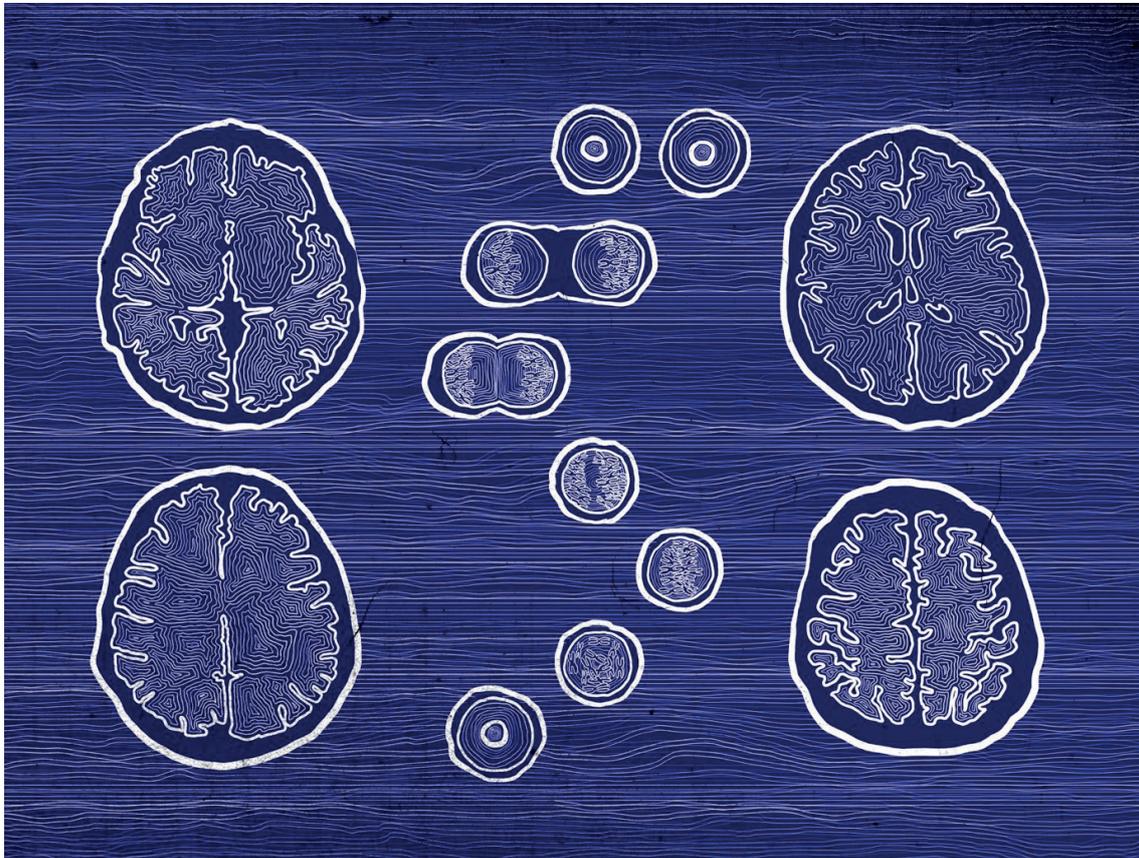


Andrew Rossetti

Trauma, Resilience, Safety (TRS)

A Music Psychotherapy Model for Addressing
Illness Burden in Oncology



JYU DISSERTATIONS 374

Andrew Rossetti

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ABSTRACT

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Medical Music Psychotherapy (MMPT) is a cutting-edge emergent model as practiced at the Louis Armstrong Music Therapy Department and Center for Music & Medicine at Mount Sinai Beth Israel in New York City, in which an eclectic mix of psychotherapeutic models merge with music experiences as a medium and facilitator of the therapeutic relationship/alliance. Radiation oncology is an area long-neglected in music therapy practice with concerns specific to a particularly fragile subpopulation in the care of people with cancer. A discreet symptomatology resulting from implications of the diagnosis, the disease, compounded by the resultant symptomatology from chemotherapy as well as radiation therapy itself may contribute to the fragility of an already challenged population, many of whom also receive surgery during their treatment trajectory. This dissertation will present and analyze the outcomes and implications of an internal review board- approved randomized control trial, that has made a critical contribution to the development and implementation of medical music psychotherapy-based oncology paradigm- TRS Trauma, Resilience, Safety: a Music Psychotherapy Model for Addressing Illness Burden in Oncology. The study's theoretical and clinical bases, and influencing underpinnings will be explained and explored. Present theory and praxis of music psychotherapy in a fragile population where allopathic medicine and mind/body constructs join to address symptom management, and pre-emptive treatment for anxiety and distress, as well as varied etiologies of emotional trauma and post traumatic stress are presented. Music psychotherapy's capacity to address anxiety in cancer patients has not been sufficiently described. This study evaluated a protocolized music psychotherapy intervention's impact on anxiety and distress experienced by patients undergoing Computerized Tomography (CT) Simulation. With a detailed trial inclusive of a subsequent protocolized radiation oncology music therapy intervention, resultant outcomes reflect how the music psychotherapy intervention significantly reduced anxiety and distress in newly diagnosed head & neck and breast cancer patients, with greater effect in subgroups with higher baseline anxiety and distress. While continued research on MMPT's effects in radiation oncology is warranted, this focus on emotional trauma and its sequelae as emergent and seminal to the fragile treatment of oncology patient procedures, provides a foundation for the subsequent TRS model.

Keywords: Medical Music Psychotherapy, Radiation Oncology, Simulation, Prescribed Music, Environmental Music Therapy, Cancer, Anxiety, Post traumatic Stress

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Trauma, resilienssi ja turvallisuudentunne: Musiikkipsykoterapiamalli syöpäsairauden aiheuttaman kuormituksen lieventämiseen

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Medikaalinen musiikkipsykoterapia (MMPT) on ainutlaatuinen hoitomalli, jota toteutetaan ja joka on kehitetty New Yorkissa sijaitsevassa Mount Sinai Beth Israel -sairaalassa ja siellä sijaitsevassa yksikössä nimeltään Louis Armstrong Music Therapy Department and Center for Music & Medicine. Kyse on eklektisestä kokoelmasta psykoterapian malleja yhdistettynä musiikkikokemuksiin, jotka toimivat terapeuttisen suhteen/allianssin rakentamisen välineenä ja edistäjänä. Sädehoitopotilaat on pitkään laiminlyöty ryhmä musiikkiterapian kliinisessä käytännössä, vaikka kyse on erityisen haavoittuvasta alaryhmästä syöpien hoidossa. Monisyinen oirekuva, joka muodostuu diagnosointiin liittyvistä, sairaudesta itsestään, sekä kemoterapian ja sädehoidon aiheuttamista implikaatioista, voivat edelleen lisätä kokonaisvaltaista kuormitusta ryhmällä, joka jo muutoinkin on kohdannut suuria haasteita - monet potilaista ovat sairautensa kuluessa saaneet myös leikkaushoitoja. Tässä väitöskirjassa esitellään ja analysoidaan kansainvälisen asiantuntijaryhmän hyväksymää satunnaistettua, kontrolloitua tutkimusta, joka on suuresti vaikuttanut MMPT:n kehittämiseen ja soveltamiseen sekä tässä väitöskirjassa esitettyyn kokonaisuuteen ylipäättään. Tutkimuksen teoreettinen ja kliininen perusta sekä sen taustalla olevat erilaiset vaikutteet selitetään tutkimuspohjaisesti. MMPT:n teoria ja käytäntö - jonka ytimessä koululääketiede ja mieli/keho ulottuvuus kohtaavat oireiden hallinnan näkökulmasta, ja jossa ahdistusta ja stressiä hoidetaan ennaltaehkäisevästi - esitellään yksityiskohtaisesti. Samoin käsitellään emotionaalisen trauman ja post-traumaattisen stressin etiologiaa niin kuin se ilmenee MMPT:n kliinisessä käytännössä. Musiikkipsykoterapian mahdollisuuksia syöpäpotilaiden kokeman ahdistuksen hoidossa ei ole tähän mennessä riittävästi kuvattu. Tämän väitöskirjan taustalla oleva tutkimus arvioi protokollaperusteisen musiikkipsykoterapiaintervention vaikutusta ahdistukseen ja stressiin potilailla, jotka olivat läpikäyneet tietokonetomografia-hoidon (Computerized Tomography (CT) Simulation). Tutkimus osoitti, että musiikkipsykoterapiainterventio vähensi merkittävästi ahdistusta ja stressiä äskettäin diagnosoitujen pään alueen, kaulan ja rintasyöpää sairastavien potilaiden kohderyhmässä - hyöty oli suurinta potilailla, joiden lähtötilanne (baseline) ahdistus ja stressi olivat muuta ryhmää korkeampia. Perustuen tässä väitöskirjassa esitetyn tutkimuksen tuloksiin sekä tutkimusta edeltävään kliiniseen kehittämistyöhön ja toimintaan voidaan todeta, että musiikkipsykoterapia tuo emotionaalisen trauman ja sen seurausten hoidossa olennaista hyötyä syöpäpotilaiden hoidon kokonaisuuteen ja tälle pohjalle rakentuu tässä väitöstutkimuksessa esitelty TRS-hoitomalli.

Asiasanat: sairaalamusiikkiterapia, toimintaympäristöön sovitettu musiikkiterapia, sädehoito, simulaatio, ahdistus, syöpä, trauman jälkeinen stressitila

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Andrew Rossetti

“Can anyone give us a really plausible explanation, not just wild speculation, of how the art of music intervenes in human physiology to cause people to become angry and sad, hopeful, and happy, in the complete absence of the features of the world that these emotions are ordinarily caused by and interact with?”

Peter Kivy, *Music Alone: Philosophical Reflections on the Purely Musical Experience* (Kivy 1991 pg. 167).

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LIST OF ABBREVIATIONS

LINAC	Linear Accelerator
IORT	Inter-operative Radiotherapy
MMPT	Medical Music Psychotherapy
MT	Music Therapy
IMRT	Intensity Modulated Radiation Therapy
GY	Gray: unit of absorbed dose of radiation
APA	American Psychological Association
NCCN	National Comprehensive Cancer Network
AD	Anxiety Disorder
MD	Mood Disorder
DSM	Diagnostics and Statistics Manual system
MSH	Mount Sinai Hospital
EMT	Environmental Music Therapy
RT	Radiation Therapy
BT	Brachytherapy
CT	Computer Assisted Tomography
PET	Positron Emission Tomography
PTSD	Post Traumatic Stress Disorder
ICU	Intensive Care Unit
TRS	Trauma Resilience Safety
ANS	Autonomic Nervous System
MCS	Music Characterization

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ABSTRACT

TIIVISTELMÄ (ABSTRACT IN FINNISH)

ACKNOWLEDGEMENTS

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1 INTRODUCTION: CANCER, TRAUMA, AND FACTORS IN ILLNESS BURDEN, AND RESILIENCE

In his seminal book *Cancer: The Emperor of all Maladies, a Biography of Cancer*, oncologist Siddhartha Mukherjee states “Cancer is not one disease but many diseases. We call all of them ‘cancer’ because they share a fundamental feature: the abnormal growth of cells (Mukherjee, 2010 p. xvii).” It is perhaps because of the complexity implied by this concept that few messages strike such terror as a diagnosis of cancer (Andersen 1984). Diagnosing, staging and treating cancer is in itself complex, and engenders an equally complex set of changes in the lives of the persons it touches. Illness and treatment burden resulting from a diagnosis of cancer are epic life altering events, and are often as perplexing and overwhelming to patients and caregivers alike, as the treatments themselves are devastating. Shakespeare, through his character Hamlet, provides a telling comment that may well be applied: “Diseases desperate grown, by desperate appliance are relieved, or not at all (Sparknotes, n.d.)”

According to a recent review, approximately 39.3% of men and 37.7% of women will be diagnosed with cancer at some point during their lifetime (American Cancer Society, 2018). The World Health Organization reported that cancer deaths are projected to reach 11 million by 2030, (World Health Organization, 2019) with 1.8 million new cases diagnosed in 2020 (American Cancer Society, 2020), and nearly two-thirds of those patients will receive radiation therapy. The use of Complementary Alternative Therapies has shown a steady increase within past decades, with an average of 40% among cancer patients (Horneber, 2011). However, the implementation varies significantly and is dependent upon one’s geographical area and type of cancer (Bray, 2018). The diagnosis is frequently accompanied by considerable emotional, psychological, physical and social suffering which may consequently contribute to the higher levels of anxiety, distress, and depression associated with oncological procedures, such as chemotherapy infusion (Greer, 2008; Andrade 2013).

Given that cancer is often a life-threatening disease, trauma and related depression and adjustment disorders are widespread in people receiving

treatment for cancer. In one recent study 16.3% of patients were diagnosed with Anxiety disorders (AD) and 11.8% with Mood Disorders (MD) (Akechi, 2004), while another found that almost half of cancer patients developed a psychiatric disorder, with those disorders being primarily MDs and ADs (Derogatis, 1983). Other findings consistently show these disorders to be common in this cohort (Akechi 2001; Kugaya 2000; Okamura 2000). The DSM IV identified the diagnosis of a life threatening disease as meeting its traumatic stressor criteria (American Psychiatric Association, 2000).

Research studying the prevalence of PTSD in cancer patients has shown that 35% of those patients experience full-syndrome PTSD or PTSD symptoms (Gurevich, 2002; Mundy, 2000; Pitman, 2001) and that in advanced cancer patients, the incidence of intrusion and avoidance symptoms climbs between 43% and 80% (Cella, 1990). Psychological distress can have devastating results, causing severe suffering and substantial degradation of quality of life (Pitman, 2001). Regardless, sadly it is often under-recognized by clinical staff in oncology settings (Pasik, 1998).

Treatment burden and illness burden are two recent concepts that provide an in-depth view of patients and their caregivers' experience of cancer, and its treatment. They provide a 'gestalt' that can better guide trauma informed care in oncology in that they identify the total effect of a disease on an individual.

Illness burden is defined as "The personal cost of acute or chronic disease. The cost to the patient may be an economic, social, or psychological cost or personal loss to self, family, or immediate community" (Burden of Disease, Medical Dictionary, 2009). Treatment burden can be seen as the deterioration in a patient's health that may be caused by exposure to medications, radiation therapy, surgery, or other forms of treatment (Treatment Burden, Medical Dictionary, 2009).

