nicht offengelegte Hilfe Dritter verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel genutzt habe.

Alle Stellen, die wörtlich oder dem Sinne nach auf Publikationen oder Vorträgen anderer Autoren beruhen, sind als solche in korrekter Zitierung (siehe šUniform Requirements for Manuscripts (URM)š des ICMJE -[www.icmje.org](http://www.icmje.org)) kenntlich gemacht. Die Abschnitte zu Methodik (insbesondere praktische Arbeiten, Laborbestimmungen, statistische Aufarbeitung) und Resultaten (insbesondere Abbildungen, Graphiken und Tabellen) entsprechen den URM (s.o) und werden von mir verantwortet.

Meine Anteile an den ausgewählten Publikationen entsprechen denen, die in der untenstehenden gemeinsamen Erklärung mit dem/der Betreuer/in, angegeben sind. Sämtliche Publikationen, die aus dieser Dissertation hervorgegangen sind und bei denen ich Autor bin, entsprechen den URM (s.o) und werden von mir verantwortet.

Die Bedeutung dieser eidesstattlichen Versicherung und die strafrechtlichen Folgen einer unwahren eidesstattlichen Versicherung (§156,161 des Strafgesetzbuches) sind mir bekannt und bewusst.š

## **Anteilserklärung**

Jenny Lena Kanitz hatte folgenden Anteil an den folgenden Publikationen:

Publikation 1: **Kanitz JL**, Pretzer K, Reif M, Voss A, Brand R, Warschburger P, Längler A, Henze G, Seifert G. The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults. *Complementary Therapies in Medicine* (2011) 19, 247 ó 255.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung und Screening der gesunden Probanden
- Klinische Untersuchung mittels Fragebögen
- Begleitung und Betreuung der Probanden bei der Eurythmietherapie
- Verantwortlich für die Herzfrequenzvariabilitätsmessungen
- Dateneingabe und -Auswertung mit SPSS
- Schreiben des Manuskripts und substantielle Mitwirkung an der Anfertigung der Publikation in der vorliegenden Form
- Submission des Manuskripts

Publikation 2: **Kanitz JL**, Pretzer K, Reif M, Witt K, Reulecke S, Voss A, Längler A, Henze G, Seifert G. The impact of eurythmy therapy on fatigue in healthy adults ó A controlled trial. *European Journal of Integrative Medicine* (2012), Vol. 4, Issue 3, e289 ó e297.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung und Screening der gesunden Probanden
- Klinische Untersuchung mittels Fragebögen
- Begleitung und Betreuung der Probanden bei der Eurythmietherapie
- Verantwortlich für die Herzfrequenzvariabilitätsmessungen
- Schreiben des Manuskripts und substantielle Mitwirkung an der Anfertigung der Publikation in der vorliegenden Form

Publikation 3: Seifert G, **Kanitz JL**, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Heart Rate Variability by Eurythmy Therapy After a 6-Week Eurythmy Therapy Training. Integrative Cancer Therapies (2012), 11(2), p. 111 ó 119.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung und Screening der gesunden Probanden
- Klinische Untersuchung mittels Fragebögen
- Begleitung und Betreuung der Probanden bei der Eurythmietherapie
- Verantwortlich für die Herzfrequenzvariabilitätsmessungen
- Mitwirkung an der Anfertigung der Publikation in der vorliegenden Form

Publikation 4: Seifert G, **Kanitz JL**, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Circadian Rhythm of Heart Rate Variability by Eurythmy Therapy Training. Evidence-Based Complementary and Alternative Medicine (2013), Article ID 564340, 9 pages.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung und Screening der gesunden Probanden
- Klinische Untersuchung mittels Fragebögen
- Begleitung und Betreuung der Probanden bei der Eurythmietherapie
- Verantwortlich für die Herzfrequenzvariabilitätsmessungen
- Mitwirkung an der Anfertigung der Publikation in der vorliegenden Form

Publikation 5: **Kanitz JL**, Reif M, Rihs C, Krause I, Seifert G. A Randomised, Controlled, Single-blinded Study on the Impact of a Single Rhythmical Massage (Anthroposophic Medicine) on Well-being and Salivary-Cortisol in Healthy Adults. Complementary Therapies in Medicine (2015), 23, p. 685 ó 692.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung und Screening der Probanden
- Klinische Untersuchung mittels Fragebögen
- Verantwortlich für die Herzfrequenzvariabilitätsmessungen
- Mitwirkung an der Anfertigung der Publikation in der vorliegenden Form

Publikation 6: Berger B, Bertram M, **Kanitz JL**, Pretzer K, Seifert G. „Like Walking into an Empty Room: Effects of Eurythmy Therapy on Stress Perception in Comparison with a Sports Intervention from the Subjects' Perspective – A Qualitative Study. Evidence-Based Complementary and Alternative Medicine (2015), Article ID 856107, 11 pages.

- Mitentwicklung des Studiendesigns und Auswahl der psychometrischen Zielparameter
- Co-autorin des Projektantrags und des Ethikkommissionsantrags
- Rekrutierung der Probanden
- Leitfadenentwicklung
- Interviewdurchführung
- Transkription der Interviews
- Korrektur und Überarbeitung der Publikation

## Ausgewählte Publikationen

**Kanitz JL, Pretzer K, Reif M, Voss A, Brand R, Warschburger P, Längler A, Henze G, Seifert G. The impact of eurhythm therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults. *Complementary Therapies in Medicine* (2011) 19, 247-255.**

*Background:* Stress and health-related quality of life (HRQoL) are two important theoretical constructs for modern therapy evaluation with clinical relevance. Eurhythm therapy (EYT) is a mind-body-therapy derived from anthroposophic medicine with promising effects on heart rate variability (HRV), HRQoL and disease scores. The purpose of this study was to investigate the impact of EYT on stress coping strategies (SCS) and HRQoL in a controlled study with moderately stressed participants.

*Methods:* 68 healthy, moderately stressed adults (mean age: 42.2; SD: 8.2) performed 10 h of EYT in a group setting over a period of six weeks. A non-randomised control group of 22 healthy adults (mean age: 43.6; SD: 13.7) received no intervention and did only complete the questionnaires at the same data points. Outcomes were measured before and after the intervention (AVEM & SF-36).

*Results:* A significant impact on SCS was found in seven AVEM scales (MANOVA,  $F(1/74) = 4.59$ ;  $p = .04$ ). With regard to changes in risk pattern affiliation (AVEM), 24% of the participants receiving EYT ( $n = 55$ ) changed over time from a risky stress coping pattern to a healthier pattern. Concerning the HRQoL four normally distributed scales of the SF-36 (vitality, social functioning, mental health and physical functioning) showed a significant group  $\times$  time interaction favouring the EYT group (MANOVA,  $F(1/74) = 17.26$ ;  $p < .001$ ). Statistically and clinically relevant mean differences over time of at least eight scale points were found for role physical, bodily pain, vitality and mental health and of at least 15 scale points for role emotional and social functioning.

*Conclusions:* A six-week period of EYT training can result in a significant reduction of stress and consequently improve QoL. Because a significant proportion of participants had high levels of stress at baseline the results suggest a health-enhancing benefit of EYT that may have clinical potential for prevention of stress and associated disorders in healthy individuals and possibly in patients with chronic diseases, for example.

doi: <http://dx.doi.org/10.1016/j.ctim.2011.06.008>

**Kanitz JL, Pretzer K, Reif M, Witt K, Reulecke S, Voss A, Längler A, Henze G, Seifert G.  
The impact of eurythmy therapy on fatigue in healthy adults ó A controlled trial.  
European Journal of Integrative Medicine (2012), Vol. 4, Issue 3, e2896e297.**

*Introduction:* Fatigue is considered a principal side effect of cancer and other chronic illnesses, and has also been reported in the healthy population characterised by reduced motivation and tiredness. The present study was conducted to evaluate the impact of eurythmy therapy (EYT) as a promising mindó body therapy on fatigue symptoms, to assess the participantsø subjective evaluation of the EYT and the correlation with heart rate variability (HRV) parameters.

*Methodology:* Sixty-eight healthy adults (mean age: 42.2; SD: 8.2) performed 10 h of EYT in a group setting over a period of six weeks. A non- randomised control group ( $n = 22$ ; mean age: 43.6; SD: 13.7) received no intervention. Fatigue was assessed by questionnaire (multidimensional fatigue inventory, MFI) before and after the intervention. Twenty-three females from the EYT group participated in two additional HRV assessments over 24 h.

*Results:* The two groups showed statistically significant changes in fatigue symptoms over time (multivariate:  $F(1/72) = 17.43$ ;  $p < 0.001$ ). Furthermore, the decrease of fatigue symptoms correlated with a proportional enhancement of the higher frequency and a decrease in the ultra and very low frequency components after EYT. Although half of the participants did not expect positive effects of the EYT at baseline, all participants reported that they did profit from the EYT.

*Conclusion:* The psychometric data match the participantsø subjective assessment of the EYT and correlates with improvements of HRV, which is probably an indicator for an improvement of autonomic regulation process by a more relaxed physical activity.

doi: <http://dx.doi.org/10.1016/j.eujim.2012.02.006>

**Seifert G, Kanitz JL, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Heart Rate Variability by Eurythmy Therapy After a 6-Week Eurythmy Therapy Training. Integrative Cancer Therapies (2012), 11(2), p. 1116119.**

*Background:* Eurythmy therapy (EYT) is a mind-body therapy used in anthroposophic medicine. Recently, the authors were able to show that at comparable workloads, EYT stimulated heart rate variability (HRV) whereas conventional ergometer training attenuated HRV. Furthermore, a long-term improvement of quality of life (QoL) and stress coping strategies by EYT could be shown.

*Objective:* This study aimed to evaluate the long-term effects of EYT training on HRV.

*Design:* A total of 23 healthy women (mean age =  $44.57 \pm 8.04$  years) performed 10 hours of EYT over a period of 6 weeks. Electrocardiograms were recorded before and after the EYT trial. HRV was quantified by the extent of high (HF), low (LF), very low (VLF), and ultra low frequency (ULF) oscillations of heart rate.

*Results:* Autonomic regulation was significantly changed following the EYT training compared with baseline. Especially the proportion referring to the total power (P) of HF/P and LF/P increased, whereas ULF/P and (ULF/VLF)/P decreased after the training period.

*Conclusion:* EYT shifted the autonomic regulation proportionally referring to the total power mainly caused by changes of ULF and VLF components of HRV. The LF and HF spectral components were also decreased following EYT while their proportion in relation to the total variance of the power spectrum was increased. The proportional enhancement of the higher frequency and the decrease of the ULF and VLF components are probably an indicator of an improvement of autonomic regulation processes by more relaxed physical activity after the EYT training, thus supporting the plausibility of the improved QoL and better stress coping strategies.

doi: <http://dx.doi.org/10.1177/1534735411413263>

**Seifert G, Kanitz JL, Pretzer K, Henze G, Witt K, Reulecke S, Voss A. Improvement of Circadian Rhythm of Heart Rate Variability by Eurythmy Therapy Training. Evidence-Based Complementary and Alternative Medicine (2013), Article ID 564340, 9 pages**

*Background:* Impairment of circadian rhythm is associated with various clinical problems. It not only has a negative impact on quality of life but can also be associated with a significantly poorer prognosis. Eurythmy therapy (EYT) is an anthroposophic movement therapy aimed at reducing fatigue symptoms and stress levels.

*Objective:* This analysis of healthy subjects was conducted to examine whether the improvement in fatigue symptoms was accompanied by improvements in the circadian rhythm of heart rate variability (HRV).

*Design:* Twenty-three women performed 10 hours of EYT over six weeks. Electrocardiograms (ECGs) were recorded before and after the EYT trial. HRV was quantified by parameters of the frequency and time domains and the nonlinear parameters of symbolic dynamics.

*Results:* The day-night contrast with predominance of vagal activity at night becomes more pronounced after the EYT training, and with decreased Ultralow and very low frequencies, the HRV shows evidence of calmer sleep. During the night, the complexity of the HRV is significantly increased indicated by nonlinear parameters.

*Conclusion:* The analysis of the circadian patterns of cardiophysiological parameters before and after EYT shows significant improvements in HRV in terms of greater day-night contrast caused by an increase of vagal activity and calmer and more complex HRV patterns during sleep.

## Research Article

# Improvement of Circadian Rhythm of Heart Rate Variability by Eurythmy Therapy Training

Georg Seifert,<sup>1</sup> Jenny-Lena Kanitz,<sup>1</sup> Kim Pretzer,<sup>1</sup> Günter Henze,<sup>1</sup> Katharina Witt,<sup>2</sup>  
Sina Reulecke,<sup>2</sup> and Andreas Voss<sup>2</sup>

<sup>1</sup> Task Force Integrative Medicine in Pediatric Oncology, Department of Pediatric Oncology and Hematology, Otto-Heubner-Center for Pediatric and Adolescent Medicine (OHC), Charité-Universitätsmedizin Berlin, Augustenburger Platz 1, 13353 Berlin, Germany

<sup>2</sup> Department of Medical Engineering, University of Applied Sciences Jena, 07745 Jena, Germany

Correspondence should be addressed to Georg Seifert; [georg.seifert@charite.de](mailto:georg.seifert@charite.de)

Received 19 June 2012; Revised 29 November 2012; Accepted 18 December 2012

Academic Editor: Thomas Ostermann

Copyright © 2013 Georg Seifert et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Background.** Impairment of circadian rhythm is associated with various clinical problems. It not only has a negative impact on quality of life but can also be associated with a significantly poorer prognosis. Eurythmy therapy (EYT) is an anthroposophic movement therapy aimed at reducing fatigue symptoms and stress levels. **Objective.** This analysis of healthy subjects was conducted to examine whether the improvement in fatigue symptoms was accompanied by improvements in the circadian rhythm of heart rate variability (HRV). **Design.** Twenty-three women performed 10 hours of EYT over six weeks. Electrocardiograms (ECGs) were recorded before and after the EYT trial. HRV was quantified by parameters of the frequency and time domains and the nonlinear parameters of symbolic dynamics. **Results.** The day-night contrast with predominance of vagal activity at night becomes more pronounced after the EYT training, and with decreased Ultralow and very low frequencies, the HRV shows evidence of calmer sleep. During the night, the complexity of the HRV is significantly increased indicated by nonlinear parameters. **Conclusion.** The analysis of the circadian patterns of cardiophysiological parameters before and after EYT shows significant improvements in HRV in terms of greater day-night contrast caused by an increase of vagal activity and calmer and more complex HRV patterns during sleep.