Illness and treatment burden are present to some degree in all experiences with illness. They are multi-faceted and perceived by some patients to be 'states' in which their actual sense of self and identity change to being that of a 'sick person'. Burden is experienced as a cost to the patient. Those costs may be economic, social, or psychological. They may also cross into the domains of personal loss of sense-of-self, family cohesion, or restricted contact with community. Illness burden may be reflected in absenteeism, productivity, response to treatment, lack of peace of mind, and reduced overall quality of life. (Burden of Disease, Medical Dictionary, 2009) The concept of treatment burden is a subset of the more generalized illness burden, in that its domains are the costs to the patient coming directly from the challenges of cancer treatment itself. These include physiological costs such as treatment-caused adverse symptomatology, and side effects, as well as emotional, psychological and sociological issues (Heckman, 2015), which in this model are categorized as "biopsychosocial costs". In the context of radiation oncology, it can be described as deterioration in a patient's global health caused by exposure to medications, radiation therapy, surgery, or other forms of therapy. This differs from mere healthcare costs deriving from the delivery of healthcare, rather than personal impact on individuals (Burden of Disease, Medical Dictionary, 2009).

Resilience is a commonly used term in multiple disciplines, and perhaps because of that there is considerable variance in definitions. Mosby's (2008) dictionary of medicine, nursing and health professions definition is 'the ability of a body to return to its original form after being stretched or compressed' (Mosby, 2008). According to Merriam-Webster Dictionary, resilience is 'an ability to recover from or adjust easily to change or misfortune' (Merriam Webster, 2002). The Dictionary of Medical Terms, defines resilience as the 'ability to endure stress (physical or mental) and return to normal even in situations that appear overwhelming' (Mikel, 2000). Other definitions include 'a dynamic process in the face of adversity related to the cancer experience' (Eisher, 2015), and 'a high psychological functioning condition following a cancer diagnosis' (Hou, 2010). According to the American Psychological Association, resilience is 'the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress such as serious health problems, family and relationship problems, work-place or financial stressors' (American Psychological Society, 2009).

1.1 Defining Cancer & Metrics

While a significant amount of research is being carried out in both music therapy and music & medicine milieus in a myriad of clinical contexts, perhaps no area is as deserving of scrutiny as is cancer. The presence of cancer is ubiquitous, and although some types of cancer are becoming less frequent, the numbers are still staggering: with 609, 640 deaths from cancer projected to occur in the US in 2020 (American Cancer Society, 2020). Around the world there were an estimated 18.1 million new cancer cases (17.0 million excluding non-melanoma skin cancer) and 9.6 million cancer deaths (9.5 million excluding non-melanoma skin cancer) in 2018 (Bray, 2018). A quarter of all U.S. deaths and about 15 percent of all deaths worldwide will be attributed to cancer (American Cancer Society, 2020).

Cancer is a multicellular disease of multifactorial etiology that can occur in any organ and arise from all cell types. Hanahan and Weinberg (2000) identified six cancer cell phenotypes that exhibit the hallmarks of cancer: cells with unlimited proliferative potential, environmental independence for growth, evasion of apoptosis, angiogenesis, invasion and metastasis to different parts of the body. If uncontrolled cell growth or metastatic spread occurs it will result in death of the individual (Chaffer, 2011). Fortunately, considerable progress towards the treatment and understanding of the hallmarks of cancer have taken place in the past decade (Hanahan, 2011). Advances in early detection and in various treatment modalities, have contributed to make more cancers curable (Pollack, 2009).

Science has identified 100 types of cancer, and they are categorized by the specific types of cells they begin in. These include: carcinoma, sarcoma, leukemia, lymphoma, myeloma, melanoma, carcinoid, neuroendocrine, brain & spinal cell, and germ cell (American Cancer Society b, n.d.).

Cancer is classified as a genetic disease. It is caused by changes to expression in the genes that control how cells divide, function, and grow. Its etiology can be inherited or occur through exposure to environmental elements that damage DNA. These include certain chemicals, tobacco smoke, or radiation. Effective treatment is all the more complex because each person's cancer is a unique combination of genetic factors. Three main types of genes are affected by these genetic changes that contribute to cancer- proto-oncogenes, tumor suppressor genes and DNA repair genes (American Cancer Society, n.d.). These changes are referred to as "drivers" of cancer and their function is as follows. Proto-oncogenes influence normal cell growth and division, but when altered in certain ways or become hyperactive, they can become oncogenes that foster cancer by allowing cells to grow and survive when they should not. Also involved in limiting cell growth and division are tumor suppressor genes. Cells with certain alterations in tumor suppressor genes may divide in an uncontrolled manner. DNA repair genes are involved in repairing damaged DNA. When mutations occur in these genes, additional mutations occur in other genes, and together cause cells to become cancerous (American Cancer Society b, n.d).

In metastasis, cancer cells from the primary cancer break away from where they first formed and travel through the blood or lymph system, to form new metastatic tumors in other parts of the body (American Cancer Society b, n.d). These metastatic tumors are of the same type of cancer as the primary tumor. Moreover, metastatic cancer cells usually have some molecular features with the cells of the original cancer, for instance, specific chromosome changes. Though treatment may help prolong the lives of some people with metastasis, its primary goal is to control the growth of the tumors and relieve symptoms caused by it. Most people who die of cancer die of metastatic disease (American Cancer Society, n.d.). In whatever stage it is found to be in, cancer is a prime source of illness and treatment burden the world over.

1.2 Medically induced trauma

Clinical distress can result from receiving a diagnosis of cancer, and the various stressors faced throughout the trajectory of the disease, including during survivorship. Clinically significant levels of distress occur in a large subset of patients, and can be indicative of *medically induced trauma*.

Medical Trauma or medically induced trauma is a phenomenon that merits attention even though it is not a term often included in the medical lexicon, and is often denied or ignored in the hospital context. Trauma experienced during hospital stays or as a result of medical procedures can produce the same sequelae as any other form of emotional trauma including anxiety, depression, PTSD, and somatic complications, as well as crises in existential, relational, occupational, and spiritual domains.

Medically induced trauma and the treatment of the disorders it causes has been an increasing focus in the healthcare community (Tedstone, 2003) though more attention is being paid to other sources of this ubiquitous experience.

Medical treatment and diagnosis share common ground with other trauma etiologies in that it also involves a perceived threat to one life, well-being or diminished personal power. Cancer is a feared disease that carries a strong potential to cause multiple points of trauma (Riba, 2019). As will be mentioned in other chapters of this dissertation, significant and enduring anxiety, distress and dissociative states such as depression are common in people receiving cancer treatment, and can be seen as clear manifestations of unaddressed medically induced trauma.

1.3 Distress in cancer patients

In the context of oncology, distress has been defined thusly: “Distress is a multifactorial unpleasant experience of a psychological (i.e. cognitive, behavioral, emotional), social, spiritual and/or physical nature that may interfere with the ability to cope effectively with cancer, its physical symptoms, and its treatment. Distress extends along a continuum, ranging from common low impact feelings of vulnerability, sadness, and fears to problems that can become disabling such as depression, anxiety, panic, social isolation, and existential and spiritual crisis (Riba, 2019 p. 2).”

The Visual Analogue Distress Thermometer, is commonly used on a daily basis by nursing to assess and report distress in many hospitals. It was used as an assessment instrument in TRS, and identifies distress in diverse domains, namely: practical, physical, emotional, and spiritual/religious (National Comprehensive Cancer Network, 2020). Conversely, many clinical studies in oncology define patient distress in terms of depression and anxiety, instead of referring to the 4 domains outlined in the Distress Thermometer (Iconomou, 2008). This may be one more indication of the concept of distress in the context of cancer care being poorly understood.

The National Comprehensive Cancer Network (NCCN) is an alliance of 30 cancer centers in the United States, most of which are designated by the National Cancer Institute (one of the U.S. National Institutes of Health) as comprehensive cancer centers. According to the NCCN Guidelines for Distress Management, “all patients experience some level of distress associated with the cancer diagnosis and the effects of the disease and its treatment, regardless of disease stage.” (National Comprehensive Cancer Network, 2020) Patients’ response to the cancer diagnosis, as well as to the diverse challenges that occur throughout the entire trajectory of the disease, can engender distress, including distress at clinically significant levels (Rossetti, 2017).

It is of utmost importance to identify and treat the distress and parallel psychosocial issues experienced by so many patients with cancer, and provide a viable and necessary path for incorporation of the concept of succinct and readily available music psychotherapy as an integral part of trauma informed care in oncology.

1.4 Anxiety and its relationship to treatment

There are numerous approaches to understanding the concept and phenomena of anxiety. This chapter will explore various perspectives in an attempt to elucidate an understanding of anxiety so as to contribute to an effective approach to its palliation in radiation therapy patients.

Anxiety is a ubiquitous phenomenon in the context of cancer treatment. There are different, and sometimes conflicting definitions of anxiety. It has been identified as an emotion, a state, and more recently, a mind-body phenomenon.

American Psychological Association (APA) defines anxiety as “an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure”(American Psychological Association, 2020), and expands that emotion based definition as follows: “an emotion characterized by apprehension and somatic symptoms of tension in which an individual anticipates impending danger, catastrophe, or misfortune.” The body often mobilizes itself to meet the perceived threat: muscles become tense, breathing is faster, and the heart beats more rapidly. Anxiety may be distinguished from fear both conceptually and physiologically, although the two terms are often used interchangeably. “Anxiety is considered a future-oriented, long-acting response broadly focused on a diffuse threat, whereas fear is an appropriate, present-oriented, and short-lived response to a clearly identifiable and specific threat” (American Psychological Association, Anxiety, 2020).

Spielberger in the seminal State Trait Anxiety Inventory defined state anxiety as “a transitory emotional state consisting of feelings of apprehension, nervousness, and physiological sequelae such as an increased heart rate or respiratory rate (Spielberger, 1983).”

It is recognized that psychosocial care is vital to a comprehensive care strategy for people diagnosed with cancer (Institute of medicine, Psychosocial needs, 2004) There is a broader trend in oncology to view psychosocial care as having an important impact on the evaluation of quality of life as well as quantity of life (Jacobsen, 2002). In addition to trying to extend how long people live following a cancer diagnosis, the oncology community increasingly recognizes the value of quality of life vs. quantity of life. Psychosocial care, with its goals of relieving emotional distress and promoting well-being, is central to efforts to improve the quality of patients’ lives.

It is still relatively uncommon for many patients who would benefit from psychosocial care to actually receive it (Jacobsen, 2008). Barriers to this include under-recognition of the need for psychosocial care by the primary oncology team and, even when recognized, there is a lack of professional programs available in many communities to provide psychosocial care to cancer patients. This was an initial motivator for the implementation of the evidence-based program that led to the development of this model of cancer care and of its continued fine tuning.

Anxiety and depression in adults diagnosed with cancer are well documented (Newport 1998; [Mukherjee, 2017](#); Stark 2000). Etiologies can be varied. They can include issues predating diagnosis, as well as reactions to

diagnosis itself of a possibly life-threatening and severe illness along with the expectation of experiencing unpleasant symptoms (e.g., pain, nausea, and fatigue). Contributing factors can also include disruptions in life plans, diminished quality of life, and disease recurrence or progression. In addition, alterations in the central nervous system can occur as a result of the physiologic side effects of certain treatments (such as high dose interferon therapy) and may directly produce anxiety or depression (Capuron, 2000). Studies indicate that heightened anxiety and depression may persist for months or even years following successful treatment (Cordova, 1995).

It has become commonplace to distinguish between state and trait anxiety (Spielberger, 1983). *State anxiety* is defined as an unpleasant emotional arousal in response to perceived threatening demands or danger (University of California, psychosocial research, 2020). Though anxiety is a felt response, a cognitive appraisal and recognition of threat is a necessary for one to be aware they are anxious (Lazarus, 1991). *Trait anxiety*, on the other hand, is seen as an element of one's personality that has been incorporated, and reflects a predisposition to respond with anxiety in anticipation of threatening situations (University of California, psychosocial research, 2020).

Regarding both state and trait anxiety, *worry* and *emotionality* are components of the experience (Spielberger, 1980). Worry is a cognitive component of the anxiety response. Individuals respond to threat with worries about the imminent danger and what they perceive as a lack of resilience or resources to counteract the threat. On the other hand, emotionality refers to the perception of the arousal component of the anxiety experience. The physiological response can include sweating, headache, nervousness, tremor, and other somatic reactions (University of California psychosocial research, 2020). To some degree, these two components usually occur simultaneously. Albeit they are only moderately related in the sense that they manifest as different phenomena. Worry can substantially impair 'performance' whereas there is less of a relationship between it and emotionality. It has been my experience in the context of MMPT in oncology, that much of the anxiety experienced by patients resides in the domain of state-oriented processes.

Further efforts have been made to distinguish the components of the response. The term Somatic Anxiety is used to identify physical manifestations, and is commonly contrasted with cognitive anxiety, which manifests in the specific thought processes, such as concern or worry, that occur during anxiety (University of California, psychosocial research, 2020).

Humans identify the "neurochemical" survival response to threats and danger as "anxiety." And though some schools of thought focus mainly on the psychological implications, anxiety is essentially a physiological reaction (Psychology Today, 2002). As such, an approach to the palliation of anxiety would, by definition, need to address both areas. This approach directly contributed to the design and implementation of the protocolized music psychotherapy intervention that the subject of the clinical research contained in this dissertation.

Expanding on this perspective on anxiety is to view it as a stress response that can be understood in the following ways: (a) as a stimulus, such as an event

that produces feelings of threat or danger (often referred to as a "stressor"), (b) as a response to such an event (symptoms), and (c) as a transactional encounter between a person and a situation. Regarding the first point, anxiety follows the threatening event (e.g., as in the form of post-traumatic stress) while the second views anxiety as part of the response pattern, and the third as an accompanying emotion response (Kean, 1997).

Stephen Porges, author of the Polyvagal Theory, reflected on anxiety as a "non-functional somatic response" and in a personal communication states: "regarding your question - from a polyvagal perspective anxiety is a derivative label of a bodily shift to mobilize even when movement (fight/flight) is not a functional or even a rational behavioral expression (Porges, 2020 personal communication). "Think about anxiety as how we label our bodily feelings and neuroception as the process through which we shift into the mobilized state. 'Anxiety' is how we label our bodily reactions. With this model, anxiety is reduced (treated) via neuroception of safety and the calming of the body changes our personal narrative and time slows down (Porges, 2020 personal communication)."

I have found, in the context of my research carried out in radiation oncology, that Porges' concept of anxiety as a shift to mobilize when motion is not a functional option provides a sound base to inform efficacious clinical interventions that include elements addressing both the somatic experience and the thought processes that engender what can be defined as a non-functional coping structure in a specific context.

1.5 Radiation oncology, chemotherapy and fragile areas of treatment: Process challenges and implications

Radiotherapy - together with surgery, chemotherapy, and immunotherapy - comprise the four main treatment modalities for cancer patients. The value of radiotherapy for cancer treatment was established more than 100 years ago and its role as a therapeutic option is continuously gaining importance. At present, more than 50% of all cancer patients in the US receive radiotherapy during their course of disease (Baskar, et al., 2012).

The main aim of radiotherapy is to achieve localized control of tumor disease without major damage to the surrounding normal tissue (Zeman, 2016). Radiotherapy can also decrease distant metastases by preventing metastatic spread from locally uncontrolled tumors. Radiotherapy is often applied in combination with systemic treatments. While most treatment is carried out with classical chemotherapeutics like cisplatin, in recent years the combination of cutting edge agents and immunotherapy (Izar et al., 2016) has gained increasing importance. Often to treat tumors, radiotherapy is also combined in a pre- or post-operative setting with surgery. Radiotherapy can be applied with curative intention, but also plays an important role in palliative care of patients with very locally advanced tumors or distant metastases. In this situation, radiotherapy can efficiently reduce pain. For example, in the case of bone metastasis, it can prevent

paraplegia caused by metastases to the vertebral column, and dissolve life-threatening advanced symptoms. When used with palliative intention, reduction of symptoms and preservation of quality of life are primary therapy goals. These often can be achieved rapidly and with relatively low doses (Willey, 2016).

Radiotherapy is usually applied over several weeks of daily treatment at fractions of 1.8–2 Gy (Ebert, 2016). The Gray or GY is the standard unit of measurement of radiation energy used in radiation oncology. This fractionated scheduling process evolved empirically over decades and exploits the radiobiological mechanism underlined in fractionated radiotherapy, that allows for cumulative doses of radiation instead of one excessively high and potentially lethal dose. RT is commonly applied during 6–7 weeks, with 3–4 weeks allowed for hypo-fractionated (larger doses) treatment or ‘boosts’ as they are commonly referred to (Bourland, 2016). Accelerated radiotherapy, which means shortening the overall treatment time by increasing the weekly dose above 10 Gy is used in some instances because it has been shown that shortening the overall treatment time counteracts the repopulation of cancer stem cells (tumor cells with capabilities of self-renewal, differentiation, and tumorigenicity) during radiotherapy and increases local tumor control (Ebert, 2016). The downside of this is that it also increases early side effects. In contrast, an excessive prolongation of the planned treatment time results in worsening tumor control and should therefore be avoided or compensated (Bourland, 2016).

Radiotherapy has been advanced by the general advance of computer technology to which it is closely tied, and has seen substantial changes in both equipment and techniques. Application requires modern information technology consisting of high performance computers. These deliver fast device control, calculations and visualization, high capacity servers for data storage and management using large databases (e.g., for images, backup in case of crash, long term storage) (Bourland, 2016). Fast network connections between the devices are imperative for discreet import/export options of data, as is dedicated software that provides clear and intuitive graphical user interfaces that facilitate securer operation and assistance in the therapeutic delivery of radiation (Bourland, 2016).

1.5.1 Categories of radiotherapy

There are five main categories of radiotherapy: external beam therapy, brachytherapy, intraoperative radiotherapy (IORT) and systemic radioisotope therapy (Ebert, 2019) Differences in these categories result from the position of the radiation source and the distance between source and target. With external beam radiotherapy, irradiation is delivered from outside the patient’s body without direct contact between source and target (Baskar, 2012).

External beam therapy using high-energy particles is currently the standard in radiotherapy. Radiation is produced by a clinical linear accelerator (LINAC), which consists of three main components: a static structure holding an isocentric gantry that can rotate 360 degrees around a patient couch (Bourland, 2016). High-frequency electromagnetic waves are used to accelerate electrons to high energy through a linear tube of approximately 3 feet in length inside the gantry. The

generated electron beam is directed toward the area to be treated on the patient by means of magnets inside the gantry head (Bourland, 2016).

Brachytherapy (BT) is a form of radiotherapy used to treat cancer by placing sealed radioactive sources in the tumor itself. Through direct contact, a high dose can be applied locally. This makes BT a highly efficient treatment, but limited to distinct tumor types, and therapy strategies. This is due to the need for direct accessibility to the target area, and limitations to maximum tumor size (Zeman, 2016). BT can be used as stand alone therapy, but it is typically delivered as additional local dose (boost) in combination with external beam radiotherapy. Interstitial BT can be used for breast and prostate cancer, while contact BT can be applied for gynecological, lung, esophageal and skin cancer (Bourland, 2016).

1.5.2 Imaging for Treatment Planning

Radiotherapy requires a defined, reproducible, stable and as-comfortable-as-possible (in many cases, meaning 'tolerable') patient position that provides unencumbered access to the treatment target area to be effective. It is the basis for all treatment planning. For this reason, imaging for radiotherapy has precise goals, namely finding a reproducible, stable, and relatively comfortable position that allows for extreme precision during RT (Ebert, 2019).

Images of the area to be treated are taken most often with a computer assisted tomography (CAT) scan, though in some cases, especially for gynecological cancers treated with brachytherapy, the images are taken with a positron emission tomography (PET) scan. This often requires patients to be injected with radioactive 'contrast' material, necessitating isolation of the patient as a security measure. Accurate and reproducible positioning is vital for obvious reasons, and patient comfort is unfortunately often compromised in favor of treatment accuracy (Rossetti, 2017). Thus, imaging sessions, often referred to as "Simulation for Radiotherapy," are the patient's first experience with radiation treatment. For that very reason, simulation is a necessary area of focus for supportive therapy. Patient positioning is determined and achieved during imaging using different aids. Among them are thermoplastic masks for restraining the head and neck region, skin marking stain or tattoos and immobilization devices such as 'breast boards', 'alpha cradles' and stereotactic abdominal compression devices, knee rolls and arm rests (Ebert, 2019).

In recent years, additional procedures for increased reproducibility and movement reduction have been developed. For example, for prostate cancer patients, bladder filling can be reproduced by a daily drinking protocol and ultrasound monitoring, and the rectum can be stabilized by a special rectal balloon (Ebert, 2019). A spacer can be implanted between prostate and rectum, thereby reducing dose to the anterior rectum wall (Ebert, 2019). Simulation comes with its own set of challenges as will be further described later in this document.

1.5.3 Overview of chemotherapy

Chemotherapy is considered a *systemic* treatment because the drugs travel throughout the body and are not limited to a specific area or organ (Izar, 2016). It is for that reason often used as an adjunct treatment as well as a primary one. It can kill cancer cells metastasized to parts of the body distant from the primary tumor, and in that sense is very different from surgery and radiation which are both considered localized treatment (Izar, 2016). Chemotherapy is effective at causing cell death to cells that divide quickly, such as cancer cells, but also negatively affect other fast-growing cells such as bone marrow cells, cells found in the oral mucosa, and in the gastrointestinal tract (American Cancer Society, 2018).

Chemotherapy is provided through different modalities. Neoadjuvant therapy is used to shrink a tumor before surgery or radiation therapy, making both local therapies likely more successful (American Cancer Society, 2018). If chemo is applied after surgery or radiation, it is referred to as adjuvant therapy, and is effective in killing remaining cancer cells not affected by the other modalities. In some cases chemo is given at the same period as radiation. It is referred to as chemoradiation, and is often aggressive and difficult to tolerate well. Chemoradiation is used as a substitute for surgery in head & neck cancer, especially when surgery is contraindicated because of the tumor's position or size (American Cancer Society, 2018) Combinations of the chemo agent cisplatin and radiation are common in this context (American Cancer Society, 2018) Combinations of chemotherapy and radiation after surgery (mastectomies, lumpectomies and sentinel and axillary lymph node resection) are commonly given to breast cancer patients (American Cancer Society, 2018) Often used chemo agents for breast cancer are carboplatin, taxotere, and 5-fluorouracil (American Cancer Society, 2018)

Chemotherapy is provided in cycles during which a dose of one or more drugs is given on one or more days. In following, the patient has several days or weeks without treatment, which gives normal cells time to recover from the effects of the drugs. Dosification is consistent with reaching a balance between maximum toxicity and patients' ability to tolerate treatment (American Cancer Society, 2019).

Chemotherapy is not always applied with curative intent, and can be effective in *managing* cancer cell growth, treating it as a chronic disease. It is also used with palliative intent to manage pain and suffering through symptom reduction (American Cancer Society, 2018).

There are a number of different delivery systems for chemo, with the most familiar being intravenous (IV). Treatment consists of the injection of the chemo agent directly into a vein along with other medications such as Benadryl and saline solution (American Cancer Society, 2018). One difficult challenge patients face is the need for repeated catheter placement and other injection and blood draws. Also prevalent in chemo are the many side effects produced by potent and toxic chemical agents, including anticipatory anxiety and somatizations caused by patients' fear of repeated experiencing of the side effects themselves. There are more than 40 commonly occurring side effects from chemotherapy,

including a number which can be life-threatening (such as kidney failure, and anaphylaxis) (American Cancer Society, 2018). Often, to avoid repeated invasive catheter placement, a 'port-a-cath' or simply 'port' is implanted beneath the dermis of the chest or upper arm under local anesthesia by a surgeon, and left in place until completion of all the patient's cycles. Due to the invasiveness of delivery and the often-severe side effects of this treatment modality; it commonly causes significant distress, fear and anxiety in those receiving it (American Cancer Society, 2018). On-site psychosocial support is common in most comprehensive cancer centers in the US.

1.6 Trauma, fear, and resilience in oncology environments

Post-traumatic stress disorder (PTSD) has been increasingly diagnosed in cancer patients. This is in part due to life threatening illness being included as a traumatic event in the *Diagnosics and Statistical Manual DSM-IV 1994* (American Psychiatric Association, 1994) Cancer is often a life-threatening disease. It is well recognized that trauma and its resulting depression and adjustment disorders are widespread in people receiving treatment for cancer. In one recent study 16.3% of patients were diagnosed with adjustment disorders and 11.8% with major depression (Akechi, 2004), while another found that almost half of cancer patients developed a diagnosis for a psychiatric disorder. These were found to be primarily major depression, and adjustment disorders (Cordova, 2017) Other studies consistently show these disorders to be common in this cohort (Andrylowski, 2015; Mehnert, 2007; Mulligan 2014). Not surprisingly, the DSM IV identified the diagnosis of a life-threatening disease as meeting its traumatic stressor criteria, though subsequently and controversially, it was removed. The consideration of a life-threatening illness as a potential traumatic event underlines the importance of many cancer patients' struggle with distress and anxiety (American Psychiatric Association, 2000). It has, however, led to controversy as to whether it actually meets the criteria of a traumatic stressor. The broadening of the concept has led to a diverse set of experiences being identified as contributors to PTSD. These include experiencing symptoms, the disclosure of diagnosis, and identification of treatment as palliative care (Mulligan 2014).

Research studying the prevalence of PTSD in cancer patients has shown that 35% of cancer patients experience full-syndrome PTSD or PTSD symptoms (Gurevich, 2002; Mundy 2000; Pitman 2001) and that in advanced cancer patients the incidence of intrusion and avoidance symptoms climbs between 43 and 80% (Cella 1990; Pitman 2001). Psychological distress can have severe negative impacts, causing acute suffering and substantial loss of quality of life, (Pitman, 2001). Additionally, clinically relevant distressing conditions not usually diagnosed as disorders such as demoralization, anxiety over health, loss of meaning in life, and existential crisis are present in an additional 15-20% of cancer patients. The burden of cancer also poses significant psychosocial consequences for patients' family members and caregivers, which adds to the overall burden

of the disease (Caruso et al., 2017). These facts are buttressed by an extensive body of epidemiological literature (Caruso et al., 2017).

In my clinical practice, I have observed that in some patients unresolved early or complex trauma appears to resurface and exacerbate physical and/or emotional adverse symptoms. This was vetted by the findings of two seminal studies that found that prior traumatic life events increase the risk of PTSD associated with a new event (Kemp 1995; King 1996). In a number of instances, patients were referred to me by medical staff for severe and “unexplainable” symptoms resulting from radiation therapy, or for emotional responses that made treatment compliance difficult. In a significant number of these patients past trauma memories and flashbacks emerged spontaneously. Many presented with PTSD-like symptoms without having had a previous incidence of those symptoms, and much less a diagnosis. There were, of course, patients who presented with longstanding or chronic psychological co-morbidities (PTSD among them.)

The majority of those patients appeared to have lower tolerance to both the physical as well as the mental or emotional difficulties of treatment. Curiously the majority of those patients were women that had suffered sexual abuse, and in some cases rape, while they were pre-pubescent or pubescent, or had suffered human vindicated violence. Among them were 9/11 survivors, or in one case, a survivor of rocket attacks in a middle east conflict zone. Interestingly, in the majority of these cases the points of trauma had long been forgotten through dissociation, and materialized with the occurrence of a new point of trauma (some part of the process of cancer treatment/diagnosis), or, at the least had not presented any somatic symptomatology until the experiencing the fear and helplessness prevalent in cancer treatment began. This may be so because there are certain aspects of treatment that mimic or symbolize the traumatic event itself. Isolation, exposure, pain, restraint, unwanted touch, physically invasive experiences, feeling overpowered, body violation, helplessness, shame and humiliation are unfortunately all potentially part of the cancer experience. Many of the symptoms cancer patients report having are similar to those that fit the criteria of PTS (Green, 2000). Those commonly reported include: typical symptoms of hyperarousal - anxiety and nervousness, sleep disruption, difficulty in concentration, intrusive thoughts about the illness and its treatment, and deliberate avoidance of reminders of the disease or treatment. Predictors of patient-susceptibility to PTSD included a serious illness or accident or the death of a close relative in the past year. (Tjemsland, 1996.)

Though the diagnosis of cancer and its treatment have been associated with PTSD (Pitman, 2001), they are also associated with posttraumatic growth. Because of complex interactions between traumatized clients, stressed staff, and a social and economic environment that is frequently perceived as hostile to the aims of recovery, our systems recapitulate the very experiences that have proven to be so toxic for the people we are supposed to treat (Bloom, 2006). And it is for this reason, that trauma informed care and treatment of trauma to redirect towards posttraumatic growth in the context of cancer treatment is so important.

1.6.1 Towards an understanding of trauma

Trauma as a ubiquitous experience has numerous definitions at present, and how it is viewed has changed with time. Early definitions recognized reactions to stressful experiences as transient situational disturbances. This suggests that without an underlying adjunct psychological condition, the individual's deleterious psychological experiences would wane as the stressor subsided. However, the term trauma (or emotional trauma) has been applied in so many varied contexts that it has lost some of its clinical meaning. In non-clinical contexts, trauma is used to describe both the negative events that produce distress and to the distress itself.

Technically, "trauma" does not refer to the reaction per se but only to the event itself. It should be used to identify events that are psychologically overwhelming in the literal sense. The Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision DSM-IV-TR; American Psychiatric Association (American Psychiatric Association, 2000) specifically defines a trauma as "direct personal experience of an event that involves actual or threatened death or serious injury, or other threat to one's physical integrity; or witnessing an event that involves death, injury, or a threat to the physical integrity of another person; or learning about unexpected or violent death, serious harm, or threat of death or injury experienced by a family member or other close associate (Criterion A1)." The response to the event must involve intense fear, helplessness, or horror.