## 1. Introduction

Eurythmy therapy (EYT) is a mind-body therapy widely used in *anthroposophic medicine* in Europe. In a crossover study in healthy subjects, deeper relaxation and improved vagal activity of heart rate variability were found after a single session of EYT compared with training on an exercise bicycle [1]. This study shows on the basis of physiological measurements that EYT is a highly effective body therapy intervention with regard to achievement of states of deep relaxation and stimulation of heart rate variability (HRV). The study showed that despite identical levels of exertion, the vagal stimulation following EYT was qualitatively very different from that after exercise bicycle training. EYT is indicated for somatic diseases as well as for psychosomatic diseases such as states of stress, burnout, chronic fatigue, or insomnia. In addition to clinical experience and a number of anecdotal reports, there

is some evidence in the literature that EYT can have positive effects in various chronic diseases [2, 3]. Heart rate variability has considerable potential to assess the role of autonomic nervous system (ANS) fluctuations in normal healthy individuals and in patients with various cardiovascular and noncardiovascular disorders [4]. The conventional statistical methods calculating variance and power spectral analysis of HRV are most often used [5]. The high-frequency (from 0.15 to 0.4 Hz) fluctuations of heart rate are determined by respiration representing autonomic neural fluctuations and central blood volume alterations [6]. These high-frequency fluctuations are modified by the phenomenon called Respiratory gate [7]. The low-frequency (from 0.04 to 0.15 Hz) fluctuations of heart rate have been proposed to be derived from the arterial pressure Mayer waves, whose major determinant is considered to be sympathetic vasomotor activity [6]. The very-low-frequency fluctuations (below 0.04 Hz) have been

attributed to the renin-angiotensin system, other humoral factors, and thermoregulation. For example, it has been shown that the reduction in HRV correlates reliably with the subjective quality of sleep in patients suffering from CFS [2, 3].

Methods of HRV analysis based on nonlinear system theory and beat-to-beat dynamics have gained recent interest as they may reveal dedicated changes of heart rate time series [5]. Several types of different fractal scaling measures, power-law analyses, complexity measures, measures of symbolic dynamics, turbulence, and deceleration capacity of heart rate have been studied in various patient populations. These methods of analysing HRV aim to assess qualitative properties rather than the magnitude of the signal [5].

Many stressors such as stress at work, anxiety, and depression are associated with reduced HRV and/or increased sympathetic activity and decreased vagal activity. Loss of the protective vagal activity is associated with an unfavourable prognosis with regard to various cardiovascular diseases and sudden cardiac death [8]. Various changes in HRV or the autonomic nervous system are seen particularly in mental and psychosomatic diseases. It should be emphasised that the reduction in HRV correlates reliably with the subjective quality of sleep in patients suffering from CFS [2, 3]. Therefore physiological measurements of HRV are particularly suitable for investigation of complex body therapies such as yoga [9], meditation [10], or EYT [1] which are reported to have a regulating effect on stress and night-time sleep [11, 12].

This study is based on previously published data from a study involving 68 healthy, moderately stressed adults (mean age: 42.2; SD: 8.2) which showed that a 6-week course of EYT training can significantly improve quality of life and stress coping in comparison with an untreated control group. The data also showed a significant decrease in the initially pronounced fatigue symptoms [2, 3].

In this continuative analysis of the study, we tested the hypothesis that the clinical improvements in the fatigue symptoms would also be reflected in a changed chronobiological circadian pattern of HRV. Therapeutic experience shows that EYT has a positive impact on night-time sleep, which might thus explain the published improvements in the fatigue symptoms [11]. The rationale for the study hypothesis was the demonstrated connection between reduced quality of night-time sleep and reduced HRV in patients with CFS symptoms [2, 3]. Circadian chronobiological rhythm in this context means particularly the fluctuation between the different physiological states of the ANS during the day and during the night. In order to explore this question, we undertook this detailed analysis of a cohort completing a six-week period of EYT training.

## 2. Methods

**2.1. Subjects.** The study group comprised 23 healthy women (mean age: 45.97), who were recruited from a population of teachers and nursery teachers. Each subject had an intervention of two treatment sessions per week over a period of 6 weeks. Before beginning the EYT, the subjects completed a baseline visit involving performance of a psychometric

test. In addition, the level of activity was controlled by requesting from the subjects to refrain from sport or other unusual physical activity and from consumption of alcohol or stimulants. The 23 women consented to recording of a 24-hour electrocardiogram (ECG) before and after the EYT. The study was approved by the Ethics Committee of the Charité-Universitätsmedizin Berlin.

**2.2. EYT Intervention.** Two EYT therapists conducted the training. The exercises were learned gradually over 2 weeks and repeated in each treatment unit (45 minutes) so that the subjects were able to perform them independently later. The sequence followed an identical pattern throughout the 6 weeks. The rhythm exercises are special EYT exercise sequences performed on the basis of the speech rhythms of verses or poems. Lyrical patterns or rhythms such as the hexameter (the classical metre of epic poetry), dactyl (a metre consisting of one heavy (long) syllable followed by two light (short) syllables), anapest (reverse of dactyl), or other variations are used. These involve rising and falling speech rhythms translated into movement and acceleration and deceleration. In addition, ball exercises, rod exercises, stepping exercises, and central speech sound exercises with consonants (L and M) formed a part of each treatment unit. The essential element of these movement exercises is the alternation between tension and relaxation and a harmonious relationship between inhalation and exhalation. For the emotional (soul) sector, exercises on spatial orientation and boundary formation and geometric exercises for inner structuring (iamb and trochee) were used. This was followed by speech sound exercises with vowels O, E, and U and soul exercise with E. Concluding exercises with a meditative character in combination with physical movement used phrases such as "I have calm within myself, I have within me the forces that give me strength." These EYT exercises were chosen because we believed that this combination would have some impact on HRV as well as on the clinical outcome parameters concerning quality of life and stress.

**2.3. HRV.** From the raw 24 h Holter ECG data, 4 h of day time (10.00 a.m. to 02.00 p.m.) and 4 h of night time (00.00 to 04.00 a.m.) were calculated, and time series of heart rate (tachogram) consisting of beat-to-beat intervals (BBIs) were extracted. The participants were instructed to sleep normally during the night and to refrain from alcohol and stimulants. This was checked by means of activity protocols. To obtain normal-to-normal (NN) heart beat time series, ectopic beats and disturbances or artifacts were interpolated in the given BBI series applying an adaptive variance estimation algorithm [13].

On the basis of the guidelines of the Task Force of the European Society of Cardiology [4], the following HRV standard indices from the time and frequency domains were calculated from the tachograms:

**2.3.1. Time Domain.** Consider the following:

- (i) meanNN = mean value of NN interval time series (ms);

- (ii) sdNN = standard deviation of NN interval time series (ms);
- (iii) rmssd = square root of the mean squared differences of successive N intervals (ms).

2.3.2. *Frequency Domain.* Power spectra were calculated by applying fast Fourier transform with a Blackman Harris window of equidistant NN interval time series. To obtain equidistant time series, the tachograms were linearly interpolated and resampled at 10 Hz. From the spectrum, the following “standard” [9] indices were calculated:

- (i) ULF = power in the “ultralow” frequency band < 0.003 Hz;
- (ii) VLF = power in the “very low” frequency band 0.003–0.04 Hz;
- (iii) LF = power in the “low” frequency band 0.04–0.15 Hz;
- (iv) HF = power in the “high” frequency band 0.15–0.4 Hz;
- (v) LF/HF = ratio of LF to HF power;
- (vi) LFn = LF power normalized as  $LFn = LF/(LF + HF)$ ;
- (vii) HFn = HF power normalized as  $HFn = HF/(LF + HF)$ ;
- (viii) LF/P = LF power normalized by the total power  $P$ ;
- (ix) HF/P = HF power normalized by the total power  $P$ .

In addition, we calculated the following indices:

- (i)  $P$  = total power in the band 0.00–0.4 Hz;
- (ii)  $(ULF + VLF)/P$  = power in the frequency band 0.0–0.04 Hz (ULF + VLF) normalized to the total power (for modified version, see [14]).

### 2.3.3. Nonlinear Dynamics

(a) *Symbolic Dynamics (SD).* Symbolic dynamics is a nonlinear method which describes the global short- and long-term dynamics of beat-to-beat variability on the basis of symbolization. Methods of nonlinear symbolic dynamics analysis [4, 13] have been shown to be sufficient for the investigation of complex systems and describe dynamic aspects within time series. The method applied in this study (there are different approaches for deriving symbolic dynamics from a time series) is described in detail elsewhere [13], and in the following, only a brief introduction is given. The NN beat-to-beat interval time series are converted into an alphabet of four predefined symbols (0, 1, 2, and 3) [14] according to the transformation rules based on consecutive comparison of successive beat-to-beat intervals. The symbols “0” and “2” reflect slight deviations (increase or decrease) from the mean NN interval, and the symbols “1” and “3” reflect stronger deviations (increase or decrease over the mean NN interval and in addition over a predefined limit). Then, the symbol strings are transformed into word series where each word consists of three successive symbols. This leads to a range of 64 different word types (000,001,...,333). Then, we estimate from the word distribution the probability of occurrence (pWxxx) of each word type (xxx = 000, 001,...,333) within

NN interval time series. As an example, the word type 321 [6] (consisting of the successive symbols 3, 2, and 1) represents sequences of two decreasing beat-to-beat intervals followed by an increasing one and can be interpreted as a fast heart rate downregulation after a heart rate increase.

The indices pTH1 to pTH20 [15] represent the number of words with a probability of occurrence higher than a specific threshold (e.g., pTH7: 7%).

(b) *Short-Term Symbolic Dynamics (STSD).* The short-term symbolic dynamics is a modification procedure of symbolic dynamics and is introduced by Porta et al. [16]. This method used in windowed 300 beat-to-beat intervals. The time series is transformed into six symbol sequences (0–5). Each sequence of three symbols formed words which are summarized in word families. As follows, an example is explained. The sequence pattern 1 2 1 or 2 4 3 implies a maximum in the middle and represents peak.

(c) *Multiscale Entropy.* The multiscale entropy (MSE) analysis is a method to characterize the complexity of a finite length of interbeat (RR) interval time series. This method is based on sample entropy (SampEn), which quantifies the irregularity of a time series and estimates the conditional probability of similarity between two sequences of  $m$  and  $m+1$  consecutive datapoints. The discrete time series  $\{x_1, \dots, x_i, \dots, x_N\}$  is transformed into different time scales, whose values are  $\tau = 1, 2, \dots, 20$  (scale 1, ..., scale 20). For scale 1, the time series is simply the original time series. Scale 2 is generated by calculating the mean value of 2 successive values of the original time series with nonoverlapping windows. For each additional scale  $\tau$ , a successive average of  $\tau$  values of the original time series is determined. Finally, the sample entropy for each coarse-grained time series is calculated. Due to the averaging of a successively increasing number of values, the sample entropy of small scales (1–5 beats) is a measure for short-term complexity, whereas longer scales (6–20 beats) represent long-term complexity [17]. Thus, it estimates correlations at multiple (time) scales. The algorithm is described in detail elsewhere [16]. The MSE method demonstrated that healthy HRV is more complex than pathological HRV [16].

2.4. *Statistics.* The analysis was performed at first with the Friedman test as a nonparametric method. The nonparametric Wilcoxon rank-sum test was applied for the statistical analysis of two dependent samples. The evaluation was performed on the basis of the HRV indices of each subject before and after EYT separately for day and night times. Values of  $P < 0.05$  (\*) were regarded as statistically significant, values of  $P < 0.01$  (\*\*) as highly significant, and values of  $P < 0.001$  (\*\*\*) as most significant. Considering the day-night contrast, the significance test was applied between day time and night time before and after EYT.

A two-factor ANOVA with repeated measures normalising the data (by transformation) before analysis was applied to investigate (1) the general influence of EYT (factor time before/after EYT), (2) the influences of EYT on day and night times before and after EYT (factor phase), and (3) the interaction between the factors time and phase.

TABLE 1: Descriptive statistics of day/night time before and day/night time after EYT (mean value  $\pm$  standard deviation) of HRV indices of day/night time before and day/night time after EYT including significance ( $P$ ) of differences ( $*P < 0.05$ ,  $**P < 0.01$ , and  $***P < 0.001$ ; n.s.: not significant).

Method	Index	Day time before EYT	Night time before EYT	$P$	Day time after EYT	Night time after EYT	$P$
HRV	meanNN	719.9645 $\pm$ 97.5070	946.1659 $\pm$ 110.8942	***	722.7145 $\pm$ 97.5392	924.8230 $\pm$ 112.5868	***
	sdNN	85.4704 $\pm$ 22.0300	81.5635 $\pm$ 21.8195	n.s. (0,54)	86.6286 $\pm$ 27.7480	74.4476 $\pm$ 22.5824	n.s. (0,07)
	ULF	1126.2409 $\pm$ 883.6143	845.5170 $\pm$ 897.9354	n.s. (0,33)	1147.2612 $\pm$ 919.5328	586.1914 $\pm$ 557.9539	**
	LF/HF	6.6243 $\pm$ 3.6584	5.7644 $\pm$ 4.6834	n.s. (0,38)	6.3557 $\pm$ 3.1467	5.1150 $\pm$ 4.1323	n.s. (0,06)
	LFn	0.8458 $\pm$ 0.0612	0.7860 $\pm$ 0.1207	n.s. (0,06)	0.8434 $\pm$ 0.0590	0.7598 $\pm$ 0.1479	*
	HFn	0.1254 $\pm$ 0.0612	0.2140 $\pm$ 0.1207	n.s. (0,06)	0.1566 $\pm$ 0.0590	0.2402 $\pm$ 0.1479	*
	(ULF + VLF)/P	0.8695 $\pm$ 0.0665	0.8186 $\pm$ 0.0994	n.s. (0,07)	0.8648 $\pm$ 0.0799	0.7948 $\pm$ 0.0915	***
SD	pW232	0.0090 $\pm$ 0.0038	0.0113 $\pm$ 0.0050	n.s. (0,08)	0.0077 $\pm$ 0.0045	0.0132 $\pm$ 0.0077	**
	pTH7	2.8261 $\pm$ 0.8341	3.5217 $\pm$ 1.0388	**	2.9130 $\pm$ 0.9493	3.1304 $\pm$ 0.9197	n.s. (0,26)
STSD	peak	0.0580 $\pm$ 0.0168	0.0661 $\pm$ 0.0229	n.s. (0,06)	0.0524 $\pm$ 0.0157	0.0693 $\pm$ 0.0313	**
MSE	scale 2	1.1177 $\pm$ 0.3088	1.2196 $\pm$ 0.3020	n.s. (0,30)	1.1318 $\pm$ 0.2786	1.3841 $\pm$ 0.2733	**
	scale 20	1.5635 $\pm$ 0.2595	1.2889 $\pm$ 0.4138	**	1.5730 $\pm$ 0.3626	1.4349 $\pm$ 0.2847	n.s. (0,22)

$P$ : significance of differences: \* $P < 0.05$ , \*\* $P < 0.01$ , and \*\*\* $P < 0.001$ ; n.s.: not significant.

### 3. Results

**3.1. Heart Rate Variability.** The ECG data from 23 healthy women were evaluated before and after EYT. Several indices showed changes in the autonomic regulation between day time and night time. Only indices that showed significant changes ( $P < 0.05$ ) between day and night times before EYT but not after EYT and vice versa and indices that are standard HRV indices (time and frequency domains) in various other studies were considered.