A list of potentially traumatic events includes experiencing: combat, sexual and physical assault, robbery, being kidnapped, being taken hostage, terrorist attacks, torture, disasters, severe automobile accidents, and life-threatening illnesses, as well as just witnessing death or serious injury by violent assault, accidents, war, or disaster. Childhood sexual abuse is included even if it does not involve threatened or actual violence or injury. Although the DSM-IV-TR definition is useful, some have criticized the requirement that trauma be limited to "threatened death or serious injury, or other threat to one's physical integrity," since many events may be traumatic even if life threat or injury is not an issue (Briere, 2006). The earlier DSM-III-R (American Psychiatric Association, 1987) definition also included threats to psychological integrity as valid forms of trauma, such as degradation or humiliation (as can often occur during medical procedures). The issue of whether an event has to satisfy current diagnostic definitions of trauma in order to be, in fact, "traumatic," is an ongoing source of discussion in the field. My personal belief is that an event is traumatic if it is upsetting enough to at least temporarily overwhelm the individual's internal resources. This broader definition is used throughout this dissertation. Observation and interaction with oncology patients has led me to conclude that people who experience major threats to psychological integrity are prone to suffering of an equal intensity to those traumatized by physical injury or life threat, and can respond equally well to trauma-focused therapies.

Informing this view of trauma is Polyvagal Theory (which will be discussed in chapter 2 of this dissertation) and by a perspective in which trauma is approached in a broader mind/body context. Bessel van der Kolk, M.D., author

of the seminal *The Body Keeps the Score*, explains how feelings of helplessness are key to traumatization: “When the brain senses threat, it immediately sends out chemicals telling the body to run, hide, fight, or on occasion, freeze. If these responses are blocked, for example, if people are held down, trapped, or otherwise prevented from taking effective action, the brain keeps secreting stress chemicals and the brain circuits continue to fire in vain. Long after the actual event has passed, the brain keeps sending signals to the body to escape a threat which no longer exists.” (van der Kolk, 2014 p. 46.)

1.6.2 Medically induced trauma

Often, a patient’s subjective experience of the medical event determines their response to points of medically induced trauma, more so perhaps than the actual invasiveness of the procedure. The reason may lie with the implicit vulnerability of specific patient cohorts. Regarding another vulnerable subpopulation, the US Department of Health and Human Services found that up to 80% of ill children and their personal caregivers experience traumatic stress reactions owing to life-threatening illness, injury, or painful medical procedure, and that 20 - 30% of parents and 15 - 25% of those children have persistent traumatic stress reactions that impair daily functioning and affect treatment adherence and recovery (National Child Traumatic Stress Network, n.d.)

Trauma experienced as a result of medical procedures, illnesses, and hospital stays can have lasting effects. Such effects are often the same as those resulting from other trauma etiologies, and include PTS/PTSD, anxiety and anxiety disorders, various depressive states, complex grief and sense of loss, as well as somatic complaints. In addition it can be speculated, in contrast to other etiologies of trauma, that medically induced trauma has a more immediate carry-over, and would therefore engender further trauma from similar experiences. Secondary crises in existential, physical, occupational, relational, spiritual, domains can often occur. Research suggests that multiple factors contribute to medical trauma. These include life-threatening diagnosis, treatment procedures and the clinical environment itself, as well as the patient’s unique response owing to their personal resources and resilience (Jones, et al., 2007; Tacon, 2011). Wade et al (2012) asserted that the strongest risk factor for PTSD and depression is a patient’s mood in the ICU.

Medical trauma can be differentiated from other traumas in that it often owes to predictable factors that can be addressed preemptively. Simply put, if we can anticipate the trauma we can plan for its prevention and intervention, as is the intent of the protocolized MMPT procedure that is the subject of the study that forms this dissertation’s base. When one considers the common denominator of all traumatic experience is real or perceived threat to one’s life or well-being and diminished personal power, the strong potential for engendering trauma that experience in the medical setting becomes startlingly clear.

I chose to highlight medical diagnoses of cancer and their associated treatments, specifically radiation oncology, because they clearly have the potential for eliciting strong emotional and biopsychosocial survival responses from patients. Considering the life-altering results and feeling of powerlessness

upon receiving a cancer diagnosis, it is not surprising that some patients will experience these events as traumatic, and without appropriate treatment will develop into posttraumatic stress disorder.

Prophylaxis and treatment of trauma-related illnesses have been of increasing concern to health practitioners and policy makers in the United States (Tedstone & Tarrrier, 2003), and posttraumatic stress that develops as a result of a medical diagnosis, procedure, or error has been the focus of several studies that seek to understand the longer-term impact of medical traumas (Brown, Kroenke, Theobald, Wu, & Tu, 2010). Tacón (2011) asserted that many cancer patients experience a profound sense of loss and grief during their struggle with the various phases of illness and its treatment. He listed potential losses associated with a cancer diagnosis, emphasizing the loss of self, independence, decreased cognitive and physical functioning, role in the family, and anticipatory grief. In this experience of loss, oftentimes, medical trauma may bring people close to death in ways that make their mortality, or their awareness of it, much more urgent (Yalom, 1980). The TRS model seeks to provide a platform for theoretical and practical palliation specifically of medically induced trauma by re-contextualizing patients' perception of their initial experience with radiation therapy.

1.6.3 Trauma informed care: a definition

The Substance Abuse and Mental Health Services Administration [SAMHSA] illustrates a viable approach to trauma-informed care applicable to oncology contexts: "The paradigm of trauma-informed care acknowledges that trauma and traumatic stress overwhelm an individual's ability to cope while simultaneously changing their biology with both short term and lifelong implications for health and wellbeing. Acknowledging that a single definition of trauma underserves the complexities and nuances of the lived experience of trauma, SAMHSA conceptualizes trauma as an event or a series of events experienced by an individual as physically or emotionally harmful or life-threatening that results in lasting adverse effects on the individual's health and wellness mentally, physically, socially, emotionally, and/or spiritually." (SAMHSA, 2014) "A trauma-informed approach then *realizes* the impact of trauma on the individual, *recognizes* signs and symptoms of trauma and *responds* by integrating knowledge about trauma and its adverse consequences into policies, procedures and practices to support the individual while actively *resisting re-traumatization*." (SAMHSA, 2018.)

Implementation of a trauma-informed care program is a process based on organizational change focused on preventing (re)traumatization during medical services. To that end there are key principles to be incorporated in the system. Foremost is the base of viewing patients as potential trauma sufferers, meaning that there is an understanding and acknowledgment of the links between trauma and mental health, and that initial experiences can carry over and color patients' perception of subsequent treatment modality. A broader definition of trauma extending beyond a mere diagnosis of PTSD is necessary, and should include

recognizing the intersectionality of points of trauma (often referred to as traumatic experiences).

It is imperative to carry out assessments of trauma in a sensitive and knowledgeable manner to avoid unnecessary activation or re-traumatization. Education of medical and technical staff is necessary so as to avoid provoking phobic responses through excessive and invasive manipulation of patients, and through the insensitive use of physical restraint and coercion. In taking utmost care to foster feelings of safety, empowerment, and proactiveness from the very first experience a patient has with their care, we can also adopt 'strengths-based approaches'. Where appropriate, these include reframing signs and symptoms of distress as functional and adaptive coping structures. For instance, dissociation can be contextualized as an effective short-term adaptive strategy to escape unbearable experiences. Finally, when strong evidence exists that the patient has unresolved and unassimilated points of trauma, priority should be given to referral to and treatment by a healthcare professional who has received appropriate training in trauma treatment. While there is little literature on this point to date, music therapists do not typically receive specific advanced training in treating trauma. A point can be made that treatment without sufficient training violates ethical considerations and proposes potential dangers, such as exacerbation of symptomology and re-traumatization. Music psychotherapy is in a privileged position poised to champion the competent treatment of trauma and its sequelae, by this potential conflict to light to the medical community.

Trauma-informed approaches are distinct from trauma-specific services in that the latter's aim is informed treatment of the condition and its symptoms using current strategies in psychotherapy and arts-based therapy, while the former's looks at a whole-systems approach in which staff would be knowledgeable in identifying traumatic response, avoiding exacerbation of those responses and referring on to trauma-specific services (Sweeney et al., 2018). For example, I have observed that trauma survivors often report that lack of control in medical settings increases their anxiety. Many report moderate to acute levels of fear and discomfort particularly regarding needles and injections, as well as broader concerns about their bodies, exposure, fear of not being able to breathe or swallow, experiencing unwanted or intolerable touch, or of being isolated in a treatment room.

1.6.4 Trauma and PTSD

Though trauma can be a deeply distressing and disturbing experience and can be defined as "The result of exposure to an inescapably stressful event that overwhelms a person's coping mechanism" (van der Kolk, 1997), trauma in itself is not a pathology. Though in some cases it can be a platform for personal growth, experiencing trauma can lead to the development of PTSD. Whether a person experiencing trauma will develop PTSD symptoms is related to the individual's coping mechanisms and ability to process and incorporate the event. The individual's personality traits and response to previous adverse experiences along with their access to social support for both mental and emotional processing are also determining factors of trauma's effects (Pabayo, 2017). These

can include functional behavioral changes, intrusive ideation, negative self beliefs, and avoidant behavior (Pabayo, 2017). Importantly, in the context of cancer treatment, studies suggest that new traumatic events, or even extremely stressful situations, are likely to reactivate prior traumatic memories, and trigger reenactment that can lead to compounded anxiety (Briere & Scott, 2015).

PTSD can be seen as a set of enduring changes leading to dysfunction in varying domains resulting from a traumatic experience that can manifest as repeated distressing memories and dreams, flashbacks of the event, and a plethora of physical, mental and emotional disturbances. The change brought about by points of trauma can further manifest as hostility or low regard towards health professionals, medical treatment or the healthcare environment itself. If not processed, they can lead to patients having difficulty with treatment compliance, or trust in their treatment regimes or caregivers (Kaufman, 2020).

MRI studies suggest architectural changes to brain structure results from trauma, indicating shrinkage in the hippocampus, amygdala, and cingulate cortex volumes as compared to healthy controls (Smith, 2005). These structural changes are relevant in that they indicate that behavioral changes from PTSD are not purely psychological in nature, and point to a need for treatment that address these changes as being equally physiological, providing a justification for a mind/body approach.

Hypervigilant states, (or increased threat surveillance) are common in PTSD along with decreased ability in emotional regulation and frontal cortex activity. These states lead to behavioral changes and increased sensitivity to external stimuli such as sound, light and tactile stimulation. The persistent stressors produced by trauma often lead to peak levels of allostatic load, which often produce an increase in related health issues. (Ganzel, 2010.)

Polyvagal theory provides a clear manner of understanding trauma response and PTSD. Ventral vagal response keeps us 'socially engaged' and able to avoid unnecessary generalized defence response to innocuous situations. However, when we perceive the presence of a vital threat in a particular situation, a dorsal vagal response occurs which produces a state of hypoarousal as a survival mechanism so as to avoid the 'terror' of an inescapable 'dangerous' situation (Porges 2009; Porges 2011). A patient with PTSD may exhibit threat hypervigilance and, upon perceiving a threat, (as might happen in a medical procedure such as radiation therapy) self-protective behaviors may be triggered. The patient may shift from a ventral vagal state to a hypersympathetic state to ready for action to a perceived threat. If the patient is not able to mitigate the perceived threat with this shift to readiness for action (this is to say a resolution to a different functional state) they may shift to a dorsal vagal state (or hypoarousal) that may manifest as halting conversation, being disengaged or dissociative, avoiding eye contact, presenting with flattened affect. If the underlying causes for these behaviors are not understood by the clinician, they can easily be interpreted as the patient being unconcerned or not comprehending what is being discussed. It is important for health professionals to understand that these behaviors are not conscious decisions, that they are being driven by trauma pathology, and that they are a warning that the individual has moved into dysregulation and sustained perceived life threat.

The physical surroundings of an office can create a sense of chaos or calm (Becker, 2008), which is why strategies like Environmental Music Therapy are of such importance, where the creation of atmospheres can modulate a patient's very perception of the environment (Rossetti, 2020). Many patients with PTSD have reported negative experiences with the medical profession with past experiences coloring a patient's reaction to subsequent experiences (Liu, 69).

Given the prevalence of PTSD in cancer patients, it is imperative that a history of the patient's trauma be taken to assess its presence and severity. Gently probing questions such as - "is there anything about your previous or current medical treatment that has been coming into your mind the past few days, if so, does it feel 'insistent'?" "As you think about your upcoming treatment, have any ideas about past experiences seemed prevalent or been recurring?" An evaluation and exploration of the patient's sleep patterns, beginning with the past few days, can also provide a gentle path into the patient's experience with trauma.

1.7 Perspectives on medical music psychotherapy [MMPT]

Music psychotherapy incorporates principles of psychotherapy, and employs music and its elements as an integral part of the dynamic therapeutic relationship (Loewy, personal communication, 2011). Thus music can be an agent of change as well as providing a context or 'space' for that change to occur. Transference and countertransference are noted, explored, and worked through using improvisation, songs, and imagery in music. While various approaches to music psychotherapy exist in practice, the model that serves as the basis for this program is eclectic and draws principally from the philosophies of Freud, Jean Piaget, Perls' Gestalt theory, as well as those of Maslow and Yalom. In it elements of psychodynamics as well as humanistic philosophy are incorporated and employed to provide the patient with perspective on their own unique patterns of relating to the world. Loewy states that music psychotherapy is exploratory in nature, and functions through assessment and processing of awareness of self, other and of the moment; thematic expression: listening, performing; collaboration; therapeutic relationship; concentration, range of affect; investment/motivation; use of structure; integration; self-esteem; risk-taking and independence (Loewy, 2011 personal communication).

It can be further defined as a clinical relationship based dynamic process occurring in and moving between the unconscious and cognitive minds, that engages the interplay/interaction with the physical self through interoception/neuroception. Psyche and soma are seen as a gestalt. Music and music making's role in the process is varied and dependent on the needs and in-the-moment requirements of the therapeutic moment itself.

Implicit in this concept is the basic underlying assumption of the existence of an unconscious mind, and that dynamic processes take place in the unconscious that are influenced by the interpersonal therapeutic relationship (Metzer, 2016). Music in this context is an articulation of human experience that

can lead to awareness of an inner state or conflict. In MMPT music can function as a bridge, as a “safe place”, as a carrier of the patient’s story, and in these contexts fuses with verbal therapeutic processing.

In MMPT, music and verbal processing can operate as interacting and mutually supportive elements, each with unique possibilities, but ultimately enhancing the therapeutic potential of the other. Schwartz (2019) described the communicative exchange in music therapy as comprising words, language and speech; musical interaction; and gestures, physical actions, affect and posture.

Blomdahl (2018) delineated the dynamic interplay between conscious awareness and embodied experience in the process and described the ‘inner dialogue’ as a private, unfolding experience of self that echoed in the finding that music and language exist within a ‘dyadic’ relationship which supports the unfolding internal and external processes of the music therapy client.

It is important in the verbal process to be exquisitely aware of the non-verbal communication taking place both in and in the absence of music. Humans are experts in nonverbal communication, which we use to enhance verbal communication. Observable behaviors such as body language, muscle tension, facial expression (including fleeting micro-emotions), kinesics, proxemics all contribute to a rich presentation of information about outpatients' inner and social worlds. The development of and the raising of this communication to our cognizant, conscious level of awareness is key to deeper understanding, as is our cultivation of instinct, and specifically, clinical instinct. My personal understanding of the phenomena of instinct lies with the posit that, to successfully navigate our physical environment and comply with Maslow’s first order of survival (Maslow, 1943) we are ‘hard-wired’ to take in all of the information possible pertaining to our external and internal world in-the-moment through our senses and through the process of ‘interoception’. This results in an avalanche of substantial quantities of information that we must then ‘process’ to evaluate and triage and classify what needs our immediate attention. This information reaches the cognitive conscious mind, while the rest does not. Nevertheless, the information that has not reached the ‘conscious’ mind has still been processed to a certain extent, and likely remains ‘archived’ in the subconscious where it remains and provides us with ‘feelings’ about what we observe. Being able to focus on and draw up into service in the conscious mind these sometimes vague feelings is what I identify as integral to the process of developing one’s instincts and learning to rely on them in a clinical context. Along with this particular skill, I would single out learning to be comfortable with silence and its use as another important adjunct tool. Central to my brief system regarding psychotherapy is the concept of focused observation, knowing how to listen deeply to the ‘how’ of what is said as much as to the ‘what’, the idea that if we listen carefully enough, we will hear what our patient is telling us then need us to do. Also imperative are the therapist’s awareness of transference and subjective countertransference as a guide to session direction and flow.

In adding music to the process, it behooves the music psychotherapist to verbally explore the music made in the session, as it is a way of exploring the patient’s inner world. As Erkkilä (2011) states: the music can operate on a protosymbolic level by triggering unconscious processes beyond the pathology

and, in a way, to prepare the client for fully symbolic expression and eventually for verbalizing, and in that way enable recognition of patients' inner experiences. Nolan (2005 p. 18) describes this verbalization as "the talking that facilitates the therapeutic process during, and in response to, music making or music listening". He points to verbal techniques as a means of providing clarity, developing client awareness across domains, and providing the therapist with a means determining how to proceed (Nolan, 2005) Verbal processing can be described as a dynamic process that unfolds over the course of therapy and refers to the process making greater sense of the experience.

Central ideas to the inclusion of music as a catalyst and reflection of the patient's state and inner world are: "we play as we are/we are as we play" and "it is difficult to lie with music" With this in mind it may be said that exploring a patient's music verbally is a way to explore the patient themselves, and that the patient's inner world is expressed metaphorically in the music she/he creates. Parallel to this process is the verbal exploration and meaning making of experiences occurring in the music that reflect the patient's 'life experiences' Verbal techniques used in this process include gently probing inquiry, the use of attentive silence, reflection, re-phrasing patient statements into questions, encouragers such as 'say more' 'and so...?' 'because...?' 'but...?' and stated observations on changes in the patient's non-verbal (body language) communication, to move the process in a therapeutic direction. Statements such as "if I am hearing you correctly..." "I somehow sense you are feeling..." encourage patient response and can be helpful in moving the process forward. Also the therapist may use meta-processing, confronting, reinforcing, clarifying, summarizing and, feedback in adhering to a central construct that the patient is who best 'knows' the 'answers,' or at least the direction the session might take to 'reach' those answers. The therapist does not presume to know the answers to the salient issues facing the patient, but will construct experiences for the patient to gain perspective (literally seeing from two points of view that perspective leading to moments of insight, on the assumption that insight can be the bearer of change, the goal of therapy in itself. The breadth of communicative exchange in music therapy has been described by Schwartz (2019) as comprising words, language and speech; musical interaction; and gestures, physical actions, affect and posture.

1.8 Aims of the Study: Foundations leading toward a clinical model of music therapy interventions in cancer treatments

The aim of the study carried out in the radiation oncology units of the Beth Israel/Mount Sinai Healthcare System is twofold, and could be seen as having both a close up and a far-reaching focus. In the broad sense the aim was to provide a theoretical and clinical base for the implementation of a novel and comprehensive music psychotherapy program - TRS. In this approach paramount was the concept of providing an environment in which patients were able to achieve proactivity, active participation in their cancer treatment on a

broad scale, and feelings of empowerment to ultimately address three of the principal challenges they would face during RT and, through that proactivity, stave off medically induced trauma. Also included in this strategy was the concept of 'continuity of care' - the intent to leverage the music therapist's following the patient through chemotherapy and surgery, when referred. The overview was to provide a foundation for patients' initial experience to be constructive in the true sense, and to use that initial experience to color or modulate subsequent treatment experiences. The principal aim of this randomized control study was to measure how a protocolized music psychotherapy intervention would impact patients' state anxiety and distress as bio-indicators of comfort, and feelings of safety during simulation for radiation therapy.

Broader secondary aims were to deepen my theoretical and methodological understanding of the concept of altered state induction, suggestion and specific biopsychosocial techniques in the context of live and pre-recorded music combined with scripted verbal directions to reduce phobic responses to imaging and treatment in radiation oncology, and to clarify the conceptual framework of music psychotherapy in oncology.

In all, at its most basic level, the purpose of this study is to (a) determine patients' with head & neck cancer and breast cancer level of anxiety and discomfort prior to simulation, and (b) determine if the following music psychotherapy protocol and prescribed pre-recorded music played during simulation moderate the anxiety experienced.

2 UNDERPINNINGS OF THE OF THE DEVELOPMENT OF A MODEL OF MEDICAL MUSIC PSYCHOTHERAPY IN RADIATION ONCOLOGY

The development of a comprehensive model of medical music psychotherapy in radiation oncology was based on observation of patient needs in this fragile environment, and began in April 2011 with my being hired to design and implement a dedicated program at one treatment site in the then Beth Israel Medical Center's outpatient cancer center (currently Mount Sinai Downtown Union Square). The center provided treatment principally for patients with head & neck, breast, and prostate cancer, though some gynecological, skin, and bone cancers were also treated, mostly as they occurred as metastatic progressions of primary cancers. Each cancer group brings with it its own set of illness, treatment, and side effect burdens. Through semi-structured anecdotal interviews and observation of medical staff, patients, and their personal caregivers, I saw with utmost clarity the glaring importance of providing MMPT as an integral part of patients' experience from the very first day of their cancer treatment. All three patient groups experience similar challenges during the simulation process, and all three suffer through the noxious effects of anticipatory anxiety, isolation and physical restraint common to that procedure.

Prior to MMPT's implementation to become part of standard treatment, phobic reactions were fairly common and addressed with the less than ideal solution of dosing anxiolytics. These adverse responses often carried over through the 5 to 9 weeks of daily radiation sessions and manifested as sustained claustrophobic reactions to restraint, generalized fear and anxiety, and emotional disturbances. This led to the formulation of the construct that modulating a person's first experience in radiation oncology by systematically addressing discrete stressors and providing them with functional resources will help them construct a view of radiation treatment as being within their ability to experience proactive, and resiliently, thereby significantly reducing medically induced points of trauma and their sequelae.

This construct led to the development of a discrete protocolized MMPT intervention that was the subject of a RCT study presented in this paper, and that formed the base for development of further interventions. Underpinning this approach are numerous theoretical concepts and include: MMPT as an integrative practice, Porges' Polyvagal Theory, Loewy's assessment constructs, my own work in Environmental Music Therapy as a format for using atmospheres to create feelings of safety in hospital environments, and the particular challenges faced by head & neck and breast cancer patients in radiation oncology.

2.1 Medical Music Psychotherapy: An Integrative Practice

The physiological aspects of maintenance of the body and mind, or their failure are based on complex interactive systems of function. At one time, "non-standard" methods of maintaining health or palliating illness were identified as 'alternative' This is a subtle qualifier that implies they are 'apart from' or not combinable with standard means of treating disease and not necessarily compliant with standards of care.

"Alternative medicine" provided options for health maintenance that were often based on Eastern philosophy and esoteric principles. Eisenberg et al (1993) published a seminal study uncovering the reality that Americans were willing to pay more money out-of-pocket for alternative strategies for health and wellness management and treatment than they paid prescription medications. This led to a surge in what was to be called "complementary medicine." Along with this surge a disposition toward incorporating this trend occurred among medical practitioners. This underlined a quiet truth that patients were open to the use of alternative strategies that could complement the impact of allopathic medicine. This shift in concepts lead to the implementation of complementary practices, and ultimately to the identification and growth of such practices as "integrative"

Accompanying this shift in concepts was the movement toward 'mindfulness' and a quest to understand and implement effective non-standard care modalities, in a move toward a more individualized and patient centered way of treating illness. This was highlighted through a desire for greater synthesis of non-standard approaches that were leading physicians to become more inclusive in their plans of care.

Medical music psychotherapy has been a part of these subtle shifts. Within the models of integrative medicine that sprouted within colleges and universities around the globe is an underlying aspect of working amongst neighboring disciplines and teams. While in the past, music therapy might have simply complemented medical care or treatment planning, today it is an integral part of treatment planning.

Insular to this planning has been the advancement of the practice in and of itself. Where music therapists in hospitals were once simply provided with referrals, in the current treatment of many of our diseases, we work alongside doctors and nurses and work within daily rounds to schematically devise

protocols that might, provide for more accurate treatment, increased the level of comfort during a painful procedure, lessening anxiety, address barriers of psychological function such as preemptive trauma that would otherwise delay impact of treatment protocols, address family conflicts impeding treatment regimens, enhance options for sleep, and many others.

2.1.1 Assessment in music medical music psychotherapy

Loewy's work on assessment models, and her 13 Areas of Inquiry (2000) provide the following constructs and thoughts regarding assessment for MMPT interventions in the context of radiation oncology. Her 13 Areas of Inquiry are psychobiological facets of patient's personality and identity. A medical music psychotherapy evaluation is different from others in that it implies that integrative aspects of treatment will ensue, and that they are bound to the patient experience relating to their greater experience of recent and distant treatment as well as influential features of their daily life. Also included in the interpretation of what they have read about their disease and what beliefs their doctors have shared about their disease and treatment regimens. (Loewy, 2000.)

A medical music psychotherapy assessment will consider the integral relationship between the mind and body: "how is the mind affecting the body and how is the body affecting the mind?" Imperative to this construct but less understood and perhaps more difficult to address, is how the spiritual aspects of function fit into the realm of belief systems, and furthermore how they are poised to take on the aspects of mind and body that the patient may feel no control over. This can work toward or against the resilience capacity that is a subtle qualifier within the disease process. We know this because the 'placebo' and 'nocebo' effects are based on it and reflect how central a role our belief systems play in our capacity to heal (Benz, 2013).

The medical music psychotherapy assessment carefully considers our patients' past relationships with both sounds and music. The 'Tour of the Room' assessment model provides each patient with an array of sounds that vary in rhythm, timbre, melodic and harmonic qualities (Loewy, 2000) Some of the sounds are presented as more classic and may lead toward discussion and learning about a patient's past history of music (piano, guitar, flutes) while other sounds are more symbolic or free-flowing and invite projection (jingle bells, ocean drum, wood blocks, spring drum) (Loewy, 2000).

As patients reflect on their relationship with sounds and with music - including their favorite songs - the therapist can also use themselves as instruments and observe what varied projections and transferences are occurring within the developing relationship, while at the same time be thinking of ways to address the unfolding personal material and clinical nuances in the treatment regimens that will follow (Loewy, 2000).

Assessment in the context of radiation oncology incorporates Loewy's 13 Area of Inquiry, but also includes specific points directly related to the prototypical symptomatology encountered by many patients receiving radiation. This assessment includes both observed state anxiety levels and patient reported levels, inquiry into history and context of claustrophobic events, significant

stressors contributing to illness burden, and potential points of trauma (especially medically induced trauma).

2.2 Polyvagal theory and its clinical applications

Stephen Porges Polyvagal Theory can be used as a central point in understanding many of the responses and coping strategies of people facing cancer and its treatment. In its clinical application to medical music psychotherapy it provides direction and justification for many of the interventions used in this model, and can be used to gain a deeper understanding of observed changes in physical and mental state and/or physiological/behavioral response in patients. In this context it is not seen as a replacement for any specific therapeutic model, but as a way of looking at systems' response that can inform and perhaps deepen any clinical music psychotherapy intervention.

Pre-polyvagal thought was that the autonomic nervous system was made up of two subsystems - sympathetic (SNS) and parasympathetic (PSNS) - and that these interacted in a system of 'checks and balances' seeking homeostasis (Porges, 2017). Our nervous system was pictured as a two-part antagonistic system, with more activation signaling a less calm state and more calming signaling less activation. Porges' revolutionary discovery was that the vagus (10th cranial nerve) was composed of phylogenetically distinct structures that were enervated to different parts of the body and that the ventral more recent structure regulates ANS response of supradiaphragmatic structures such as the face, brain, heart, larynx, and auditory system. Conversely, the dorsal and older or "reptilian" structure regulates the subdiaphragmatic area (Porges, 2017) The newer or 'mammalian' structure provides us with the 'social engagement system' of the ventral vagus. Together these make up three different interactive systems - ventral vagus, sympathetic nervous system, and dorsal vagus - in the context of stress response and survival strategies (Dana, 2018).

There is a hierarchical order in which our body reacts to stress (or threats) (Porges, 2017). It explains how we seek to transition between distinct functional states of arousal to mitigate threats and stress. Of late, this is often portrayed graphically in texts on the clinical application of PVT as a ladder, with movement on this ladder driven by arousal response to stressors (Dana, 2018). This is typically described as moving from calm and socially engaged (ventral vagal), to fight or flight response to threats (sympathetic response), and, if resolution is not encountered, moving into shut down and dissociation (dorsal vagal response) (Dana, 2018).

The fundamental premise of Polyvagal Theory is based on the idea that to flourish, humans require feeling safe, and that our biology is dedicated to that purpose. The autonomic nervous system (ANS) orchestrates the body's rapid survival responses. Through a hierarchical exchange with the sympathetic branch, the two branches of the ANS - sympathetic and parasympathetic - defend against threats by means of the fight-or-flight response while the

parasympathetic system of responses help us move out of a defensive response and into a state of calm or low activation (Dana, 2018).