The mean beat-to-beat interval (meanNN) was significantly different between day and night (increased during the night); however, this difference remained practically unchanged before and after EYT (Table 1). Table 1 shows the mean values and standard deviations of the indices. The standard deviation (sdNN) shows no significant differences between day and night even after EYT. LFn decreases during the night after EYT, whereas HFn increases. LF/HF is not significantly changed by EYT but exhibits a shift towards lower values (trend) confirming the LFn and HFn results. ULF and the normalized (ULF + VLF)/P decreased significantly during the night after EYT (Figure 1). The indices from symbolic dynamics word type pW232 and pTH7 are generally increased during the night. While pW232 shows significant differences between day and night after EYT, the index pTH7 changed in the opposite direction (significant between day and night before EYT and nonsignificant after EYT). Further, the index mean\_huegel from short-term symbolic dynamics is generally increased in the night. The day-night difference after EYT is increased, so that the significance level changed from nonsignificant to  $P < 0.01$ . Finally, the indices scale 2 and scale 20 from MSE are generally increased during the night time after EYT (Figure 2(b)), whereas they are not changed during day time (Figure 2(a)). The differences between day and night, however, are significantly increased after EYT in scale 2 and decreased in scale 20 (Figures 2(c) and 2(d)) after EYT.

Figure 3 shows the error bar of the indices scale 2 and scale 20 of the day and night times before and after EYT (confidence interval 95%).

The ANOVA analysis revealed highly significant phase dependencies in all indices with the exception of SDNN and LF/HF. No significant time dependencies and interactions could be found; however, a clear trend ( $P < 0.15$ ) especially in the indices scale 2 and scale 20, pW232, and mean\_huegel could be observed.

The differences between day and night times before and after EYT as percentage changes are demonstrated in Figure 4.

### 4. Discussion

The general aim of this study was to examine the physiological effects of an innovative intervention on day-time and night-time HRV and thus to provide a basis for optimization and explanation of new treatment approaches such as EYT. In this study of a cohort of 23 women completing a 6-week course of YET training, we analysed the 24-hour ECGs with respect to the circadian pattern of the HRV changes. The most important finding is that there are significant changes between the day and night times before EYT and the day and night times after EYT (Figure 4).

The 23 women in the study showed an increase in vagal activity (increased difference of HFn after EYT) and in the complexity of autonomous regulation (pW232, pTH7, mean\_huegel, and scales 2 and 20) during sleep and a more marked day-night contrast after EYT. These changes in the direction of greater complexity and altogether greater HRV during the night after EYT could reflect more refreshing sleep and explain the reduction in fatigue symptoms. This effect has been shown by the shift of the degree of variability and complexity represented mainly by the nonlinear indices (Table 1). A supporting result was found by Stein et al.

[18], who observed that exercise training increases total heart rate variability in normal older adults and that the most marked alterations are in nocturnal heart rate. This development is supported by the change of the ULF index. The reduction of the ultralow oscillations (ULF) during the night reflects more relaxed sleep with a smaller number of movements, while the changes during the day displayed a slightly modified HRV. These changes during sleep may be one explanation for the already published lesser fatigue symptoms [4, 13, 19] after the YET training. Furthermore, the complexity measures of symbolic dynamics (pW232 and pTH7), short-term symbolic dynamics (mean\_huegel), and MSE (scale 2 and scale 20) [16] show a comparable pattern. The index mean\_huegel is increased during the night after the 6-week course of YET training which means that the probability of occurrence of this word type is much more pronounced (representing increased short-term regulation related to increased vagal activity). In contrast, the index pTH7 is decreased during the night after EYT. This means that word types with a probability of occurrence of more than 7% are reduced. This causes an increase of other word types, again leading to increased complexity. The MSE indices scale 2 and scale 20 (Figures 2 and 3) confirm this development of increased complexity [15]. Even if the indices of all scales from MSE are generally increased during the night after EYT (Figure 2(b)) representing a general increase in complexity through all time scales, the differences between day and night, however, only showed a significant increase after EYT in scale 2 (Figure 3(a)). This could be a marker for increased short-term vagal activity (see also HFn). Interestingly, An et al. [20] could show that the state of relaxation after cyclic meditation results in parasympathetic dominance in women, as evidenced by the increased HF component of the RR-interval series. The fact that the dynamics of heart rate variability is different in women as compared to men has also been seen. The observed significant increase in complexity (sampling entropy) after the practice when the subjects report a sense of calmness and well-being.

Thus, in the context of the published data of the study, the subjects appear to sleep better at night and be more alert during the day resulting in a better quality of life [11, 21]. This finding is supported by the study of Grant et al. [22] who observed that exercise interventions lead to a significant increase in vagal influence during supine, rising, and standing.

It seems likely that negative influences such as daytime stress which can reduce vagal activity during the night [23] and shift the sympathovagal balance towards sympathetic predominance were reduced by the EYT intervention in this study. This was demonstrated by better stress coping abilities after the EYT intervention [4, 13, 19]. This is an interesting finding as we know the alarmingly negative association of stress with cardiovascular health [24]. Stimulation of vagal activity during the night has also been shown for other interventions, such as cyclic meditation [25].

The strength of this analysis is that the changes shown to result from the EYT training are confirmed by various methods of HRV analysis. The already published improvements in health-related QoL, stress coping, and fatigue symptoms

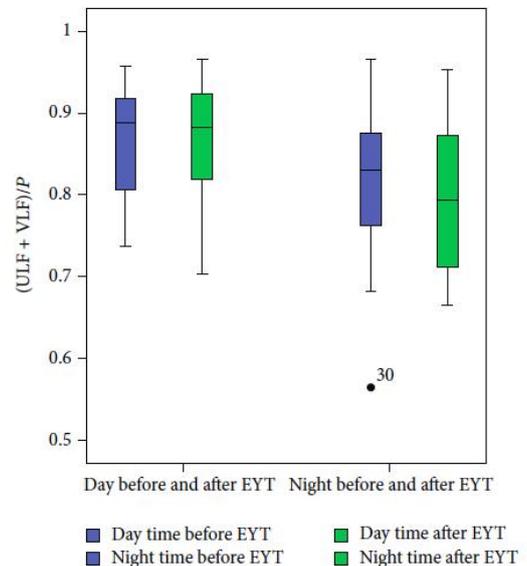


FIGURE 1: Box plots of the HRV index  $(ULF + VLF)/P$  for day time before and after EYT and night time before and after EYT.

[4, 13, 19] are substantiated by these analyses. The effects within the group examined are robust and present an overall plausible picture.

The precise mechanism of action of EYT is still difficult to explain. Conceptionally, EYT attempts to utilise basic physiological rhythmic processes and to stimulate these through speech, speech rhythms transformed into movement, and special movement sequences. Although we are still a long way far from understanding its mode of action, this training method nevertheless appears to have significantly positive clinical effects. The results obtained to date should be further examined in clinical studies and particularly also in patients suffering from cancer, fatigue, or other forms of chronic stress.

An effect of this kind has not previously been described for other mind-body interventions but may be of general interest. "Sleep is the best medicine" is an old saying which contains a lot of truth. Many illnesses can be caused or negatively influenced by lack of sleep or an unhealthy sleep-waking rhythm [26–30]. In addition to promoting the development of cancer or having a negative impact on its course, disturbed sleep has even been shown to compromise processes of immunological regulation [31–34]. There is a close functional relationship between sleep and the autonomic nervous system [35]. The cyclic pattern of healthy sleep is subject to active regulation by the autonomic nervous system and shows a highly regulated rhythmic picture of chronobiological processes in direct interaction with autonomic functions of the cardiovascular system such as blood pressure, heart beat, and respiration [34, 35]. Status changes in the transition from one sleep phase to another have a marked impact on parameters of HRV or blood

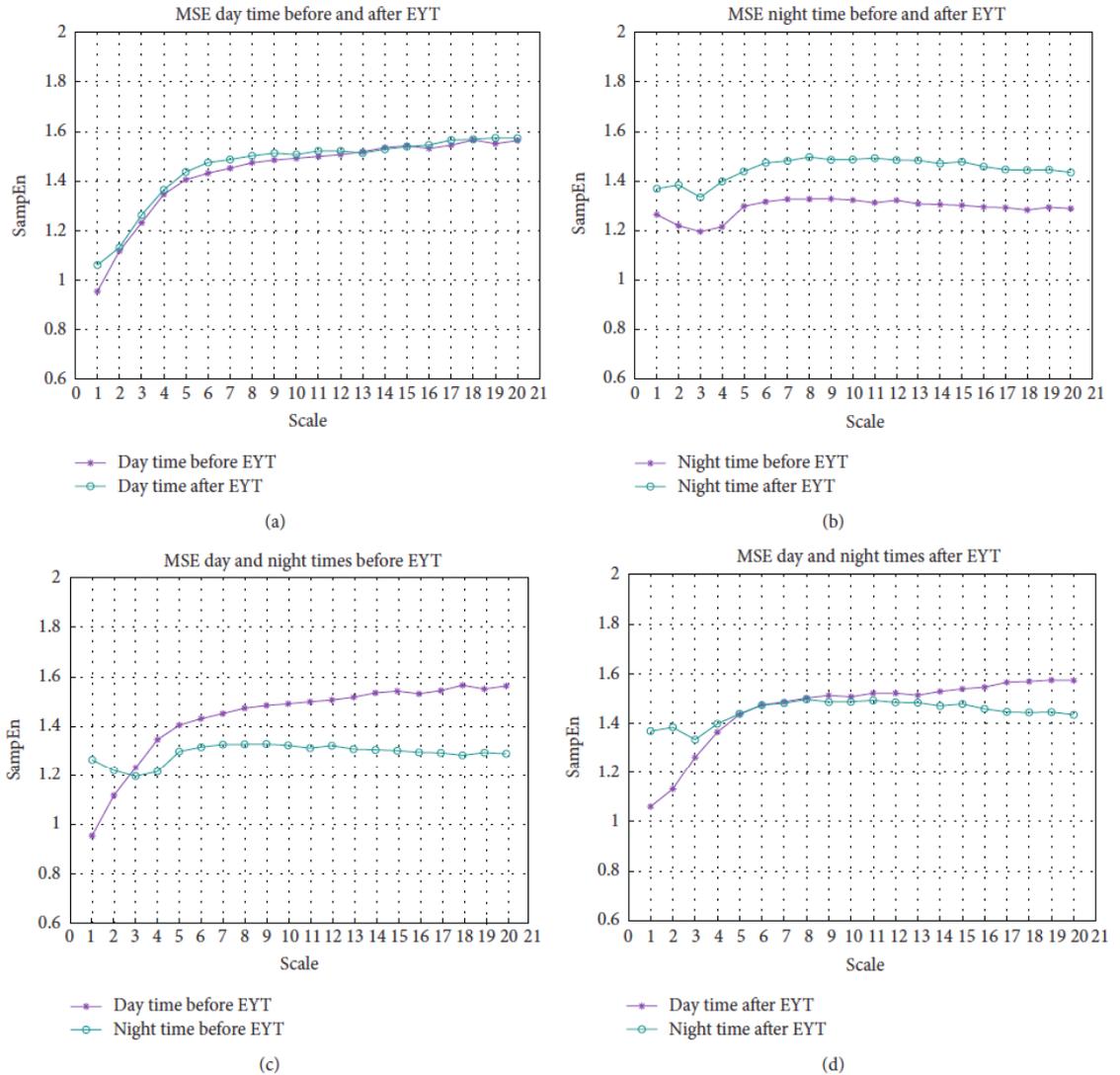


FIGURE 2: Behaviour of MSE indices before and after EYT. The sample entropy (SampEn) (y-axis) is plotted over the scales (x-axis). (a) MSE during day before and after EYT. (b) MSE during night before and after EYT. (c) MSE during day and night before EYT. (d) MSE during day and night after EYT.

pressure variability, for example [36, 37]. Sleep disturbances are often accompanied by changes in the circadian rhythms [38, 39]. This has been studied for various neurological diseases [40, 41] and for hypertension [42]. In cancer patients, disturbances of the circadian rhythm are associated not only with fatigue symptoms [38, 39], which compromise patients' quality of life, but also with a significantly worse prognosis [43]. Therefore, it is of general clinical interest to search for therapies [44] or interventions leading to better sleep or a better chronobiologic [38, 39] pattern of the activity of the autonomous nervous system.

**4.1. Limitations of the Study.** For organizational reasons, it was not possible to randomize the study. Therefore, we

cannot rule out the possibility that the EYT group might have contained preferentially subjects who believed that they could benefit from a treatment aimed at stress reduction and improvement of quality of life. However, this only affects the comparison of the psychometric data, not the HRV analysis. The fact that the study lacked an appropriate control intervention such as light aerobic training remains a weakness of the study.

Furthermore, we are aware of the influence of respiratory rates on HRV parameters.

Unfortunately, it was not feasible to monitor respiration for 24 hours in this setting. It was beyond the scope of this study to have completely standardized conditions as we were interested in real-life effects. Because of limited availability

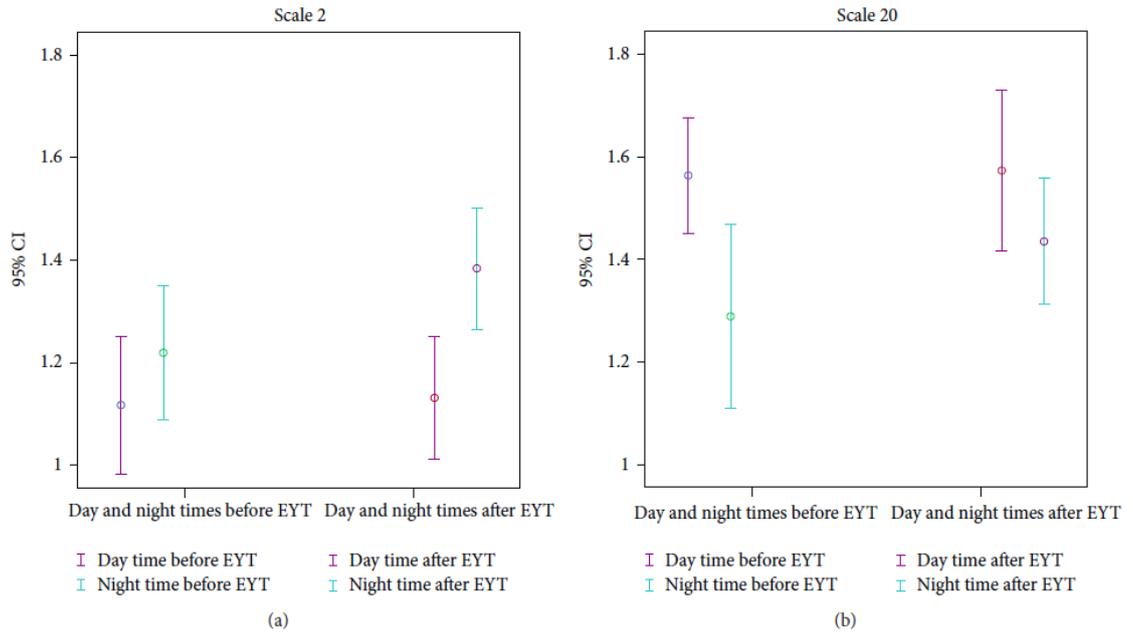


FIGURE 3: Error bar of the indices scale 2 and scale 20 comparing day and night times before and after EYT (confidence interval 95%).