The parasympathetic system is contained in the vagus nerve, which extends from the base of the skull with many innervations down through the body into the abdomen. Its branches form two major pathways, each of which regulates a distinct neurophysiological state (Dana, 2018). The first of these pathways, the ventral vagal, reacts to cues of safety by providing a sense of connectedness and readiness for social engagement. The dorsal vagal pathway reacts to cues of danger, causing shut down, dissociation and withdrawal from others. In the dorsal vagal state refuge is found through dissociation and shutdown (Porges, 2011). It is important to note that this process of recognizing cues for danger and safety occurs beneath consciousness (Dana, 2018). Functioning in the background, the ventral, dorsal, and sympathetic elements of the ANS reviews subtle indicators of safety or danger while avoiding the conscious mind. Porges refers to this process as “neuroception” (Porges, 2011). Clinician and author Debra Dana provides an example of this function in an “everyday life context” as follows: For example, if you enter a loud, crowded party and see strangers huddled together, laughing, you may unconsciously pick up cues of rejection. In a micro-moment, your sympathetic nervous system leaps into action, signaling you to turn around and leave the party posthaste, or perhaps head straight to the buffet and fill a plate.

Just then, you notice one of the guests breaking away from the crowd and walking toward you. She extends her hand and introduces herself, her face open and welcoming. Almost instantly, your breathing slows, your heart rate goes down, and your body relaxes into the experience of Ah, I’m safe now. Your ANS has just guided you from a sympathetic state to a ventral vagal one, permitting what Porges calls your social engagement system to come fully online. You’re now calm, ready to connect – and maybe initiate a new conversation (Dana, 2019 p. 1).

Dorsal vagal responses to situations that are interpreted as ‘life threatening’ such as a diagnosis of cancer or subsequent physically and emotionally invasive treatment can provoke much stronger reactions than those suggested in Dana’s everyday scenario, and can manifest in dissociative states.

In clinical practice from a Polyvagal-Informed perspective, a principal goal of therapy is to provide the patient with resources or perspective so that she/he may move toward self-regulation out of “a dysregulated state – either a numbed-out ‘dorsal vagal’ state or a hyper-aroused ‘sympathetic’ one – and return to ‘ventral vagal,’ the biological seat of safety and connectedness.” This author posits that “wellness” could be described by the ability to transition between functional states, and that certain elements of “illness” lay with the in-ability to do so, and remaining “frozen” in a dysfunctional, dysregulated state. This concept gains particular importance in clinical contexts such as treating patients with phobic responses to treatment or treatment environments, pain with low response to medication, emotional disorders and post-traumatic stress.

This is so, because polyvagal allows us to recognize and contextualize patient response and gain insight into the functional resilience structures they have in place, or lack. Many of the processes that are so essential to healing and

well-being involve identification of one's resilient characteristics, and ventral vagal states appear to be optimal for modifying one's dominant life narrative to that end.

Based on the Polyvagal Theory we are able to incorporate music psychotherapy into biobehavioral processes that stimulate the Social Engagement System (SES), and create a context for the 'connectedness' that allows self-regulation. Both biological and behavioral responses can be obtained through SES engagement. The face and voice become more expressive, and changes in physiological states result in more regulated and calmer behavior and states. This is especially relevant in patients who have suffered points of trauma. They often interpret face-to-face interactions as threatening and hence, these do not elicit a neuroception of safety. The Social Engagement System can potentially be triggered through vocal prosody or music while facilitating direct face-to-face interactions (Porges, 2010). Porges points out that music can influence functional adaptive states that influence affect regulation, social engagement behaviors, and our ability to communicate (Porges, 2010). We experience these states with feelings of safety, danger, or ultimately, life threat.

Polyvagal influenced music psychotherapy processes are especially significant in regards to the treatment of trauma related disorders in that they help navigate from chronic states of defense to more regulated dynamic states, and thus, enhance the capacity to self-regulate and to connect with others. As Porges and Rossetti (2019) state "Implicit in the therapeutic applications of music has been the assumption that music has a direct effect on the human mind and body and can efficiently shift physiological and mental state to promote health, growth, and restoration. Thus, music may functionally 'retune' our nervous system's capacity to regulate visceral organs, shift mood states, and optimize social behavior, trust, and connectedness (Porges & Rossetti, 2019 p. 117)."

The physiological mechanisms through which music can calm and sooth can be explained by the Polyvagal theory (Kolacz, 2018; Porges 2010; Porges 2010). Music is a link to "down-regulation of the sympathetic nervous system involved in mobilization behaviors (e.g., fight/flight) and an up-regulation of a component of the parasympathetic nervous system (i.e., ventral vagal complex) that fosters the spontaneous social engagement behaviors involved in co-regulation and optimizes homeostatic processes (Porges, 2019)."

"Ancient traditions have used sounds as agents of healing, and researched-based music therapy can be seen as a logical continuation of these practices (Porges & Rossetti, 2019. p. 117)." This link between ancient and current can be viewed on a continuum to explicate music's function as a clinical tool, and is as follows: Parents have long used voice to engage and calm their infants, and reflexively raise the pitch of their voice and expand the range of intonations (or prosody) (Beebe, 2010; Trehub, 2015), in doing so. Prosody is the term used to describe the emotional tone embedded in speech through the modulation of vocal intonations. It is important to note that a lack of prosody is one of the vocal characteristics frequently observed in survivors of trauma. This strategy of infant directed speech or "motherese" became culturally structured, morphing into the more definable music structure of 'lullaby' (Loewy, 2015). We can view infant-directed speech as exaggerated prosody, and in following, we can conceptualize

lullabies and vocal music as hyper-prosodic vocalizations (Loewy, 2004, Loewy, 1995). Acoustic features of lullabies may vary depending on culture, though most include characteristic intonation, simple pitch contours, and a pitch register that reflects a specific vocal range (Shoemark, 2011) contained within a frequency band that emphasizes positive social communication that is outside the frequencies used to convey life threat (very low frequencies) or danger (high frequencies).

This continuum helps explain the efficiency of music as a treatment modality in conveying cues of safety and trust to a 'prewired' neurobiological portal. This is particularly salient when considering that feelings of safety and trust are essential in treating the sequelae of trauma, and arguably are the cornerstones of the therapeutic relationship itself.

Polyvagal Theory provides a plausible explanation of how some aspects of music therapy may work and is described in Dana's (2018) seminal work. Humans have a frequency band of perceptual advantage that permits them to process large amounts of acoustic signals to determine safe/dangerous situations. Optimization of acoustic signals is determined by the physics of the inner ear. An optimized bandwidth is used for social engagement and communication, and corresponds to feelings of safety. Conversely, social engagement is compromised when humans are in a defensive physiological state, such as *medical treatment scenarios*. Music within optimal frequency bands can be used to bring perceptual advantage for communication to the forefront, and listening to melodies optimizes the social engagement system's function. When this happens, autonomic state regulation via vagal pathways is improved. There is also improved regulation of the facial muscles involved in the communication of emotional state, resulting in calmer, more resilient behavior.

In summary, trauma and chronic stress turn off the social engagement system with consequences to both mental and physical health. In this process the nervous system is "retuned" to become hypervigilant and defensive. Be that as it may, humans have the potential to reverse these disruptive effects by responding to cues of safety and trust. Music targets this potential and provides an efficient vehicle to 'retune' and rehabilitate our nervous system, and to support the healing journey following trauma and in stress-related disorders.

2.3 Introduction to EMT: hospital environments, atmospheres and safety

Environmental Music Therapy (EMT) is an integral part of the TRS model. Trauma informed care must necessarily take into account the effects of the environment itself on whether patients and staff perceive those environments to be conducive to, or protective against points of trauma. As stated in a recently published article by Rossetti "A myriad of sensory elements contribute to a person's perception of a hospital experience. EMT is a human-centered, trauma-informed intervention that encompasses utilization of the metaphoric and associative properties of live music to modulate patients', caregivers, and staff's

perception of the hospital milieu as a potentially hostile environment (Rossetti, 2020, p. 130)."

There is a growing interest in discovering specific elements of design of hospital environments - from intensive care units to waiting rooms. Central to this process is the evaluation of sound and psychoacoustics in these healing spaces. The meaning of the composite sounds in an environment, as defined by its syntax and semantics, and the associations and metaphors they invoke, is of critical importance to optimal healing experiences (Rossetti, 2020).

When applied skillfully and ethically EMT is a valuable resource at the forefront of medical music psychotherapy, with an enormous potential to constructively modify the perception of hospital environment in real time, contributing to feelings of safety, and self-regulation (Rossetti, 2020, in press).

The concept of environments consisting of individual factors that are experienced not as a series of isolated events, but as an integrated whole (Craik, 2000; Schneider, 2000) is critical to an understanding of 'meaning making' through one's experience of an environment. Sound strongly affects the unified sensory perception of the hospital environment (Rossetti, 2020).

2.3.1 The importance of environments: adverse experiences and perception of the waiting room

The body of research on the clinical implications of patient satisfaction regarding the waiting room experience is growing (Cooke 2001; Spechbach, 2019; Ward 2017). Mulcahy (2010) expressed the issue thusly "Waiting, it would seem, is a rite of passage for the cancer patient: waiting for tests, waiting for lab tests, waiting for results, waiting for diagnosis, waiting for prognosis, waiting for remission, and waiting for recurrence. The cancer experience is akin to sitting endlessly in a waiting room, where the patient is powerless to do anything but watch the clock." (Mulcahy, 2010).

State anxiety is ubiquitous in hospital waiting rooms, which can be said to be veritable Petrie dishes for state anxiety and distress (Rossetti, 2017) with measurable correlation between waiting time and increasing anxiety (Rossetti, 2020 at press). This phenomenon contributes to widely reported patient discomfort, and has been identified as a primary source for overall patient dissatisfaction (Anderson 2007; Eliers, 2004; Leddy, 2003). A recent study found that oncology patients in treatment waiting rooms experienced significant levels of anxiety, depression, and perceived stress (Florian, 2011). Waiting places patients at the mercy of another's schedule and as such can effectively create as sense of loss of control (Mulcahy, 2010). In Bournes and Mitchell's (2002) study, patients described waiting as "a grueling experience of unsure stillness" and used terms such as "'distressing,' 'horrible,' 'frustrating,' 'stressful,' 'brutal,' 'frightening' and 'difficult - like an emotional hell' 'the hardest part of the cancer journey'" to express the meaning of waiting in the healthcare system (Bourn & Mitchell, 2002). Fear of the unknown is a common emotion in the cancer waiting room (Mulcahy, 2010) which can be compounded by patients forced to see other patients who are showing visible effects of the ravages of both disease and treatment. Adding to the challenges of navigating this environment is the

practice of advanced or suffering patients conversing with others in the waiting room sharing what are sometimes horrific details of their treatment trajectories. These elements, along with simple boredom, can all contribute to a highly disagreeable experience and perception of the hospital waiting room as a hostile place where one has to be 'on-their-guard' often meaning un-necessary and non-functional states of arousal. One recent study found clinically significant levels of state anxiety and distress were prevalent in patients awaiting radiation therapy for cancer, and also in their personal caregivers (Martinsen, 2014).

2.3.2 The Importance of Environments in Medical Care

Horsburgh posited that environments are an integral element of medical care (Horsburgh, 1995). Well designed sensory impressions of those environments can foster resilience, feelings of safety and positive mood by contributing to a more constructive patient life experience (Martinsen, 2014). The treatment environment impacts both process and outcomes as well as the interrelationship between environment and behavior (Corey, 1984; Davis 1979; Holahand 1973).

Moreover, health care professionals typically are not trained to address potential psychological issues experienced by distressed patients. And, when patients waiting for procedures report anxiety and fear responses related to unknown outcomes, experience pain as a result of the procedure, or suffer disruption of life plans, (Viegas, 2010) in the majority of cases these professionals are under equipped to address those difficulties.

Adverse affective states can arise from anticipatory anxiety in patients awaiting medical treatment that can negatively influence patients' experience of illness and treatment itself (Bugbee, 2005; Lang, 2000; Lang, 2006; Lang, 2008; Rossetti, 2017; Schupp, 2005) and may cause physiological issues including hemodynamic instability, procedural complications (Martin, 2005) coronary constriction, elevated levels of blood pressure and heart rate (Krantz, 1996).

Pre-procedural anxiety level can also indicate a predisposition for experiencing more intense pain and anxiety during procedures themselves (Schupp, 2005; Auerbach, 1983). Patients suffering from emotional issues also tend to require greater procedural times and medication (Schupp, 2005). Unresolved distress can have a deleterious effect on department resources and can actually contribute to longer wait times and interrupted imaging procedures (Schupp, 2005; Martin, 2005; Auerbach 1983).

2.3.3 Rational for EMT and a Brief Overview of its History

EMT supports the introduction of a person-directed dynamic music 'soundtrack' that can establish audible safety cues and enhance feelings of control and 'normalcy' (Rossetti, 2013). This occurs by means of a dynamic relationship between the patients and their acoustic environment (Rossetti, 2013). The construct regarding the creation of an environment, through the use of sound and music to engender feeling of safety and its resulting ventral vagal parasympathetic states finds its validation in Porges' Polyvagal Theory (Porges, 2009).

EMT was defined more than two decades ago by music therapist Joanne Loewy who initiated it in the neonatal intensive care unit at Beth Israel Medical Center. She brought in the hospital's first EMT music therapist who subsequently studied EMT (Stewart, 2000) under her direction (Loewy, 2000) with music therapist (then intern) Kristen Stewart. It was subsequently implemented in SICUs, chemo infusion suites and MICUs, and then applied to the environment of waiting rooms where ambient noise is not a principal concern and patient distress owes to other factors.

There is a modest amount of literature on the clinical effects of EMT. The first pilot study was conducted by Schneider and Stewart, early EMT champions (Schneider & Stewart, 2000). It found that EMT positively affected neonates' heart and respiratory rates. It also found that staff's recognition that their talking contributed to 'unwanted sound' on the unit. A later pilot study conducted by Canga (2012) in the chemotherapy infusion suite illustrated changes in emotional states and perception of noise levels.

Canga et al (2012) conducted a pilot study investigating the impact of EMT on the chemotherapy infusion suite environment. It illustrated changes in perception of noise levels, emotional states, and was found to positively modify the patient and staff experience. Another study found a "change in communication styles between hospital staff and patients during EMT interventions, including slower and softer speaking styles, increased smiling, and relaxed interactions (Zhang, 2018)." A recently completed study of EMT in radiation oncology waiting rooms, suggest EMT has the ability to reduce anxiety and distress in this population and is an efficacious means for reducing patients' and caregivers' perception of waiting time duration (Rossetti, 2020). This study was built on the clinical application of EMT in fragile environments by Louis Armstrong Center for Music & Medicine (LACMM) staff in a long existing program.

2.3.4 Understanding concepts of environment, atmospheres, soundtracks and soundscapes

The construct of perception of the hospital milieu as hostile is the underpinning behind EMT. This perception draws in part from the constant exposure to ambient stressors and a sonic environment that contributes to an apparent need to be on alert. The representational meaning of the sounds in a hospital, and the associations formed through accompanying events are strong contributors to this outcome. Extended states of un-needed hyper-vigilance and resulting sympathetic autonomic nervous system activity can become an exacerbating factor in distressed, anxious or medically induced trauma states. And EMT, when seen as a clinical extension of the concept of 'music as environmental design,' can be used to palliate those states.