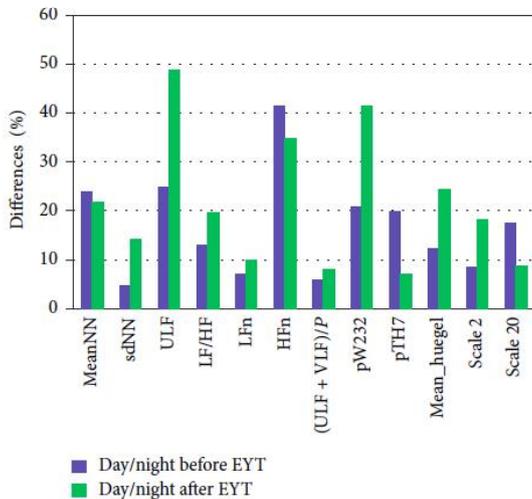


FIGURE 4: Differences of selected HRV indices between day and night times before (blue) and after (green) EYT as percentage changes.

of male subjects, we have an unbalanced male/female ratio in this study with a majority of women. Therefore, the subsequent analysis was based only on the data of women. However, this fact is supported by findings of other groups. The difference in heart rate variability between men and women has been commented on before [22, 45], where it

was observed that baroreflex responsiveness is attenuated and vagal activity is augmented in women compared with men. Because the LF component of the heart rate variability reflects, in part, the baroreflex-mediated control of the heart rate, women tend to display a lower value of power in the LF spectrum of the heart rate variations leading to a more predominant vagal modulation. An et al. observed this behavior demonstrating a parasympathetic dominance in women (in contrast to men). Furthermore, Uusitalo et al. [46] could not find significant changes in cardiac and vascular autonomic regulations with regular exercise training in 140 men. These findings support the hypothesis that men and women show a different reaction on exercise and stress and therefore should be investigated separately.

We performed the multivariate ANOVA analysis to figure out time and phase dependencies. Here, we found only significant phase dependencies and no significant time dependencies and interactions between time and phase; even a clear trend in several indices could be observed in time dependencies and interactions. This is not surprising because the results from multidimensional two-factor ANOVA have to be considered with caution due to the relative small number of cases. Further, about half of the indices had to be transformed to normal distribution leading to additional side effects.

Finally, in an ongoing study, we will increase the number of included subjects enabling us to prove definitely the dependency of the changed day and night time differences on the EYT outcome performing a two-factor ANOVA with repeated measures.

## 5. Conclusion

The results of this study show that a 6-week course of EYT training can have a positive impact on the circadian rhythm of the heart rate. There is a shift in HRV during the night towards a more vagal-dominated rhythm with a greater complexity corresponding better to the physiological pattern at night. The day-time rhythms of HRV also changed in terms of a trend towards a more typical day-time pattern. Therefore, in summary, we see an overall improvement in the circadian rhythm which could provide an explanation for the improvement of QoL, fatigue symptoms, and stress coping. This treatment should be further investigated in patients with chronic illnesses. Patients with cancer and fatigue syndrome, in particular, could benefit from the treatment.

## Conflict of Interests

The authors declare that they have no conflict of interests.

## Acknowledgments

The authors thank all study participants for their participation in the study. This study was kindly supported financially by the Zukunftsstiftung Gesundheit, the Helixor Stiftung, Rosenfeld, the Software AG-Stiftung, and the Dr. Hauschka Stiftung, Stuttgart (Germany). Furthermore, they thank Dr. Mario Walther, Institute of Medical Statistics, Computer Sciences and Documentation.

## References

- [1] G. Seifert, P. H. Driever, K. Pretzer et al., "Effects of complementary eurythmy therapy on heart rate variability," *Complementary Therapies in Medicine*, vol. 17, no. 3, pp. 161–167, 2009.
- [2] R. S. Boneva, M. J. Decker, E. M. Maloney et al., "Higher heart rate and reduced heart rate variability persist during sleep in chronic fatigue syndrome: a population-based study," *Autonomic Neuroscience*, vol. 137, no. 1–2, pp. 94–101, 2007.
- [3] A. R. Burton, K. Rahman, Y. Kadota, A. Lloyd, and U. Vollmer-Conna, "Reduced heart rate variability predicts poor sleep quality in a case-control study of chronic fatigue syndrome," *Experimental Brain Research*, vol. 204, no. 1, pp. 71–78, 2010.
- [4] "Heart rate variability: standards of measurement, physiological interpretation and clinical use. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology," *Circulation*, vol. 93, no. 5, pp. 1043–1065, 1996.
- [5] H. V. Huikuri, J. S. Perkiömäki, R. Maestri, and G. D. Pinna, "Clinical impact of evaluation of cardiovascular control by novel methods of Heart rate dynamics," *Philosophical Transactions of the Royal Society A*, vol. 367, no. 1892, pp. 1223–1238, 2009.
- [6] M. A. Cohen and J. A. Taylor, "Short-term cardiovascular oscillations in man: measuring and modelling the physiologies," *Journal of Physiology*, vol. 542, part 3, pp. 669–683, 2002.
- [7] D. L. Eckberg, "The human respiratory gate," *Journal of Physiology*, vol. 548, part 2, pp. 339–352, 2003.
- [8] R. E. Kleiger, J. P. Miller, and J. T. Bigger, "Decreased heart rate variability and its association with increased mortality after acute myocardial infarction," *American Journal of Cardiology*, vol. 59, no. 4, pp. 256–262, 1987.
- [9] M. Satyapriya, H. R. Nagendra, R. Nagarathna, and V. Padmalatha, "Effect of integrated yoga on stress and heart rate variability in pregnant women," *International Journal of Gynecology and Obstetrics*, vol. 104, no. 3, pp. 218–222, 2009.
- [10] H. An, R. Kulkarni, R. Nagarathna, and H. Nagendra, "Measures of heart rate variability in women following a meditation technique," *International Journal of Yoga*, vol. 3, no. 1, pp. 6–9, 2010.
- [11] J. L. Kanitz, K. Pretzer, M. Reif et al., "The impact of eurythmy therapy on fatigue in healthy adults—a controlled trial," *European Journal of Integrative Medicine*, vol. 4, no. 3, pp. e289–e297, 2012.
- [12] J. L. Kanitz, "Impact of eurythmy therapy on stress coping strategies and health-related quality of life," *European Journal of Integrative Medicine*, vol. 1, no. 4, 256 pages, 2009.
- [13] B. A. Voss, S. Schulz, R. Schroeder, M. Baumert, and P. Caminal, "Methods derived from nonlinear dynamics for analysing heart rate variability," *Philosophical Transactions of the Royal Society A*, vol. 367, no. 1887, pp. 277–296, 2009.
- [14] A. Voss, H. Malberg, A. Schumann et al., "Baroreflex sensitivity, heart rate, and blood pressure variability in normal pregnancy," *American Journal of Hypertension*, vol. 13, no. 11, pp. 1218–1225, 2000.
- [15] A. Voss, R. Schroeder, P. Caminal et al., "Segmented symbolic dynamics for risk stratification in patients with ischemic heart failure," *Cardiovascular Engineering and Technology*, vol. 1, no. 4, pp. 290–298, 2010.
- [16] A. Porta, S. Guzzetti, N. Montano et al., "Entropy, entropy rate, and pattern classification as tools to typify complexity in short heart period variability series," *IEEE Transactions on Biomedical Engineering*, vol. 48, no. 11, pp. 1282–1291, 2001.
- [17] Y. L. Ho, C. Lin, Y. H. Lin, and M. T. Lo, "The prognostic value of non-linear analysis of heart rate variability in patients with congestive heart failure—a pilot study of multiscale entropy," *PLoS ONE*, vol. 6, no. 4, Article ID e18699, 2011.
- [18] P. K. Stein, A. A. Ehsani, P. P. Domitrovich, R. E. Kleiger, and J. N. Rottman, "Effect of exercise training on heart rate variability in healthy older adults," *American Heart Journal*, vol. 138, no. 3, part 1, pp. 567–576, 1999.
- [19] A. Voss, J. Kurths, H. J. Kleiner et al., "The application of methods of non-linear dynamics for the improved and predictive recognition of patients threatened by sudden cardiac death," *Cardiovascular Research*, vol. 31, no. 3, pp. 419–433, 1996.
- [20] H. An, R. Kulkarni, R. Nagarathna, and H. R. Nagendra, "Measures of heart rate variability in women following a meditation technique," *International Journal of Yoga*, vol. 1, no. 3, pp. 6–9, 2010.
- [21] J. L. Kanitz, K. Pretzer, M. Reif, A. Voss, R. Brand, P. Warschburger et al., "The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults," *Complementary Therapies in Medicine*, vol. 19, no. 5, pp. 247–255, 2011.
- [22] C. C. Grant, M. Viljoen, D. C. van Rensburg, and P. S. Wood, "Heart rate variability assessment of the effect of physical training on autonomic cardiac control," *Annals of Noninvasive Electrocardiology*, vol. 17, no. 3, pp. 219–229, 2012.
- [23] J. F. Brosschot, E. Van Dijk, and J. F. Thayer, "Daily worry is related to low heart rate variability during waking and the subsequent nocturnal sleep period," *International Journal of Psychophysiology*, vol. 63, no. 1, pp. 39–47, 2007.

- [24] A. Rosengren, S. Hawken, S. Ôunpuu et al., "Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control study," *The Lancet*, vol. 364, no. 9438, pp. 953–962, 2004.
- [25] S. Patra and S. Telles, "Heart rate variability during sleep following the practice of cyclic meditation and supine rest," *Applied Psychophysiology Biofeedback*, vol. 35, no. 2, pp. 135–140, 2010.
- [26] R. Leproult and E. Van Cauter, "Role of sleep and sleep loss in hormonal release and metabolism," *Endocrine Development*, vol. 17, pp. 11–21, 2009.
- [27] M. C. Mormont, J. Waterhouse, P. Bleuzen et al., "Marked 24-h rest/activity rhythms are associated with better quality of life, better response, and longer survival in patients with metastatic colorectal cancer and good performance status," *Clinical Cancer Research*, vol. 6, no. 8, pp. 3038–3045, 2000.
- [28] A. K. Pati, A. Parganiha, A. Kar, R. Soni, S. Roy, and V. Choudhary, "Alterations of the characteristics of the circadian rest-activity rhythm of cancer in-patients," *Chronobiology International*, vol. 24, no. 6, pp. 1179–1197, 2007.
- [29] E. Van Cauter, K. Spiegel, E. Tasali, and R. Leproult, "Metabolic consequences of sleep and sleep loss," *Sleep Medicine*, vol. 9, supplement 1, pp. S23–S28, 2008.
- [30] X. S. Wang, M. E. G. Armstrong, B. J. Cairns, T. J. Key, and R. C. Travis, "Shift work and chronic disease: the epidemiological evidence," *Occupational Medicine*, vol. 61, no. 2, pp. 78–89, 2011.
- [31] T. Bollinger, A. Bollinger, L. Skrum, S. Dimitrov, T. Lange, and W. Solbach, "Sleep-dependent activity of T cells and regulatory T cells," *Clinical and Experimental Immunology*, vol. 155, no. 2, pp. 231–238, 2009.
- [32] P. A. Bryant, J. Trinder, and N. Curtis, "Sick and tired: does sleep have a vital role in the immune system?" *Nature Reviews Immunology*, vol. 4, no. 6, pp. 457–467, 2004.
- [33] B. T. Preston, I. Capellini, P. McNamara, R. A. Barton, and C. L. Nunn, "Parasite resistance and the adaptive significance of sleep," *BMC Evolutionary Biology*, vol. 9, no. 1, article 7, 2009.
- [34] R. Wolk, A. S. Gami, A. Garcia-Touchard, V. K. Somers, and S. H. Rahimtoola, "Sleep and cardiovascular disease," *Current Problems in Cardiology*, vol. 30, no. 12, pp. 621–662, 2005.
- [35] P. Meerlo, A. Sgoifo, and D. Suchecki, "Restricted and disrupted sleep: effects on autonomic function, neuroendocrine stress systems and stress responsivity," *Sleep Medicine Reviews*, vol. 12, no. 3, pp. 197–210, 2008.
- [36] D. Liao, X. Li, A. N. Vgontzas et al., "Sleep-disordered breathing in children is associated with impairment of sleep stage-specific shift of cardiac autonomic modulation," *Journal of Sleep Research*, vol. 19, no. 2, pp. 358–365, 2010.
- [37] A. Silvani, "Physiological sleep-dependent changes in arterial blood pressure: central autonomic commands and baroreflex control," *Clinical and Experimental Pharmacology and Physiology*, vol. 35, no. 9, pp. 987–994, 2008.
- [38] B. Bjorvatn and S. Pallesen, "A practical approach to circadian rhythm sleep disorders," *Sleep Medicine Reviews*, vol. 13, no. 1, pp. 47–60, 2009.
- [39] N. Kanathur, J. Harrington, and T. Lee-Chiong, "Circadian rhythm sleep disorders," *Clinics in Chest Medicine*, vol. 31, no. 2, pp. 319–325, 2010.
- [40] W. D. S. Killgore, "Effects of sleep deprivation on cognition," *Progress in Brain Research*, vol. 185, pp. 105–129, 2010.
- [41] E. K. Lee and A. B. Douglass, "Sleep in psychiatric disorders: where are we now?" *Canadian Journal of Psychiatry*, vol. 55, no. 7, pp. 403–412, 2010.
- [42] R. Robillard, P. A. Lanfranchi, F. Prince, D. Filipini, and J. Carrier, "Sleep deprivation increases blood pressure in healthy normotensive elderly and attenuates the blood pressure response to orthostatic challenge," *Sleep*, vol. 34, no. 3, pp. 335–339, 2011.
- [43] P. F. Innominato, C. Focan, T. Gorlia et al., "Circadian rhythm in rest and activity: a biological correlate of quality of life and a predictor of survival in patients with metastatic colorectal cancer," *Cancer Research*, vol. 69, no. 11, pp. 4700–4707, 2009.
- [44] W. J. M. Hrushesky, J. Grutsch, P. Wood et al., "Circadian clock manipulation for cancer prevention and control and the relief of cancer symptoms," *Integrative Cancer Therapies*, vol. 8, no. 4, pp. 387–397, 2009.
- [45] Y. Kubota, W. Sato, M. Toichi et al., "Frontal midline theta rhythm is correlated with cardiac autonomic activities during the performance of an attention demanding meditation procedure," *Cognitive Brain Research*, vol. 11, no. 2, pp. 281–287, 2001.
- [46] A. L. T. Uusitalo, T. Laitinen, S. B. Väisänen, E. Länsimies, and R. Rauramaa, "Physical training and heart rate and blood pressure variability: a 5-yr randomized trial," *American Journal of Physiology*, vol. 286, no. 5, pp. H1821–H1826, 2004.

**Kanitz JL, Reif M, Rihs C, Krause I, Seifert G. A randomised, controlled, single-blinded study on the impact of a single rhythmical massage (anthroposophic medicine) on well-being and salivary cortisol in healthy adults. *Complementary Therapies in Medicine* (2015), 23, p. 685 - 692.**

*Background:* Rhythmical massage (RM) has evolved from classical massage and is based on the principles of Anthroposophic medicine. The goal of this randomized, single-blinded study was to assess the efficacy of a single RM intervention with either aroma oil (RA) or a neutral oil (RM) compared to a sham massage (SM) on several dimensions of well-being and salivary cortisol in a laboratory setting.

*Methods:* 118 healthy adults (mean age: 25.2 years; SD: 4.7) were randomized to one of three groups (RM, RA or SM). After baseline measurements, all subjects were exposed to an experimental stressful situation (Trier Social Stress Test, TSST), before receiving a single massage intervention of about 60 min including a 20-minute rest period. Well-being as the main outcome parameter was assessed by standardized questionnaires (MDBF, Bf-S, B-L) and visual analogue scales (VAS) prior to the beginning of the massage and subsequently. Salivary cortisol and heart rate variability (data are shown elsewhere) were also measured.

*Results:* Participants who received RM or RA showed no statistically significant improvements (MDBF, Bf-S, B-L) compared to the SM group after adjusting for baseline differences observed between the treatment groups. Furthermore, no statistically significant differences were found between the RM and RA groups in any of the analyses. Within a follow-up survey all participants from the RA and 82% from the RM group described the intervention as relaxing compared with 42% in the SM group. Salivary cortisol did not differ statistically significantly between the three groups over time.

*Conclusions:* We found no significant effect within this trial. This may be due to the methodological complexity of massage research and especially the sham-controlled design with only one single intervention examined. The influence of the setting, and the expectations of and interaction between participant and practitioner seem to play a role that needs to be verified. Therefore the true potential of rhythmical massage intervention still needs to be validated.

doi: <http://dx.doi.org/10.1016/j.ctim.2015.07.008>

**Berger B, Bertram M, Kanitz JL, Pretzer K, Seifert G. šLike Walking into an Empty Roomõ: Effects of Eurythmy Therapy on Stress Perception in Comparison with a Sports Intervention from the Subjects÷ Perspective ó A Qualitative Study. Evidence-Based Complementary and Alternative Medicine (2015), Article ID 856107, 11 pages.**

*Background:* Stress and health-related quality of life are important constructs used in treatment evaluation today. This study is based on a randomised controlled trial examining the stress-reducing effect of eurythmy therapy in comparison with step aerobics in 106 healthy but stressed subjects. The aim of the analysis was to characterise changes in the subjective perceptions of the participants.

*Methods:* Interviews were conducted with 76 healthy adults, 36 (f = 31/m = 5) from the eurythmy group and 40 (f = 28/m = 12) from the step aerobics group both analysed by content analysis and phenomenologically.

*Results:* The following categories were identified for the eurythmy therapy group: enabling a productive therapeutic response, emergence of a new perceptual space, reevaluation of the accustomed perception, and emergence of new options for action. Step aerobics places increased physical and intellectual demands. These are perceived differently as pleasant and relaxing, insufficiently challenging and/or boring, and too challenging and thus experienced as stress-enhancing.

*Conclusion:* The qualitative results provided revealing insights into the profound effects of and subjective assignments of meaning to external and internal stress factors. Processes of mental reinterpretation leading to stress reduction can be stimulated by physical procedures such as eurythmy therapy.

## Research Article

# “Like Walking into an Empty Room”: Effects of Eurythmy Therapy on Stress Perception in Comparison with a Sports Intervention from the Subjects’ Perspective—A Qualitative Study

B. Berger,<sup>1</sup> M. Bertram,<sup>2</sup> J. Kanitz,<sup>3</sup> K. Pretzer,<sup>3</sup> and G. Seifert<sup>3</sup>

<sup>1</sup>Department of Health, University of Witten/Herdecke, 58313 Herdecke, Germany

<sup>2</sup>Department of Nursing Science, University of Witten/Herdecke, 58313 Herdecke, Germany

<sup>3</sup>Task Force Integrative Medicine, Department of Paediatrics Specialising in Oncology and Haematology, Charité University Hospital, 13353 Berlin, Germany

Correspondence should be addressed to G. Seifert; [georg.seifert@charite.de](mailto:georg.seifert@charite.de)

Received 2 December 2014; Accepted 11 February 2015

Academic Editor: Avni Sali

Copyright © 2015 B. Berger et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Background.** Stress and health-related quality of life are important constructs used in treatment evaluation today. This study is based on a randomised controlled trial examining the stress-reducing effect of eurythmy therapy in comparison with step aerobics in 106 healthy but stressed subjects. The aim of the analysis was to characterise changes in the subjective perceptions of the participants. **Methods.** Interviews were conducted with 76 healthy adults, 36 ( $f = 31/m = 5$ ) from the eurythmy group and 40 ( $f = 28/m = 12$ ) from the step aerobics group both analysed by content analysis and phenomenologically. **Results.** The following categories were identified for the eurythmy therapy group: *enabling a productive therapeutic response, emergence of a new perceptual space, reevaluation of the accustomed perception, and emergence of new options for action.* Step aerobics places increased physical and intellectual demands. These are perceived differently as *pleasant and relaxing, insufficiently challenging and/or boring, and too challenging and thus experienced as stress-enhancing.* **Conclusion.** The qualitative results provided revealing insights into the profound effects of and subjective assignments of meaning to external and internal stress factors. Processes of mental reinterpretation leading to stress reduction can be stimulated by physical procedures such as eurythmy therapy.

## 1. Background

Stress and health-related quality of life are important constructs of treatment evaluation today. Stress reduction is considered a preventive health-relevant parameter. Programmes for lasting stress reduction prevent burnout and depressive episodes and can thus lead to reduction of various chronic somatic illnesses such as cardiovascular diseases and cancer.

In recent years, the two methods mindfulness based stress reduction (MBSR) and mindfulness based cognitive therapy (MBCT), in particular, have been increasingly employed as therapeutic techniques and also increasingly examined for their stress-reducing effects. The systematic review of randomised controlled studies conducted by Fjorback et al. in

2011 comes to the conclusion that MBSR can increase mental health and reduce stress symptoms as well as symptoms of anxiety and depression and can therefore be recommended as intervention for medical disease management [1].

Eurythmy therapy (EYT) is a treatment method used in anthroposophical medicine in which patients are taught exercises which integrate cognitive, emotional and volitional elements. The exercises are based on speech and direct the patient’s attention to their own mentally experienced intentionality when performing the exercises. As a result, a connection between internal and external activity can be experienced.

With regard to the therapeutic effects of eurythmy therapy, emphasis has so far been placed on examining

the interdependences between eurythmy therapy and physiological processes [2, 3]. An important result here was the increase in heart rate variability as an expression of the physiological reaction capacity of an organism, as well as the improvement of a circadian rhythm. With the exception of a few small pilot studies, for example, in children with brain tumours [4] or patients with hypertension, there are no clinical studies on eurythmy therapy. There is only a largish cohort study examining the long-term impact of EYT on disease score and quality of life in stressed but healthy subjects. In this study conducted by Kanitz and colleagues in 2011 the authors were able to show the effectiveness of eurythmy therapy with regard to improvement of stress coping and quality of life in healthy subjects [5].

In view of this dearth of studies, we decided to conduct a randomised controlled study to examine the effects of eurythmy therapy on stress coping and heart rate variability in healthy subjects. This prospective randomised three-arm study was conducted in 2010-2011 at the Berlin Charité hospital with 121 healthy subjects (publication in preparation). The transcripts of the interviews from this study form the data base for the present paper. The focus of the qualitative analysis was the subjective perception of the effectiveness of eurythmy therapy and step aerobics on the stress perception of the study participants.

## 2. Material and Methods

**2.1. Design of the Randomised Controlled Intervention Study.** The recruiting for the randomised controlled study was performed by poster, via the Charité intranet and via the intranet of the Berlin job centre. Participants aged between 27 and 50 years without physical or mental disease were included. Twice a week for seven weeks, the participants took part in either an hour of eurythmy therapy (EYT) under the instruction of a eurythmy therapist with homework (53 participants) or an hour of step aerobics (STA, 53 participants). A further group (15 participants) had anthroposophical art therapy. The emphasis of the eurythmy therapy was on experiencing the connection between physical sensation (of the feet, the spine, etc.), perception of the movement, and experiencing of one's own personal intentionality in the exercises. The exercises included use of the sound "M." In the M exercise, the hands are held at about the level of the chest with the palms facing each other and encounter each other alternately. This leads to the simultaneous experience of "pushing something away" and "taking something back." This movement is intended to produce attentiveness to the outside and to the inside at the same time and permit a weighing up between the demands from without and the inner needs. Through the reflecting practice of this gesture, it is possible, for example, to uncover one's own ability, unconscious in daily life, to burden oneself with (perceived) demands or toward them off, and to interpret something as a stressor or not.

**2.2. Methodology of the Qualitative Study.** In addition to the intervention, the subjects were asked to participate in a guided narrative interview after completion of the

intervention. The development of the interview guide, the conduct of the interviews, and the transcription of the interviews were performed by the psychologist JK, the eurythmy therapist KP, and a student assistant. The qualitative study was designed after conducting the interviews and uses questions 1, 2, and 5-8 of the questionnaire to answer the question formulated above (Box 1). For this, the verbatim transcriptions of the interviews were analysed by two external qualitative researchers using a hermeneutic content analysis approach (BB) and a body phenomenology (MB) approach. First, all answers were removed from the person-related context and sorted by question. The analyses were performed by BB and MB separately and then compared, discussed, and merged in a complementary fashion.

### Box 1: (Interview Guide)

(Questions which were included in the analysis)

(FQ = Further questions, only to be asked if no answers come spontaneously)

#### Questions

(1) What did you expect personally from participating in this study?

FQ: What positive/negative expectations did you have of the intervention?

(2) How severe was your stress before the start of the intervention?

FQ: Critical life events?

FQ: Would you have tried alternative ways of coping with the stress?

(5) Did you notice changes in the stress during the intervention?

FQ: Were you able to cope better with stress?/Did you develop new strategies and techniques? If so, which?

(6) Did you notice behaviour patterns through the intervention that you were not aware of before?

(7) How do you think the changes came about? What do you think is responsible for them?

FQ: Intervention/through taking part in a study (being looked after, attention)/sport, exercise, calm, relaxation, group, feeling of responsibility towards the study team, personal motivation, meditation/therapist/relationship to the therapist/important events during the time of the interventions

(8) What sticks particularly in your mind about the interventions? What did you take away from the intervention for the future?

**2.3. Ethical Aspects.** The performance of the randomised controlled study including the qualitative interviews was part of the application for ethical approval submitted to the ethics committee of the Berlin Charité. A positive ethics committee opinion was obtained. Participation in the interviews was voluntary. The study participants signed informed consent

confirming that they agreed to the pseudonymised use of the data and that they were aware that they could revoke their consent to participate in the study at any time without giving reasons.

**2.4. Hermeneutic Content Analysis of the Data.** In the hermeneutic content analysis of the data, after the open and axial coding (cf. [6–8]), the codes were grouped, paraphrased (Table 1 and Box 1), reduced, and then interpreted with regard to the research question. The aim was to identify objective complexes of meaning on the basis of the available text. The interpretations made on the basis of these steps were reported as results in continuous text, while the underlying paraphrasing and quotations are listed in table form in the appendix. Qualitative content analysis is a process of understanding complex layers of meaning in the material. The analysis does not stop at manifesting superficial content but is aimed towards latent complexes of meaning [6]. Various philosophers have pointed out the importance of assignment of meaning in terms of a subjectively relevant action. For example, the sociologists of knowledge Berger and Luckmann [9] developed a model of the everyday world in which the acting subjects assign meaning to their experiences and develop interpretations and an underlying logic to their actions which are suitable for everyday use. These acts in turn generate certain effects. This means that the body of daily knowledge of the study participants and their assignments of meaning to the effect of the respective interventions on their stress perception are of therapeutic relevance. In the sociology of knowledge, the concrete assignment of meaning is regarded as fundamental for the societal and subjective reality and hence for the both societally relevant knowledge and subjectively relevant knowledge, feeling, and acting. Thus, from the sociological perspective, the assignment of meaning of the study participants is seen to be important in its own right for the effectiveness of treatments in addition to the respective physiological dimensions studied.

**2.5. Body Phenomenological Analysis.** The body phenomenological analysis, like the hermeneutic analysis, was performed via open axial coding. Against the background of phenomenology, the primary scientific perspective of this analysis is that of an ecological theory of the organism [10, 11] which interacts complementarily with its environment in the sense of the gestalt circle [12]. The focus is on the response which the eurythmy triggers in the study participant, on the interactions between body, consciousness, and environment. In body phenomenology, the felt body (German: Leib) is the active perceptual agency which precedes the reflective perceptions. It is not the intellect but the felt body which is the medium of experiencing the world [13].

The felt body is also not the “material body out there,” from which a person might be able to distance himself, but the entity with which he is existentially connected and which allows him to be in the world as a perceiving and acting agent. Husserl called this active entity the “functioning body” [14]. Complementary therapies address the senses in numerous ways. The resulting perceptions are the corporeally engaged implementation of the environment as the expression of a

person’s individual corporeal capacity. The felt body is thus a kind of resonator, actively reflecting his environment [15]. The felt body, which on one hand is coupled with nature and on the other hand belongs entirely to the individual person, is not an entity which can be separated from the material body (German: Körper). The felt body and the material body are, rather, two complementary forms of existence of one and the same entity. For everything which is experienced perceptually via the felt body and in synchronicity with the (therapeutic) environment, there is a correlation in the material body. This explains the effectiveness of all mind-body techniques: perceptions, for example, mindfulness, meditation, artistic exercises, and correlation with the processes in the material body, for example, improvement of the immune status and lowering of blood pressure [16, 17]. The phenomenological approach searches for signs of such felt-body processes and thus distinguishes in the data analysis between

- (1) a priori experience: indicators of immediate experiencing of intentionally perceptive processes before any judgment;
- (2) reflected experience: indicators of experiences that have already been thought through.

The codes stem mainly from the verbatim responses of the subjects. In some cases, they are paraphrases for the purpose of summarizing longer responses. All codes were incorporated in the continuous text.

### 3. Results

Of the 106 study participants, 76 participated voluntarily in the qualitative interviews. Of the 76 interviewees, 36 were from the eurythmy therapy group ( $f = 31/m = 5$ ) and 40 were from the step aerobics group ( $f = 28/m = 12$ ).