This idea embodies Ulrich's conclusion that healthcare environments should be free of stressful environmental characteristics to promote positive medical outcomes (Ulrich, 2000). It expands the use of music from a mere 'add-on' or simple distraction and changes it into a component of an intentionally designed environment.

The exploration of constituents' perception of hospital environments as influenced by specific atmospheres as well as the elements and constructs that contribute to those atmospheres will provide the basis for establishing how EMT can modify the perception of stressors and atmospheres. This will provide an orientation of how EMT might 'shape' the environment into one more conducive to healing and well-being for both patients and staff.

Noise can be seen as being "unwanted sound" but potentially so can music. Because of this, it is imperative to begin with an assessment of interaction and response, and continuing it in an ongoing process. This avoids that music will be used as 'masking noise' (Rice, 2013) and instead focuses on the concept that quality of life is not necessarily improved by removing sound but rather by shaping its aspects. Music that is inappropriate to the patient becomes noise in the perceived experience.

Optimal healing environments are characterized by atmospheres that help the environment's inhabitants feel more protected from a perceived threatening hospital environment. This will likely prompt patients to feel empowered to engage with the environment. Hospital environments are "removed from the everyday world" (EDW) (Shatell, 2005) of the patient. EMT can be effectively used to re-contextualize and ritualize the non-EDW and in that process build a path back to the patient's everyday world, fostering feelings of connectedness and safety.

Primary to increasing the clinical efficacy of EMT is an understanding of its underlying concepts. Within the context of this dissertation, and as guidelines for practice, the author defines the following salient terms:

Environments are physical places composed of many multi-sensorial elements. A soundscape is the conglomerate of the existing sonic elements of an environment. Atmospheres are a 'felt experience' a subjective interpretation/perception of the meaning and emotional content of a given environment. They can be modulated by the inclusion/exclusion, and re-contextualization of elements (especially acoustic elements) felt and emotional that affect the pervading tone or mood. Soundtracks are dynamic musical constructions providing discrete cues and clues that define the emotional significance of other multi-sensory elements, or of the gestalt experience of the hospital environment itself (Rossetti, 2020 p. 134)."

In a closer look at soundscapes, they may be defined as "an environment of sound with emphasis on the way it is perceived and understood by the individual or by a society' (Axellson, 2011). The concept of soundscape is a way of understanding the acoustic ecology of a space, and making sense of the sounds heard in a particular place, as a gestalt.

The relatively new field of atmospherics deals with the creation of spaces that invoke a particular mood. Michael Hauskeller is a philosopher in residence at the University of Liverpool whose recent work has focused on the theory of perception and human enhancement. His work in this area contains useful concepts applicable to EMT: atmospheres are felt or experienced and are not limited to cognitive associations. They pertain to the specific relationship a person has with a particular environment, and are dependent upon subjective perception. He describes them as tempering spaces (Hauskeller, 2018).

Through EMT music and controlled sound elements can become potent tools in the creation of atmospheres. The concept of soundtracks is a particularly efficacious way of focusing on the dynamic process of atmosphere creation. Clear thought that can be applied to the construction of Ad Hoc soundtracks in EMT is provided by film composer Joel Douek. He elucidates the process as seeking to hear what is not yet there but should be, and that a soundtrack can be highly effective in pointing to a process listeners fill in and complete, becoming co-creators of a musical emotional experience (Douek, 2013). In this context the soundtrack constructed through EMT can use environmental cues to become a portal. It can be seen as means to transition to and from our subconscious, employing our instincts and shared culture (Douek, 2013). Soundtracks and EMT both “bring meaning and underscore experiences of daily life (Rossetti, 2020 p.134).” The influencing power of music, its ability to convey images, metaphor, and emotion in both concrete and abstract ways, is such that it can create atmospheres that reduce stress and anxiety or even uplift and promote social engagement. Existing hospital environments can dissolve, and a myriad of atmospheres can take their place. They can create spaces that are serene, unhurried, easy-going, stately, light and joyful, or even sublime. Music can be used, as soundtracks themselves can be used to make sense of visuals. Urgency can be represented by loudness or speed, a gentle resolving harmony can replace discord, humor can be introduced in an otherwise dire environment, and a particular person’s presence can be underscored with the use of leitmotif.

2.3.5 Adjunct Concepts: Entrainment & Attunement in Trauma Informed Practice (Polyvagal Theory)

Music experiences can be used to regulate emotional or relational states through attunement and entrainment. These are key concepts in EMT theory and practice (Lindahl, 2019).

Entrainment is a phenomenon of “shared periodicity” referring to an individual's relationship to the variable elements of the environment they find themselves in. This relationship is chronobiological, physical, and behavioral (Rossetti, 2020). In a bio-musical sense it refers to the synchronization of an organism to an external rhythm such as human music. In this process an external rhythmic cycle captures and modifies out internal rhythms (Entrainment sagepub n.d.). Aasgaard (2004) defines attunement as an ability to actively sense and attend to changes in the environment.

As an integrative experience, EMT can generate greater levels of engagement with the community. This engagement can be seen as a key component to human wellbeing, and is experienced as synchronized somatic responses (Silva, 2005).

EMT is rooted in Stephen Porges’ seminal Polyvagal Theory (PVT). PVT elucidates the structural organization and function of the human Autonomic Nervous System (ANS). It is important to recognize how music, along with other stimuli, can impact ANS function. According to Porges ‘connectedness’ is a biological imperative. PVT underlines our physiological need to co-regulate bio-behavioral states through engagement with others. We seek to regulate

physiological and behavioral states reciprocally and synchronously through connectedness. This neurobiological mechanism links physical and mental health to social behavior. Porges (2017) pointed to music as an effective means to communicate cues of safety to our. Cues of safety down-regulate defense and optimize homeostatic processes. Porges affirmation that music supports connectedness and co-regulation is paramount to EMT's efficacy as a clinical intervention is (Porges, 2017).

2.3.6 EMT in Practice

On a mechanistic level, EMT entails intentionally modifying music (by making changes to its individual elements, such as tempo and intensity) so that it responds to and shapes a specific environment (and that environment's sonic components) This process is influenced by the behaviors observed by the therapist, (such as changes in facial expression and gestures) and seeks to influence peoples' relationship with the hospital environment. It is a dynamic process that mimics the very definition of music itself: "ordering sounds in succession, in combination and in temporal relationships to produce a composition having unity and continuity (Music, n.d.)". Various studies suggest the process serves to decrease stress and anxiety levels, improve the deleterious effects of noise, and modulates pain perception (Rossetti & Canga, 2013; Rossetti, 2017; Schneider, 2005). My working definition of EMT is "The use of live music in a dynamic process using attunement to an environment and entrainment to its constituents to provide a soundtrack for that environment that modulates the constituents' perception of the meaning of that space and its soundscape (Rossetti, 2020)."

In an earlier construct using music in environmental settings, Aasgaard (1999) pointed to an approach centering on three domains: space, time, and quality.

As with all interventions in the TRS Model, EMT begins with assessment. In a recent article, the author proposed that "assessment of an environment implies becoming aware of two domains: of the 'sonic footprint' of that space, that is, the types and intensities of noise it contains, its 'feel' whether tense and somber or light and resting, and its 'energy' - a sense of dynamism of lack thereof for instance, and of the inhabitants themselves" (Rossetti 2020). In essence, the therapist looks for and analyses the salient elements contributing to the inhabitants' experience and perception of the environment, with attention paid to the auditory atmosphere, or soundscape itself. One takes note of the background sound, as well as foreground sounds such as conversations. Then follows a shift to focus on those observable characteristics defined by behavior, and extra-verbal communication (facial expression, body language, muscle tension) to better assess inhabitants' affect, physical and emotional states. The next step in the process is to formulate a 'feel' for the atmosphere itself (relaxed and supportive, or tense and oppressive, for instance). Another observable element to be assessed is the 'connectedness' and interaction (or lack of it) between the inhabitants. This gains importance in waiting rooms where feelings of safety will owe in part to the constituents' ventral vagal activity (Porges, 2017).

fostered by regulation via their social engagement system. This process was described early on by Schneider (2000, p. 97) in the following: “I am aware of the tension in motion and sound, the sounds accompany these movements as ballet score supports dancers- the environment determines the music” and explains that metaphor and association are integral to the process.

EMT is considered a dynamic therapeutic process. In light of this, optimal assessment should include a monitoring of any changes resulting from the intervention. This is to make sure that the therapist adapts dynamically to the need of the constituents by fine tuning changes in the music. As many music therapists describe using intuition in song choice and music making processes (Zhang, 2018) reliance on clinical intuition and metacognitive approaches in the assessment process seems organic, especially given the nature of the intervention itself. The intervention does not lend itself to using the usual and customary process of written assessment based on verbal inquiry, written short and long-term goals, and individualized session plans.

2.3.7 Modes of Intervention: a Hierarchy of Efficacy

As with any interventional approach, there is room for variability. In the context of a therapeutic modality such as MMPT where there is variability in therapists’ music capabilities, there should necessarily be a context for providing interventions in an inclusive and not exclusive manner. Such is the case in EMT. While there are a number of plausible ways to approach the EMT intervention (for example if we look at a hypothetical where one therapist is adept at improvisation, and another is more adept at song reproduction) it is imperative to look at projected effects of each approach may or may not be. In light of this, the concept of hierarchy of efficacy applied to EMT is as follows.

The hierarchy of efficacy owes to the adaptability of the music being made and how it relates to the clinical and biopsychosocial needs of the inhabitants of a given environment. Music is a complex and pervasive phenomena, that owes to patterns of music syntax (meaning of the sound), music semantics (meaning of the music), metaphoric content, related associations, meaning (referential and biographical) of lyrics, and interaction of its elements (Rossetti, 2020). These contribute to the outcomes of listening. Much of the research on emotional and physiological responses to music focuses on how the individual elements of music, and musics’ structural features correlate to specific responses (Faith, 2001; Mitchell, 2006; Punkanen, 2011; Scherer, 2001; Zentner, 2010).

At present, to the best of my knowledge, there is no discrete system for the manipulation of music elements in live music to provoke specific responses. The adaptation of the “Music Characterization System” discussed in this dissertation as a system for the use of pre-recorded music (Rossetti, 2014) could be a viable option. The MCS can be applied to live music to guide change in a work’s characteristics in a dynamic system of in-the-moment response to the music therapist’s continued assessment of the environment and needs of the inhabitants. In the MCS the therapist would be aware of 12 music elements and use what would be lower numerical values to provide more “relaxed” sounding music, or higher values for more “active” sounding music which can be

stimulating or empowering. The following table outlines the procedural steps in this process. (Rossetti, 2020.)

TABLE 1 EMT: Description of procedural steps

Step	Process	Goal
1. Assessment of Environmental Variables	<p>A- Foreground and background unwanted/contributory sound</p> <p>B - Inhabitants' physical emotional and psychosocial states, affect, and observable characteristics though evaluation of behavior and cues from constituents' extra-verbal communication (facial expression, body language, muscle tension)</p> <p>C - Feel for the environment itself (oppressive, tense, supportive, relaxed).</p>	Establish base-line for initiation of EMT intervention
2. Initiation of the Intervention	<p>A - Verbal/Extra-verbal contact with inhabitants</p> <p>B - Formulation of clinical goals</p> <p>C - Choice of beginning music</p> <p>D - Introduction of music into the existing soundscape</p>	Construction of therapeutic relationship/alliance through interactive music experience. Beginning of dynamic process.
3. Dynamic development of the intervention	<p>A - Choice of EMT modality (predetermined list, inhabitants' significant music, improvisatory process and level)</p> <p>B - Continuous assessment of inhabitant entrainment/response/change</p> <p>C - Redirection of goals if needed</p> <p>D - Assessment of change in environment 'qualities' in brief silence</p> <p>E - Modification of music elements to contribute to therapeutic process</p>	Deepening of therapeutic relationship through interaction/metaphor/associative processes concurrent with goals. Continuous assessment of response / adjustment of goals and music process
4. Closure/ bookending of the intervention	<p>A - Determination of constructive ending concurrent with final goals</p> <p>B - Choice of finalizing or 'bridging' music</p>	Participants have a sense of a structured and intentional experience

Likely the lowest level on the hierarchical scale of EMT would be a simple 'playlist'. This typically is composed of therapist-chosen pre-composed music played live "as is". The reasoning behind this is that the metaphors and associations engendered by the playlist would also be left "as is". There would be no adaptation of the music following the continuous assessment process. Increased efficacy would be found in the next level by using pre-composed music chosen as a result of the intuitive assessment process. Increased efficacy could also be obtained by using patient preferred music and could include a gradual shifting into similar songs.

This process honors the musical preferences and needs of the caregivers, staff and patients. The therapist can employ an improvisational process in playing the same music. This would entail changing the nature of discrete music elements following the 'guidelines' laid out via ongoing assessment and intuitive process. This would be likely to invoke more of the desired clinical changes identified during assessment. This might entail transformational manipulation of meter and other "macro-elements" of the original. The sounds present in the existing soundscape would be incorporated in the music and contextualized by playing in a key center in which those sounds make harmonic sense. For instance, a monitor beep sounding a B natural is the root of B major, but is also the major 3rd of G major, the minor 3rd of Ab minor, the 5th of E major, and so on.

2.3.8 Soundtrack and significant music

Ultimately, we find the concept of 'soundtrack' at the apex of the process. The perception of the environment as being safer and less distressing is obtained by "modulating the experiential qualities of the milieu itself in a situational, multisensory, and affective context with listening as the primary sensory mode" (Rossetti, 2020). This is improvised music that excludes playing pre-composed music "as is". It incorporates ambient sounds (if existent) and cues from observed behavior via skillful changes to underlying musical elements to create their re-contextualization. The therapist "employs a functional metaphoric voice to express an emotional narrative imbued by the inhabitants and embraced by the EMT music therapist, moment by moment." (Rossetti, 2020). Multi-level observation is imperative in this process.

The concept of 'music as metaphor' and symbolic representation come to the forefront. It is posited that its efficacy rests on the therapist's response to the continuous adjuvant assessment being carried out. Related to the concept of symbolic representation is the idea of 'significant referential music' (SRM) SRM derives from Loewy's "Song of Kin" (Loewy, 2015) and refers to patient preferred music that provokes strong associative qualities. SRM is often directly related to important events or specific situations in peoples' lives. A number of studies suggest that skillful use of SRM (more commonly referred to as 'patient preferred music') can improve various deleterious conditions, including chemotherapy induced nausea, negative mood-state, pain, and anxiety (Clark, 2006; Mitchell, 2006; Rossetti, 2017; Wakim, 2010).