#### 3.1. Hermeneutic Content Analysis (BB)

**3.1.1. Expectations of Participation in the Study (Question 1).** The participants took part in the study with various expectations. Some had no expectations, others had the diffuse expectation that they would be given something that would help them cope with stress. Others again expected that they would be introduced to a new form of exercise and a fourth group was interested mainly in getting to know complementary methods.

**Getting to Know New Methods for Stress Reduction.** Many participants wanted to learn about ways of coping with stress. As a rule it was not clear what individual participants understood by stress. Little was said about their current life situation. Some participants used formulations such as “stress reduction, winding down, finding peace and quiet, and being able to relax.” It is possible that these participants had an underlying stress model which assumes an excess of external stressors (at work, in the family). Others used expressions such as “wanting to take a step back, not letting things affect me so much anymore, and not letting things get to me so much”. Participants occasionally said they wanted to “learn

TABLE 1

Categories for level of stress before the study (Question 2)	
(1) Excessive stressors	
(i) Combination of numerous demands and pressures through career, looking after children, household, professional development courses, freelance work, or home construction.	<i>"Yes, a kind of subjective feeling of not being able to cope with all the demands at the same time, in my private life and in my job, although I can't say that there's any concrete pressure from anywhere that I could actually name, it's more just everything together, the fullness of the day you might say." (m22876a3)</i>
(ii) Having to manage too many projects at the same time (too many irons in the fire).	<i>"I was totally tense and almost dreaded every new task I had to deal with, whether it was just a simple everyday matter or a new project at work, because I notice that I can't stand any more pressure, and I felt totally stressed, well actually almost on the brink." (w14672a3)</i>
(iii) No longer able to cope with the pressure.	<i>"Always stress. But then maybe I also create it myself, hectic, always on the go but not so that I would say "I'm stressed out" and burst into tears, it's not like that. I think I need it too" (m08563b2)</i>
(2) Work-related stressors	
(i) Too long working hours (two jobs) or shifts that go against the body's natural rhythms.	<i>"It's an ongoing problem with me, stress I suppose, also sort of a kind of eustress, I'm not a very calm sort of person, always in action and yes, I try to learn to handle it, handle it better, so that I don't end up with exhaustion, which has often happened in the past." (w03471b1)</i>
(ii) High (physical) demands (noise at school; high level of customer contact).	<i>"Actually it's usually rather high, through the customer meetings which then often don't go in the right direction and then of course I don't get anywhere with the customer. Yes, it's the work is very nice but it does involve very strenuous meetings, ..." (w23065b3)</i>
(iii) Uncertainty through time-limited employment.	<i>"Well I did have quite a strong feeling of stress, all of a sudden I had a study that I had to analyse, with 5000 variables and then I also had another study for which I am actually employed and have a contract, but because of this other study I had to as it were postpone the work, and that led to stress." (m12182b2)</i>
(iv) Various work projects with colliding time schedules.	<i>"Well the problem is that there are just too many things in my life that are important to me and so ...so I find it difficult to put the focus on any one thing. Well, so there's uni, 2 children, working 2 days, although I find the work incredibly fulfilling. (...) I don't really experience it as stress because it gives me a lot and well it's a vocation really. But then altogether it is stress because I can't do things which I could be doing during that time. (...) But there are only 24 hours in a day. My flat gets more and more chaotic and actually I spend a lot of time getting things sorted "inside me". Actually, I could say that I haven't got the time to study and work." (w06375a1)</i>
(v) Taking on responsibility as team leader.	
(vi) Difficulty getting on with colleagues (dominant colleagues; relationship problems with colleagues).	
(3) Own beliefs and attitudes	
(i) Feeling of being under too much pressure.	<i>"Well, that varies, I mean there are days when I can cope with it well, with stress, but sometimes I also notice that I get into a sort of pattern, that I find it difficult to distance myself from it, that then in a job one job has to be done after another without stopping for breath, then I notice that I get caught up in it too, well yes I think it is a high level of stress." (w03064a1)</i>
(ii) Inability to recognize one's own limits early enough.	<i>"I felt relatively stressed, although I, I mean I really should say that I always create the stress myself. I mean I haven't really got that much stress at work, that I always run around or have a lot of stress privately, ok my mother's death maybe, I create a lot of stress for myself too, that I think everything has to be perfect." (w04108a1)</i>
(iii) Feeling unable to cope with the demands.	<i>"Significant, or substantial. Well I did feel rushed, from one appointment to the next, things like that, so that sometimes I just didn't have the time to calm down, although I had already done 2 or 3 relaxation techniques before". (w05367a2)</i>
(iv) Desire to do everything perfectly.	
(v) Attribution of the excessive pressure to the amount of work.	
(vi) Feeling of not wanting to miss anything.	
(4) Family conflicts	
Insoluble family problems which dominate one's whole life are perceived as stress; this includes seemingly insoluble problems with one's own parents or problems which have been pushed aside too long. Being prevented from continuing on one's own path can be perceived as stress.	<i>"And then a relatively large amount of stress privately too, when there were sometimes these unsolvable conflicts, when I noticed that that throws me off course, that it's too much." (w06779a1)</i>

TABLE 1: Continued.

Changes in perception in the eurythmy group	
(1) Integration of mind and body through the combination of speech, breathing, and movement	
The combination of speech and movement enabled the participants to create a connection between their cognitive attitude and their bodily perception. Through visualisation these body images can be summoned up again and lead to changed behaviour in everyday situations.	<p>"I find this combination of movement and speech much better than if you only have one or the other." (w24264a3)</p> <p>"...because it's also easy to incorporate movements in your everyday life and even if it's not the movements, then the sentences which were spoken there, and that they just stay inside you and that you can make that clear to yourself again and again, that there's a different way of doing things and that you just have to become aware of it when you're racing along in the fast lane like that, and that you can also reduce speed again now and again." (w17669a3)</p> <p>"Yes, I've noticed a behaviour pattern, that I do everything relatively quickly, that's my behaviour pattern, I've become aware of that, I didn't notice that before." (w03064a1)</p> <p>"I learned from the therapy to really consciously breathe now and again, breathe in and out, that life is not so hard after all. I mean this listening to yourself and then you can wind down better and you're calmer somehow..."</p>
Reducing speed in everyday life expands the space for one's own perception. Breathing can be perceived as a relevant mediator. Participants usually notice that their breathing is too shallow; deeper breathing is perceived as helpful and brings relief and permits calmness.	
Creating a personal (inner) space	
Perception of the felt body through expansion of the material body by its subjective dimension	
The exercises make it possible to intensify the perception of the body and permit a greater consciousness of physical processes and thus of the stress symptoms. Recognizing how difficult it can be to get away from (negative) emotions. The exercises provide the participants with a tool which makes it easier to distance themselves inwardly from things that usually irritate them. The improved self-perception makes it possible to take a step back and look at the situation, creates space for appropriate appraisal, and extends the options for action. The inner appraisal increases tolerance towards others.	<p>"Through the movements I can intensify my sensations and thus increase my awareness for myself and my body and my state. When I notice that I'm losing my grip on something, I'm going to try and remember that" (w20773a3)</p> <p>"The exercises have already sort of stayed in my body. If you do them often then it's sort of always there with you and I think once, I wasn't feeling so good, then I did the exercise in my mind while I was cycling and then I felt better... and if you do that often then your body remembers." (w17074a3)</p> <p>"...not letting other people get so close to you so that you don't get emotional" (w09280a1). "There are exercises that I have in my head" (w01166a1)</p> <p>"Well, behaviour patterns, that I find it hard to let go of my anger, that there probably must be some sort of incentive, like these exercises, I mean that I have to decide consciously to do an exercise like that, now I'll let go of that, and afterwards you have a good feeling which you wouldn't have had if you had just let things go on." (w01061a1)</p> <p>"...more an awareness that I'm so fidgety and do not radiate calm, I'd like to change that" (w24164a3)</p> <p>"Combination of rest and movement, finding balance between rest and movement, tension and relaxation, being able to direct your thoughts inwards and outwards, being mindful of yourself and being mindful of others, and finding the right balance between the two." (w04180a1). "The ability to feel exactly where I stand at a particular moment: at rest or in action, and then also to consciously deal with it and be able to shape it" (w24964a3)</p>
Achieving a new balance between the internal and external worlds	
The more conscious awareness of one's own body makes it possible to distinguish more consciously between self and other and draw boundaries between the two. One is no longer so other-directed. Doing the exercises in a group allows the participants to recognize their own behaviour or see it mirrored.	<p>"That you can leave others their rhythm and still stay with yourself and be aware of your own rhythm" (w10177a2)</p> <p>"...the coming and going of the rhythm of life, breathing in, breathing out, letting in and letting go, not holding on to things" (w10366a2)</p> <p>"Yes, I find it very exciting, when you're together in a group of people who all come with the same symptoms, I mean stress, (...) but in watching the group I recognized things in myself and that was exciting, to see it from the outside like that, that really helped me, I must say." (w24264a3)</p>
Perceiving new options for action	
The ability to break out of the victim role and assume responsibility for one's own perceptions and reactions. This ability leads to the perception of new options for action and thus generates a freedom of choice of which the participants were not previously aware.	<p>"Keeping calm in the movement so that I still have the freedom of choice even when there's a lot going on, not becoming a victim of the circumstances and the demands but assuming responsibility for the situation myself at every moment." (w24783a3)</p>

TABLE 1: Continued.

Perception of changes in the step aerobics group	
More zest for life, tranquility, and relaxation	
Movement helps to wind down when you are angry. Movement relaxes and creates distance; you can see things more calmly.	<p>“Well I’m more laid back about things, I can definitely say that, if I can’t change things I just have to accept them, there’s a solution for everything.” (w02766b1)</p> <p>“Relaxed afterwards, I mean not tired, that you felt emotionally strengthened again, went home in good spirits and your head was clear.” (w03471b1)</p>
Concentration improves the ability to relax	<p>“I wasn’t aware that I couldn’t concentrate properly at all, but that that is important so as to be able to switch off properly again and relax” (w16263b2)</p>
Participating in the study increased the motivation to take up sport again.	<p>“... sport is an exaggeration, but getting a bit of exercise and stretching and things like that, and I’ve taken a bit of that home with me” (w22059b3)</p>
The active exercises made it possible to regain a feeling of lightness and carefreeness and thus had a beneficial effect, in contrast to passive wellness activities such as massage.	<p>“... yes, it was simply a good feeling because it was also fun. If it didn’t go so well at the beginning and at the end it did, then it was worth the effort.” (w25467b3)</p>
The sport made the participants feel good and was experienced as fun and was also experienced as relaxing in the group.	<p>“Yes, exactly, I was sort of in my own world during these exercises. I’m amiable, I mean I remembered my childhood, when you sort of skipped around without a care and simply enjoyed life.” (m23065b3)</p>
No fundamental change in the perception of stress	
The intervention did not bring about any fundamental changes in the stress perception. During the exercises you can feel good and relax but they do not bring any lasting relief. The problems are still there.	<p>“Well more a sense of physical well-being, but that your head is cleared of the problems and thoughts: no” (m05582b1)</p>
There was even one participant who experienced doing the exercises as an additional stress factor. Participants who do sport regularly experienced no reduction in stress.	<p>“No, not really. Well the sport business was always very relaxing, but generally now, work still stays in the way as an obstacle.” (m05976b1)</p> <p>“Not at all, I mean nothing positive. It’s just as stressful as before at work.” (m26061b2)</p> <p>“Well anything that looks like step aerobics (...) is horror for me” (w166161b2).</p>
The group situation leads to a certain feeling of being under observation. However, the pleasant group atmosphere in which no-one is judged is perceived as positive; however, participants denied any change with regard to the perception of stress.	<p>“Not really. I mean in the group there is the group effect too, whether you’re keeping up or not, or whether you’re are sort doing it a lot worse than the others or whether that’s ok, that’s always the thing in a group. (...). The atmosphere was so friendly. You didn’t have the feeling that you might be a failure or something like that, no.” (w23761b1)</p>

more about themselves.” This can be assumed to indicate a willingness and interest in personal further development. These participants seem to have a different underlying stress model in which the responsibility for coping is seen to lie in the individual intrapsychic situation and capability for appropriate appraisal. Participants also expressed quite concrete ideas about what they wanted to deal with, for example, sleep problems or feelings of depression.

*Being Introduced to New Forms of Exercise.* Another expectation of the study was the possibility of access to new also previously unknown forms of exercise. Some of these were participants who were unable to carry on with a previously practiced sport and were looking for a substitute. Others wanted to stop being a couch potato and get moving again.

*Interest in Taking Part in a CAM Trial.* Interest in complementary medicine and the opportunity to take part in a trial and thus learn more about a certain intervention characterised the motivation of a further group of participants. Other participants motivation was the opportunity to support CAM—treatment options by taking part in such a study. An other

factor that might play a role here is that it possibly seems easier to try out an unknown treatment method in the context of a study and its controlled conditions.

*3.1.2. Stress Level before the Start of the Intervention (Question 2).* The participants reported different levels of stress before the beginning of the study. However, it remains unclear what the interviewees understood by stress and how it was defined. A few interviewees mention this as a problem in their response. Amongst those who rated their stress levels as high, the following stressors could be identified: stress through (1) multiple pressures and demands in different combinations, (2) work-related pressures and demands, (3) internal beliefs and attitudes, or (4) family pressures (see Table 1).

*3.1.3. Changes as a Result of the Interventions.* For this analysis, questions 5, 6, 7, and 8 were analysed together (See Box 1).

(i) *Results of the Eurythmy Group.* The following categories were identified.

(1) *Integration of Mind and Body through the Combination of Speech, Breathing, and Movement.* The combination of these three elements creates a movement which can be reproduced mentally or internalized. The body responds to stress situations with physical symptoms. Through the exercises, it becomes possible to experience and recognize these reaction patterns and thus to link them to events in the environment and reflect on them.

(2) *Creation of a Personal Inner Space.* The metaphors of the empty room and the inner space describe the fact that these are evidently previously unknown perceptions which are unaccustomed and new and, like an empty room, ask to be filled. Something can enter this space for which there was evidently hitherto no (perceptual) space, something which can come between an external event and the internal reaction.

(3) *Perception of the Felt Body through Expansion of the Material Body by Its Subjective Dimension.* Through the newly acquired perceptual space, an appraisal agency can develop which is able to create distance, pause for a moment, and consciously draw a boundary.

(4) *Achieving a New Balance between the Internal and External Worlds.* The previous boundaries between the internal and external worlds can be redefined. Where previously external events crossed one's personal boundaries, these boundaries can now be redrawn. The stress-precipitating factors can be left outside and do not invade the inner world.

(5) *Increased Options for Action.* The improved perception of one's own body and one's personal needs creates space which can be made use of by a self-aware subject. This feeling of empowerment makes it possible to cast off the feeling of impotence. New choices become visible. It is possible to put the brake on, slow down or speed up, and to decide for oneself.

#### (ii) *Results of the Step Aerobics Group*

(1) *More Zest for Life, Tranquility, and Relaxation.* Some participants were able to enjoy the exercise. It distracted them from their everyday problems and enabled them to relax and sleep better. Performing exercises in a group was experienced as pleasurable. Their motivation to participate in sports was stimulated.

(2) *More Relaxation through Concentration.* The need to concentrate on the exercises helped some participants to relax better.

(3) *Benefit: No Substantial Change in the Stress Symptoms.* With regard to the stress perceptions, there was little mention of change. The pressures and demands experienced as stress had not changed. Some participants even complained of additional pressure, particularly if the surroundings did not seem quite right (see Box 1).

### 3.2. *Body Phenomenological Analysis*

3.2.1. *Results in the Eurythmy Therapy Group.* The a priori experience of the participants is expressed by the category classes, *sensation* and *perception*. Experiences already

reflected on could be divided into the classes *reflection* and *options for action* and *what remains*.

#### *Sensations and Perceptions a Priori*

*Feeling Moved.* This category describes a group of characteristics which indicate an awareness of something that cannot yet be expressed in clear ideas or words. In perceptual psychology, these are sensations [18]. This includes statements such as "sort of reached me" (m22876a3), "felt in good hands" (w24668a3), "felt kind of pleasant" (m15281a1), and "the rest phase really feels good" (w12471a2), but individual participants also said that "all this waving your arms around" (w03681a1) "felt silly" (w03681a1).

*Walking into an Empty Room.* By far, the majority of the statements on the effect of the eurythmy therapy describe concrete perceptions or mental concepts. In contrast to pure sensation, perception describes the result of a complex process by which "events and objects are 'rendered experienceable'". Perceptions have direction and weight, are spatial, have gestalt character, categorize the perceptual content, and can be recalled as mental concept. The ambivalent experience of experiencing "concentration" (w03064a1; w14568a3) and "relaxation" (w11864a2) is expressed in the movement. What happens is a "switching off and concentrating entirely on the exercise" (m00980a1). Thus, it does not appear to be a contradiction that during an experience characterised as "totally relaxed – absolutely" at the same time a "sharpened sensory perception" (w19561a3) develops.

An important experience is "experiencing structure" (w14568a3; w10366a2), first in the movement sequences. "Boundaries" (w10366a2) are experienced. This also creates a kind of body memory: "I feel as though it's got inside me and I can take it with me now" (w24783a3) "When you do (the exercises) often you feel a kind of resonance." (w09280a1) This feeling of resonance can, if needed, also be generated from memory and without the eurythmy exercise: "...that it is very helpful in certain (stress) situations to create visual images which you can then use" (w14672a3). In stress situations, this makes it possible "to set boundaries, for example" (w14672a3).

"It is like a kind of – I'm exaggerating now – 'other world' which you enter" (m22876a3). Some subjects feel they lack "the proper words" (m22876a3) for this perception. The common feature is the experience that through the eurythmy therapy the participants have a tool which they can use to create their own conscious space. "This resulted in a feeling of calm, a calm anchor, everything was calm" (m22876a3). "...well the exercises have – how can I put it – stayed in my body; if you do them often then they're always there with you" (w09280a1). The mental image and the movement go hand in hand and the mental image is enough to conjure up the physical experience of a calm space: "...well you arrive there and you're in a completely different situation, regardless of where you were before, it's as though you walk into an empty room and then first empty yourself completely too, free yourself of everything" (w14672a3).

### Reflections

*Shows You Where You Stand.* Typical statements are “winding down [and] staying centred” (w04862a1) and “learning a lot about yourself” (w12661a2) and eurythmy therapy is something that “shows you clearly where you stand at the moment” (w14672a3). It allows you to “connect with yourself. I mean through the movements and the speech and the harmony of speech, movement and sensation” (w20773a3). However, “it’s inexplicable to me how it works” (w20773a3). This taking a step back gives you time to reflect: “Hey, what other options are there out there so I do not act as though I’m blinkered and get all het up but try and find a different way of seeing things” (w24783a3). Unproductive behaviour patterns become conscious and can be worked on. Awareness of oneself and one’s environment is heightened. What remains is “just allowing yourself to pause for a moment and look at exactly what’s going on” (w24783a3).

### Options for Action

*Being Able to Leave the Stress Outside.* You now have the option to “take a break” (m00980a1) or to not “let things get to you so much” (w10366a2). You can consciously “leave [a stressor] outside” (w10366a2) or “keep the level below this tip-over point or before this tip-over point and could open the valve first and release the pressure” (w17669a3). Exercises can be done at home or at work and “I can also do the exercises in my mind afterwards if I do not have the opportunity to do them at that particular moment” (w11864a2). Eurythmy therapy is an individual tool against stress, can be incorporated in your everyday routine, and help you to “downshift” (w17669a3). Eurythmy therapy allows you to experience “But this is my time for myself, that I can always reconnect with myself” (w17074a3) and just “get some distance and simply say with some things I really do not have to do so much” (w06779a1).

### What Remains

*Inner Calm.* “I cannot prove it but I feel calmer, more composed, inwardly stronger” (w04862a1). The eurythmy therapy has created “inner composure” (w09280a1) or “grounded [me]” (w10366a2). It has “[made me] totally relaxed” (w19561a3) and feel “unbelievably good” (w12471a2). In addition, it led to a general sharpening of attention (w10177a2).

3.2.2. *Results of the Step Aerobics Group.* The data set generated by open coding could be divided into the classes *Physical, Emotional Experiences and Perceptions* and *Evaluation of the Benefit*.

*Physical, Emotional Experiences and Perceptions a Priori.* The sensations and emotional experiences are summarised here to begin with describing experiences of consciousness which, in contrast to perceptions, are prereflexive and cannot be clearly classified [18].

*Physical Wellbeing.* The exercises were experienced as physically pleasant (w23065b3). “Well more a sense of physical well-being, but that your head is cleared of the problems and thoughts: no” (m05582b1). The experience is that “you feel good during the exercise and also for a short time afterwards” (w19477b3).

*A Pleasant Diversion.* The main element is enjoyment: Taking part in the step aerobics “was amusing” (w01769b1), “easygoing” (m20585b3), “nice” (w01769b1), and “was fun” (w09771b2). Apart from these more emotional experiences the participants less often mentioned the influence that the STA had on their physical sensation: “exercising to music was pleasant” (w14380b2); “exercise makes you feel good” (w09771b2). There was practically no mention of a connection with the experienced stress. A typical statement was “was a pleasant diversion” (w03179b1).

The following statements were reflected cognitions of the participants about their experience.

*Sharpened the Senses/Had to Concentrate Damned Hard.* In the words of one participant, it was like “having a mirror held up in front of things again, where you could look at them cognitively, so that you get calmer and can change your lifestyle” (m12182b2). The following statement exemplifies how the STA forced the participants to focus their attention: “you had to sharpen your senses, to so-to-speak give the body the commands which were expected. And because you were in a group you also made an effort to be good and not get out of line. Now you forgot everything going on around you, I mean stress from work and things like that” (m16777b2). The result is a time-out, which can however also create stress itself “if I’m only desperately trying to keep up and looking to see which movement comes next” (w03574b1).

A not insignificant number of participants felt that one stress was replaced by another: “well one thing is the physical side and the other, and I think that’s more what causes the stress that you feel, is the head, and it’s really hard to believe how challenging it can be for the brain to remember a simple sequence of movements and carry them out at the same time and that’s so complicated for my brain” (w23483b3). The participants accepted the fact that “you had to concentrate so damned hard” (w14380b2). But for some, the rapid sequence of exercises was “too short to achieve any kind of relaxation” (w03574b1).

### Evaluation of the Benefit

*Start the Evening Relaxed after the Exercise.* As a result of the STA, some participants were able to “really switch off after work” (w03471b1). In many statements, the focus was on the experience of the STA as sport and this was generally evaluated as positive: “sport was good for my muscles” (w13661b2) “... for the immune system” (w23483b3), and for the “cervical spine” (m16777b2); “Even though it was physically strenuous I still went home feeling fit. I definitely leave with a positive result” (w14380b2); there seems no doubt “that exercise is good” (w03471b1).

A number of participants reported that after the STA they were able to “start the evening more relaxed” (w12764b3).

However, there were also statements such as: “Well at the moment I cannot say that it’s brought about any lasting change. On the day itself yes” (m24376b3). The relaxation appears to be directly connected with the physical participation in the exercises. A lasting effect is generated at best through the motivation to take up sport again or to do sport more often. For example, one participant reported “well actually no substantial change, I mean that I did not really feel less or more stressed. What it did do for me was that I felt more motivated to do sport” (w09771b2). This experience of a call to action was felt by numerous participants: “. . .that maybe I should take up sport, something, I do not know what, but I should look for something” (w14380b2). It stands out that the basic attitude to STA as a sport is an affirmative one: STA is regarded as positive not only because of the positive subjective experience but also because of the society that generally regards sport as positive or at least beneficial for health.

*Temporarily Clears Your Mind.* Some participants explicitly commented on the effect of the STA. One sums it up like this: “Yes one thing is the physical side, and the other really what goes on in your head, that at the moment I have no room for anything else, although otherwise so much fits in there, yes and I think that’s the main thing, the main reason why you can switch off so well, probably with any kind of sport too, it could probably just as well be something else instead of doing things on the stepper” (w23483b3). The effect is “a clear cut the moment you enter the room” (m24376b3). “Well while I was really coming here twice a week I had the feeling that lots of things just rolled off me like water off a duck’s back” (w01769b1).

Various participants explicitly said that they did not notice any change. One example: “I work out regularly anyway, so I cannot say that there was any stress reduction” (m26061b3).

**3.3. Comparative Evaluation of the Results.** If we place the results of the different analytical approaches side by side, we can see that they complement each other. The body phenomenological analysis keeps strictly to the perceptions of the study participants. The hermeneutic interpretation applies itself to the hypothetical disclosure of latent contextual associations.

Thus, while the body phenomenological analysis shows the response of the body to a therapeutic intervention, the hermeneutic interpretation points to the meaning that this response phenomenon has for the individual. Both analyses reveal the presence of a previously nonexistent perceptual space. The following interpretations of the combination of both main analytical categories emerge.

#### 3.3.1. For the Eurythmy Therapy Group

(1) *Enabling a Productive Therapeutic Response.* Therapeutic interventions create an environment with which the intentional consciousness can synchronize (with regard to the threshold experience, e.g.). In particular, the eurythmy

therapy practiced here permits productive perceptions (perceptions, feelings).

(2) *Emergence of a New Perceptual Space.* These perceptions include the experiencing of a new “perceptual space.” This can be charged individually with sense and meaning and creates the awareness of a manageable entity (intentionality).

(3) *Reevaluation of the Accustomed Perception.* This entity is able to reflect on and reevaluate the previously unreflected, habitualised patterns of action. This reevaluation can apply to both the externally perceived stressors and the inner resources.

(4) *Emergence of New Options for Action.* On the basis of this reevaluation new options for action are perceived and can be actively utilized.

**3.3.2. For the Step Aerobics Group.** The step aerobics places increased physical and intellectual demands on the subjects. These are perceived by them in different ways:

- (1) pleasant and relaxing;
- (2) insufficiently challenging and/or boring;
- (3) too challenging and thus experienced as stress-enhancing.

(5) *Descriptive Statistics of the Responses in the Qualitative Interviews with regard to the Changes in Stress (Response to Question 5). Did you perceive changes during the intervention with regard to the stress? (See Table 2).*

## 4. Discussion

The qualitative interviews show that the participants did perceive effects of the interventions. Both the step aerobics group and the eurythmy therapy group reported feeling relaxed as a result of the intervention. However, it stands out that practically only the participants in the eurythmy therapy group achieved a changed perception of the factors which they had previously experienced as the causes of their stress. The results of the analysis of the STA group do not point in this direction; hence, the exercise alone cannot be regarded as an adequate intervention for stress reduction. In addition, the positive affirmative attitude to sport in society must also be taken into account when evaluating the results.

**4.1. Stress Model.** In stress research, Kaluza [19] distinguishes different stress models. The medical epidemiological model focuses on quantity and quality of stressors. In the psychological stress model of Lazarus, it is the subject that is responsible for whether an external stressor is regarded as a challenge or a burden and that also evaluates their own potentials for dealing with the challenges or pressures as adequate or inadequate [20]. The salutogenic stress models look at the individual’s own resources and the perceptual possibilities [19].

The interviews with the participants show that they evidently had different inherent stress models. While some interpreted stress as too much of something (work, customer contact, engagements, shifts, further training, family,

TABLE 2

N = 76	Eurythmy therapy group n = 36		Step aerobics n = 40	
	Female n = 31	Male n = 5	Female N = 28	Male N = 12
	No (n = 26)	1	0	16
No lasting change (n = 11)	3	3	3	2
Yes (n = 39)	27	2	9	1

etc.) and thus used an epidemiological stress model, others focused more on their attitudes and their reaction to the stressors. They saw an inability on their part to set boundaries or a self-imposed pressure to do everything perfectly. A third group saw themselves as lacking inner resources, as problems appeared insolvable and they were unable to continue their development. The underlying stress model here may be a subjective stress model which assumes a lack of salutogenic resources.

If we now look at the results with regard to the different stress models held by the study participants, we can postulate that the different models have an influence on whether an intervention can be interpreted as stress-reducing or not. It is striking that it was mainly those who had experienced a change in their own perception reported a subjective effectiveness of the interventions: these were almost exclusively participants from the eurythmy therapy group. According to their statements, the eurythmy therapy can create an independent perceptual space, which opens up internal possibilities to actively distance oneself from external stressors. This consciousness space appears to be an important precondition for reevaluation of both external and internal stressors and increased perception of resources. The inner distance, the deceleration of their own actions, and the taking a step back create the necessary space for a subjective reevaluation. However, the emergence of this inner space was only made possible by the exercises in the eurythmy therapy group.

Eurythmy therapy can be classed as a mind-body technique and requires the active involvement of the participant. Performing the exercises, formation of mental images, and experiencing the movement, feelings, volitional impulses, and other perceptions are not passively experienced but actively generated and thus generate an awareness of one's personal perceptual space. This active generation of perceptions presumably correlates with therapeutic effects. An important aspect of participation is the respective stress model held by the person performing the exercises. Participants who have an externalized stress model and feel at the mercy of their stress appear to have few possibilities of changing their perception and their coping strategies in this productive way. The study results suggest that it was particularly those participants who had or developed a stress model which resulted in re-evaluation of the stressor and of their personal resources who benefited from participation in the study. This productive approach to the treatment in

this study was seen almost only in the eurythmy therapy group. The self-perception created through the eurythmy therapy permits a re-evaluation of external stressors and inner resources.

**4.2. Gender Differences.** With 59 female and only 17 male participants, we find a common pattern of gender allocation within this study. In a recent study about the use of CAM methods in Norway, which find out, that a total of 33% of the participants reported use of CAM within the last 12 months, 42% of the asked women used CAM methods compared to men (24%). As reason for this imbalance, the authors cited qualitative studies, where women express unmet needs regarding their individual health care goals. They emphasize the importance of CAM as a health care system that enables them to take active part in decision-making processes and treatment and, thereby, contribute to positive health outcomes for themselves as an important basis for their treatment decisions [21]. Because participants have been allocated by randomisation, the higher amount of women mirrors only their higher interest in CAM methods compared to men, regardless of the allocation to the control group.

A limitation of this study is that the inclusion criterion for the healthy participants were raised stress scores in the TICS questionnaire (average *T*-score in the eurythmy therapy group: 60 and that in the step aerobics group: 59). It must be assumed that these participants are able to mobilize further resistance resources which were not documented here. A further limitation is that the decision to include qualitative interpreters in the study was not made until after the data collection so that we had to deviate from the usual rules of interview guide compilation and sampling strategy. The questions of the interview guide could only partly be analysed. The results reported here are based on the analysis of the qualitative statements.

## 5. Conclusion

The qualitative results provided revealing insights into the profound effects and subjective assignments of meaning to external and internal stress factors. Processes of mental reinterpretation leading to stress reduction can be stimulated by physical procedures such as eurythmy therapy.

## Conflict of Interests

The authors have declared that no conflict of interests exists.

## Acknowledgments

The authors like to thank Hilary Coleman for skillful linguistic help. The study was funded by the SOFTWARE AG Foundation (Germany) and the Zukunftsstiftung Gesundheit (Germany). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the paper.

## References

- [1] L. O. Fjorback, M. Arendt, E. Ornbøl, P. Fink, and H. Walach, "Mindfulness-based stress reduction and mindfulness-based cognitive therapy: a systematic review of randomized controlled trials," *Acta Psychiatrica Scandinavica*, vol. 124, no. 2, pp. 102–119, 2011.
- [2] G. Seifert, J. L. Kanitz, K. Pretzer et al., "Improvement of heart rate variability by eurythmy therapy after a 6-week eurythmy therapy training," *Integrative Cancer Therapies*, vol. 11, no. 2, pp. 111–119, 2012.
- [3] G. Seifert, P. H. Driever, K. Pretzer et al., "Effects of complementary eurythmy therapy on heart rate variability," *Complementary Therapies in Medicine*, vol. 17, no. 3, pp. 161–167, 2009.
- [4] J. L. Kanitz, K. Pretzer, G. Calaminus et al., "Eurythmy therapy in the aftercare of pediatric posterior fossa tumour survivors—a pilot study," *Complementary Therapies in Medicine*, vol. 21, supplement 1, pp. S3–S9, 2013.
- [5] J. L. Kanitz, K. Pretzer, M. Reif et al., "The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults," *Complementary Therapies in Medicine*, vol. 19, no. 5, pp. 247–255, 2011.
- [6] P. Mayring, *Qualitative Inhaltsanalyse, Grundlagen und Techniken*, vol. 11, Auflage Beltzverlag Weinheim und Basel, Berlin, Germany, 2010.
- [7] J. Strübing, *Grounded Theory. Zur sozialtheoretischen und epistemologischen Fundierung des Verfahrens der empirisch begründeten Theoriebildung. 2. Aufl.*, Qualitative Sozialforschung, 15, VS, Verl. für Sozialwiss, Wiesbaden, Germany, 2008.
- [8] U. Kelle and S. Kluge, *Vom Einzelfall zum Typus*, vol. 2 of *Fallvergleich und Fallkontrastierung in der qualitativen Sozialforschung*, Auflage, Verlag für Sozialwissenschaften, Wiesbaden, Germany, 2010.
- [9] P. L. Berger and T. Luckmann, *Die gesellschaftliche Konstruktion der Wirklichkeit. Eine Theorie der Wissenssoziologie*, Mit einer Einleitung zur deutschen Ausgabe von Helmuth Plessner. Übersetzt von Monika Plessner, Fischer Taschenbuch, Frankfurt/Main, Germany, 3rd edition, 1972, (1970).
- [10] T. Fuchs, *Das Gehirn—ein Beziehungsorgan. Eine Phänomenologisch-Ökologische Konzeption*, Kohlhammer, Stuttgart, Germany, 2010.
- [11] M. Bertram, "Rhythmische einreibungen nach wegman/hauschka—forschungsmethoden und-ergebnisse," in *Dimensionen Therapeutischer Prozesse. Ein Ökologisches Modell*, M. Bertram and H. Kolbe, Eds., Springer, Wiesbaden, Germany, 2014.
- [12] V. Weizsäcker, P. Achilles, M. Küttemeyer, and W. Rimpau, *Natur und Geist. Erinnerungen. Einleitungen und Rezensionen*, Suhrkamp, Frankfurt am Main, Germany, 1st edition, 1986.
- [13] M. Merleau-Ponty and R. Boehm, *Phänomenologie der Wahrnehmung*, De Gruyter, Berlin, Germany, 1974.
- [14] E. Husserl and K. Held, *Die phänomenologische Methode. Ausgewählte Texte I*, Auflage, Stuttgart, Philipp Reclam jun, Berlin, Germany, 1998.
- [15] T. Fuchs, *Das Gehirn—ein Beziehungsorgan. Eine phänomenologisch-ökologische Konzeption*, Kohlhammer, Stuttgart, Germany, 3rd edition, 2010.
- [16] F. L. Bedford, "A perception theory in mind-body medicine: guided imagery and mindful meditation as cross-modal adaptation," *Psychonomic Bulletin & Review*, vol. 19, no. 1, pp. 24–45, 2012.
- [17] J. C. Rüegg, *Mind & Body: Wie unser Gehirn die Gesundheit beeinflusst*, Wissen & Leben, Schattauer, Stuttgart, Germany, 2010.
- [18] R. J. Gerrig and P. G. Zimbardo, *Psychologie (Pearson Studium—Psychologie)*, 18 Aktualisierte Auflage, Auflage, München, Germany, 2012.
- [19] G. Kaluza, *Stressbewältigung—Trainingsmanual zur psychologischen Gesundheitsförderung. 3. Auflage*, Springer, Berlin, Germany, 2004.
- [20] R. S. Lazarus and S. Folkman, *Stress, Appraisal and Coping*, Springer, New York, NY, USA, 1984.
- [21] A. E. Kristoffersen, T. Stub, A. Salamonsen, F. Musial, and K. Hamberg, "Gender differences in prevalence and associations for use of CAM in a large population study," *BMC Complementary and Alternative Medicine*, vol. 14, no. 1, article 463, 2014.

## **Lebenslauf**

Mein Lebenslauf wird aus datenschutzrechtlichen Gründen in der elektronischen Version meiner Arbeit nicht veröffentlicht.

## **Komplette Publikationsliste**

### **Artikel in peer-reviewed Journalen**

**Kanitz JL**, Pretzer K, Reif M, Voss A, Brand R, Warschburger P, Längler A, Henze G, Seifert G.

The impact of eurythmy therapy on stress coping strategies and health-related quality of life in healthy, moderately stressed adults.

Complementary Therapies in Medicine. 2011; 19 (5): 2476255. **IMPACT FACTOR: 1.872**

**Kanitz JL**, Pretzer K, Reif M, Witt K, Reulecke S, Voss A, Längler A, Henze G, Seifert G.

The impact of eurythmy therapy on fatigue in healthy adults ó A controlled trial.

European Journal of Integrative Medicine. 2012; 4 (3): e2896e297. **IMPACT FACTOR: 0.559**

Seifert G, **Kanitz JL**, Pretzer K, Henze G, Witt K, Reulecke S, Voss A.

Improvement of Heart Rate Variability by Eurythmy Therapy After a 6-Week Eurythmy Therapy Training.

Integrative Cancer Therapies (2012), 11(2), 1116119. **IMPACT FACTOR: 2.354**

Seifert G, **Kanitz JL**, Pretzer K, Henze G, Witt K, Reulecke S, Voss A.

Improvement of Circadian Rhythm of Heart Rate Variability by Eurythmy Therapy Training.

Evidence-Based Complementary and Alternative Medicine (2013), Article ID 564340, 9 pages.

**IMPACT FACTOR: 2.175**

**Kanitz JL**, Reif M, Rihs C, Krause I, Seifert G.

A randomised, controlled, single-blinded study on the impact of a single rhythmical massage (anthroposophic medicine) on well-being and salivary cortisol in healthy adults.

Complementary Therapies in Medicine (2015), 23, p. 685 ó 692. **IMPACT FACTOR: 1.545**

**Kanitz JL**, Camus ME, Seifert G.

Keeping the balance ó an overview of mind-body therapies in pediatric oncology.

Complementary Therapies in Medicine (2013), 21 Suppl 1, 20 ó 25. **IMPACT FACTOR: 2.216**

**Kanitz JL**, Pretzer K, Calaminus G, Wiener A, Längler A, Henze G, Driever PH, Seifert G.  
Eurythmy Therapy in the aftercare of pediatric posterior fossa tumor survivors-a pilot study.  
Complementary Therapies in Medicine (2013), 21 Suppl 1, 3-9. **IMPACT FACTOR: 2.216**

Berger B, Bertram M, **Kanitz JL**, Pretzer K, Seifert G.

"Like Walking into an Empty Room": Effects of Eurythmy Therapy on Stress Perception in  
Comparison with a Sports Intervention from the Subjects' Perspective-A Qualitative Study.  
Evidence-Based Complementary and Alternative Medicine (2015), Article ID 856107, 11 pages.  
**IMPACT FACTOR: 1.880**

### **Präsentationen:**

- Sept. 2012 Kanitz JL, Rihs C, Krause I, Reif M, Henze G, Seifert G:  
• Short term improvement of subject well-being after a single rhythmical massage  
- a prospective, randomised, controlled trial  
• Eurythmy therapy in the aftercare of children and adolescents with brain tumours  
of the posterior fossa - a pilot study  
Eingeladene Vorträge; *5th European Congress for Integrative Medicine and  
Health* in Florenz, Italien
- Mai 2012 Kanitz JL, Pretzer K, Calaminus G, Wiener A, Längler A, Henze G, Hernaiz  
Driever P, Seifert G:  
• Eurythmy Therapy in the Aftercare of Pediatric Posterior Fossa Tumor Survivors  
- a Pilot Study  
• Improvements of Well-being after one Single Rhythmical Massage Intervention  
in Stressed Adults - a Prospective, Randomised, Three-Armed Study  
Eingeladene Posterpräsentationen; *3. International Research Congress on  
Integrative Medicine and Health* in Portland/Oregon, USA
- März 2012 Kanitz JL, Pretzer K, Seifert G:  
• Eurythmy therapy in the aftercare of pediatric posterior fossa tumour survivors -  
a pilot study (Vortrag)  
• The impact of eurythmy therapy on stress coping strategies and health related  
quality of life in healthy, moderately stressed adults (Posterpräsentation)  
• The Impact of Eurythmy Therapy on Fatigue in Healthy Adults - a Controlled  
Trial (Posterpräsentation)

- Improvements of Well-being after one Single Rhythmical Massage Intervention  
 in Stressed Adults • a Prospective, Randomised, Three-Armed Study•  
 (Posterpräsentation)  
 Eingeladene Vorträge und Posterpräsentationen; *3. Wissenschaftskongress der  
 Anthroposophischen Medizin*, Gemeinschaftskrankenhaus Havelhöhe in Berlin
- Februar 2012 Kanitz JL, Pretzer K, Seifert G:  
 •Stand der klinischen Forschung zur Eurythmietherapie, Rhythmischen Massage  
 und Kunsttherapie•  
 Eingeladener Vortrag; *Onkologischen Fortbildungen der Charité* in Berlin
- Juni 2011 Kanitz JL, Seifert G:  
 •Aktuelle Forschungsprojekte der AG IMO in der pädiatrischen Onkologie•  
 Eingeladene Vorträge; *2. Forschungstreffen Anthroposophische Pädiatrie* in Jena
- Mai 2011 Kanitz JL, Pretzer K, Seifert G:  
 •Eurythmietherapie in der pädiatrischen Onkologie•  
 Eingeladener Vortrag; *Stiftungstreffen von HELIXOR, Software AG, WALA und  
 Weleda* in Stuttgart
- Mai 2010 Kanitz JL, Pretzer K, Reif M, Henze G, Seifert G:  
 •Impact of eurythmy therapy on fatigue and health-related quality of life - a  
 controlled parallel two arm study•  
 Eingeladener Vortrag; *5th International Congress on Complementary Medicine  
 Research* in Tromsø, Norwegen
- Nov. 2009 Kanitz JL, Pretzer P, Schubot M, Voss A, Reif M, Henze G, Seifert G:  
 •Impact of eurythmy therapy on stress coping strategies and health related quality  
 of life•  
 Posterpräsentation; *2. European Congress for Integrative Medicine (ECIM)* in  
 Berlin
- Sept. 2009 Kanitz JL, Pretzer P, Seifert G:  
 •Stressabbau und Steigerung der Lebensqualität durch Eurythmietherapie•  
 •Wirkungen Rhythmischer Massage (RTM) auf physiologische Parameter bei  
 gesunden Probanden- eine kontrollierte, randomisierte, einfach verblindete  
 Studie•  
 Eingeladene Vorträge; *1. Forschungstreffen Anthroposophische Pädiatrie* an der  
 Charité • Universitätsmedizin in Berlin

## **Danksagung**

Zunächst danke ich meinem Arbeitsgruppenleiter und Erstgutachter Prof. Dr. med. Georg Seifert, der meinen akademischen Weg über viele Jahre gefördert und dessen Enthusiasmus mich oft angesteckt hat. Ebenfalls bedanke ich mich bei meinen KollegInnen der Arbeitsgruppe Integrative Medizin in der pädiatrischen Onkologie sowie den studentischen Mitarbeitern: Dr. Catharina Delebinski, Dr. Maria Moneta, Claudia vom Hoff-Heise, Antje K., Julia S., Hergen P.. Mein besonderer Dank gilt den Koautoren, die mein Interesse an diesem Themenfeld teilten und wodurch viele wichtige Impulse für diese Arbeit entstanden sind. Insbesondere danke ich Dr. Marcus Reif (IKF Berlin), Prof. Alfred Längler, Dr. Dirk Cysarz und Prof. Andreas Voss für ihre jahrelange Begleitung und den fachlichen Austausch.

Ohne die wertvolle Arbeit der TherapeutInnen hätte diese Arbeit ebenfalls nicht entstehen können und dafür danke ich besonders Kim Pretzer, Maria Schuboth, Carolina Rihs, Ingrid Krause und Herwart Pretzer.

Die Zeit meiner wissenschaftlichen Laufbahn wurde begleitet von Freunden, die mich ermutigt und bestärkt haben und mir damit viel Kraft und Freude geschenkt haben (Rosa, Justus, Silke, Eva, Grace, Zsuzsi, Jule). Schön, dass es euch gibt! Einen besonderen Anteil hatten Merle K. und Anke S., die diese Arbeit Korrektur gelesen haben. Merci! Ebenfalls danke ich meiner Mutter für ihre Geduld und Bereitschaft, neue Wege zu gehen. Und ich danke Frau T. für ihre Klugheit und Empathie von der ich hoffentlich lange schöpfen werde.

Und schließlich danke ich Henning. Für die Liebe. Für M.