2.3.9 EMT Postlude

“EMT is a transformative intervention developed and designed for modulating perceptions of hospital spaces and uses music in a psycho-environmental design (Rossetti, 2020 p. 139).” There is growing interest in the evaluation and design of hospital environments and the use of atmospheres to obtain less stressful, patient-centered healing spaces. It is an integral part of the trauma-informed strategies of the TRS model given that it is in tune with current trajectories leading the way to prophylactic measures to avoid medically induced trauma. The very basis for informed care is to impart change that leads hospital constituents to experience the hospital itself as a “safer” and less hostile place.

2.4 Mask anxiety in head & neck cancer patients

As mentioned earlier, the diagnosis and subsequent treatment of head and neck cancer can have a potentially devastating effect on psychosocial functioning, and also disproportionate emotional distress owing to the possibility of physical disfigurement from disease progression and/or treatment, as well as from impairment of such basic human functions as eating, speaking, and breathing (Duffy, 2007). Dramatically, the suicide rate was more than four times greater among patients with head-and-neck cancer than among the general population (Zeller, 2016). It is not uncommon for this population to experience moderate to severe psychological distress requiring anxiolytics to complete treatment with one study not only finding high levels of psychosocial distress at baseline but also showing that (85%) of HNC patients taking part experienced an increase in depression scores during RT (Chen, 2009).

Head and neck cancer patients may be a particularly vulnerable cohort also due to the necessity of wearing an immobilization mask during radiation therapy. They are at high risk of experiencing distress (Zeller, 2006). Distress is a term that describes an unpleasant experience of a psychological, social, spiritual and/or physical nature and/or physical nature that may interfere with the ability to cope effectively with cancer, its physical symptoms, and its treatment (Duffy, 2007).

“Mask Anxiety” or distress resulting from having to use an immobilization device during treatment for head and neck cancer is a common experience, and symptomatological expression included significant claustrophobia (Nixon, 2019). Little is known formally about specific techniques or strategies used to palliate this sometimes debilitating experience, which makes it all the more important to develop, implement and divulge interventions such as the one which is the subject of the study this paper is partially based on (Rossetti, 2017).

Furthermore, distress has been found to be directly related to the use of the thermoplastic mask used to immobilize patients to ensure precision of treatment (Budach, 2017; Clover, 2011; Nixon, 2018).

The immobilization process is extremely intimidating for many patients and it is common for interruptions to treatment to occur due to mask anxiety and

accompanying intolerable physical sensations (Oultram, 2012). This can further affect the treatment flow itself that may induce distress in the radiation therapists themselves resulting in an increase in waiting time for subsequent patients on the treatment schedule, which has the potential to increase anxiety in those patients.

One study found that 22% of patients treated sustained the same level of distress, and 6% of this population experienced an increase along the course of RT (Nixon, 2009). This same study recommended that due to high prevalence and variable patterns over time, that routine screening for mask anxiety be carried out throughout the course of RT be conducted (Nixon, 2019). This may be so in part because there is evidence that HNC patients who report distress before and after RT have a poorer survival rate (Habboush, 2017) and face long-term challenges associated with physical function (Clover, 2011; Habboush, 2017; Singer, 2012)

Another showed 14% - 16% of patients self rated for clinically significant anxiety during simulation and first day of Tx while RT techs identified anxiety in 24% - 44% with 13% -24% experiencing disruption to the session (Oultram, 2012).

This becomes salient when viewed in the light of literature showing that 50% of all cancer patients receive RT (Oultram, 2012) and that 40-60% of cancer patients experience psychological distress of varying severity (National Comprehensive Cancer Network, 2018). If significant levels of distress are not addressed, then cancer patients will experience a lower QOL, have lower satisfaction levels, and compliance with treatment, and possibly a decrease in survival (Humphris, 2008).

Early studies have shown that between 14% and 58% of HNC patients using mask immobilization experienced distress and accompanying claustrophobia (Nixon, 2018; Oultram, 2012; Sharp, 2005). Multiple factors appear to cause mask anxiety. These include pre-existing psychological illness, vulnerability associated with claustrophobia, fear of movement restriction, concurrent stressors and a history of anxiety attacks and trauma (Clover, 2011; Budach, 2017; Nixon, 2018). Adverse response to the use of the mask encompass a mix of psychological (e.g. anxiety, distress, feelings of vulnerability, uncertainty, fear, overwhelm and panic) and physiological (e.g. tachycardia, sweating, tachypnea) reactions (Budach, 2017; Clover, 2011; Nixon, 2018).

Mask anxiety has been reported to cause disruptions in the first day of RT for 24% of patients undergoing treatment (Clover, 2011) and in one study it has been described by participants as one of the most distressing things elements of RT for head and neck cancer (Rose, 2001). Moreover, more than a third of patients never fully acclimate to the mask and continue experiencing mask anxiety throughout RT (Nixon, 2019).

Happily, because patients undergoing RT for head and neck cancer are typically seen on a daily basis by medical personnel, unique opportunities exist in the diagnosis and management of emotional challenges and disorders. This creates an open platform for referral of these patients to medical music psychotherapy to both palliate and pre-empt distress, likely contributing to pre-empting potential points of trauma.

2.5 Anxiety and distress in breast cancer patients

Radiation therapy, especially on the first day of treatment, may generate anxiety that can be palliated through processing of specific concerns the patient has and the implementation of resources in the form of discreet coping strategies.

Radiotherapy (RT) is frequently used as an adjuvant treatment to limit local recurrence after breast surgery, and consequently prevent metastasis (and therefore mortality) (Egestad, 2013). Given the advances in early diagnosis and the development of less invasive organ preserving surgical procedures, RT has become one of the most frequently used procedures for breast cancer (Grilo, 2020).

Correspondingly, RT is perceived by many breast cancer patients as stressful (Halkett, 2010) and a significant number of breast cancer patients experience anxiety and distress (Stiegelis, 2004) at treatment onset (Leon-Pizarro, 2007; Halkett, 2018). Fear is often a causal element and its etiology can be traced to a myriad of contexts, such as: unknown consequences of the procedure and the body's response to the treatment (Halkett, 2008), potentially damaging effects of radiation exposure (Halkett, 2008; Halkett, 2012; Shimotsu, 2010), and uncertainty surrounding future impacts of the treatment on the patient's life and health (Halkett, 2012) equipment malfunctions and the emission of excessive radiation doses (Holland, 1990), of errors in the positioning anatomical irradiation and of potentially not being completely cured (Shimotsu, 2010).

Other aspects that may increase anxiety levels prior to treatment relate to the environment of RT units themselves and their often-sterile environment and atmospheres (i.e., the linear accelerator, and simulation room themselves (Halkett, 2012) and the need for the patient to be isolated and immobilized in a closed space (Shimotsu, 2010). In this light, provision of specific information addressing patients' needs and concerns and the patient's relationship with her RT treatment team have been identified as factors that may mitigate anxiety triggers. Fears surrounding voluntary exposure to procedures that involve radiation can be related to associations with past experiences (e.g., generational contact with Hiroshima, knowledge that radiation itself has the potential to cause cancer) and to their frightening consequences. MTs can work with the emotional issues, points of trauma and associations patients may bring with them to the first day of treatment, but the MTs ability to identify and qualify these sources and communicate them to the radiation therapist/attending physician who can provide accurate information regarding specific aspects of treatment and procedures is equally important, as evidenced in Lewis' work with breast cancer patients. It was shown that breast cancer patient perceptions of receiving less support (regarding practical, informational, and emotional issues) from RT health professionals were identified as a significant predictor of experiencing more anxiety prior to the first session of treatment (Leon-Pizarro, 2007). The use of a true team approach where the transfer of salient patient information is key to each of the team's professionals being able to best apply their individual areas of expertise and create a 'nucleus of care' to best address the patient's comfort and empowering participation in the intervention.

Grilo (2019) found 20% of women RT patients reported that their doubts about the first day's treatment experience were not fully addressed, even though they did receive some information from their radiotherapist. Given that in The TRS Model the music therapist sees the starting patient before the radiotherapist, she/he can take an active part in mitigating this issue by sharing specific information obtained in assessment (for instance past history of claustrophobic events, trauma, non-constructive impressions of previous medical treatment, anticipatory anxiety, etc.) to that the technical and medical team can focus on providing orientation to the procedure itself that will ease the patient's concerns.

Significantly, Grilo also found that relaxation techniques, guided imagery, and music (Grilo, 2019) have also been proven effective at reducing anxiety levels experienced during RT sessions. This study also found significantly high mean values of treatment-related anxiety that corresponded to those of similar studies [Schneider, 2016; Schreier 2004; Tuncer, 2014) to the point where they establish a need for Screening of patients' anxiety levels should take place prior to CT simulation with anxiety self-report assessments (Oultram, 2012; Stapleton, 2017; Tuncer 2014) or through the use of more cancer-specific measures (Olausson, 2017; Schreier, 2016; Shimotsu, 2010). Grilo identified the need for mental health care specialists to properly assess breast cancer patients' anxiety levels and identify those patients who could benefit from psycho-oncological support or who require individualized attention with more emotional support (Grilo, 2019). And while certainly there are clinically significant levels of anxiety on the first day of RT treatment, a recent German study found high levels across the course of the therapy at all stages: examination, before tumor board decision, before surgery, during chemotherapy, during radiation and follow-up screening: Examination 40.21 ± 11.11 , Surgery 50.24 ± 13.84 , Tumor board decision 52.89 ± 18.73 , Chemotherapy 40.64 ± 10.94 Radiation 42 ± 10.44 3, Follow up examination 47.99 ± 14.29 (Wagner, 2018). The TRS Model posits that in some contexts those scores could be modulated indirectly by an initial protocolized MPT intervention that would eliminate 'carryover' to subsequent cancer treatment experiences.

2.6 Toward understanding resilience in cancer patients

Cancer diagnosis and treatments can cause people to suffer acute adversity and lead to varied levels of distress (Harms, 2019; Ugalde, 2017). In seeking to enhance support of people with difficulties in dealing with these potentially overwhelming stressors, clinical research has centered on isolating factors that increase vulnerability to significant distress (Orom, 2015; singer, 2012). Less attention has been given to prophylactic individual factors such as resilience.

Fortunately, the concept of resilience as a contributing factor to enhanced outcomes and patient experience in treatment milieus has been gaining traction, and a growing corpus of clinical literature is contributing to its position as a valuable strategy in healthcare (Eicher, 2015; Luo, 2020). In Aspinwall's (2005) seminal work she stated "positive emotions and beliefs seem not only to be associated with good outcomes among people experiencing adversity, but also

to play a role in realizing them” and that “people bring strengths to and develop them from the experience of cancer treatment (Aspinwall, 2005 p. 2550).”

This focus brings us to an approach that looks to the realm of positive psychology in embracing and fomenting optimism, resilience, human strengths, and ‘in the moment-ness’ instead of leaving the patient to dwell on depression, pessimism, vulnerability and illness. This is not to say that as therapists we seek to create a sense of false hope or denial of the realities of serious illness. Instead our aim is to provide a venue for a greater gratitude, and realization of each person’s specific characteristics to confront adversity. Essentially stated in regards to quality of life: an ounce of joy is worth a pound of hope.

The inclusion of resilience as a cornerstone in the TRS model rests on the observation that resilient cancer patients seem to fare better during the treatment process. Studies have shown that a wide proportion of people, some 30% to 90%, with cancer and other life-threatening illness actually report improved QOL, positive changes in values, and changes in spirituality as a result of the experience (Armor 1996; Taylor, 1983; Tedeschi, 1998; Updegraff, 2000) Other studies have pointed to the positive affect that characterizes resilience contributing to favorable outcomes in physical domains including: faster cardiovascular recovery from stress (Fredrikson, 2000; Papousek, 2010) lower levels of cortisol (Dickray, 2010), enhanced function of immune system (Davidson, 2010), and lower morbidity and decreased pain symptoms (Cohn, 2006) One such study in breast cancer patients showed that, optimism was a predicting factor of lower levels of psychological distress at the patient’s 3, 6, and 12 month follow ups and of greater acceptance of having had breast surgery, higher levels of constructive forms of coping, (such as positive reframing), and lower levels of denial and dissociation (Carver, 1993).

In studies looking specifically at people living with cancer, resilience was found to impact physical, psychological and social functioning, and that in the domain of treatment induced symptoms, some people with higher identified resilience experience less fatigue, insomnia, diarrhea, nausea and vomiting, constipation, pain, appetite loss (Luthar, 2003; Strauss, 2007; Tian, 2014; Zou, 2018) while others may adapt well to their altered physical functioning (Reinwalds, 2018). Interestingly no cancer specific instruments to measure resilience have been identified at present.

Regarding psychological functioning, resilience may assist individuals to maintain or increase positive emotions. This enables them to more readily adjust through ‘redefining’ or re-prioritizing life goals and opens a path to personal or post traumatic growth (Dooley, 2017).

With respect to social functioning, research shows that resilience positively correlates with social functioning. This is significant for its tie-in to self-regulation and the ability to transition between functional parasympathetic and sympathetic states (Ristevska, 2015; Schumacher, 2014)

Be that as it may, to date, the concept itself of individual resilience in adults with cancer has not been analyzed in detail, though it plays an important role in facilitating individuals’ adapting to adversity (Luo, 2020).

2.6.1 A Brief History and Synthesis of Definitions of Resilience Towards a Workable Concept in Cancer Care

To arrive at a working definition and deeper understanding of the concept of resilience we will look at a brief history of the concept. The first conceptualization of the term was proposed in Antonovsky's salutogenic model (Antonovsky, 1979) as generalized resistance resources. It refers to resources to effectively avoid or combat psychosocial stressors and is seen as the predecessor of resilience.

The concept of resilience was developed across multiple disciplines including nursing, epidemiology, social work, psychology, and education (Atkinson, 2009). Early studies mainly explored response behavior of children or adolescents to developmental threats (Hasse, 2009). This concept expanded into the field of chronic diseases, including cancer. In the realm of oncology, studies focused primarily on children, adolescents and young adults, (Docherty, 2013, 2014; Rosenberg, 2015; Rosenberg, 2016) with only a small number carried out on adult cancer patients (Eicher, 2015; Molina, 2014).

One possible reason for the lack of studies on resilience in adults with cancer is that definitions of resilience and its conceptualization might still be too broad to reflect the specific features of adults affected by cancer (Luo, 2020)

Despite discrepancies, a common theme in defining resilience is the ability to recover and rebound from adversities. TRS employs the following as a working model to identify and foment resilient characteristics of patients and convert them into a self-care strategy:

The ability, through a dynamic process or due to innate traits to resist, and adapt to adverse mental and/or physical events in cancer-related contexts, and incorporate new strategies to thereby recover or maintain a desired level of functionality.

An important point of this approach is that while one's resilient characteristics may indeed well serve the patient in their present situation, the process of acquired in-sight and illumination of new options to increase the amplitude of constructive/protective response to future medical adversities is paramount.

Given that our working definition of resilience includes traits as well as process, it serves this model to identify a number of inherent or developable traits that contribute to resilience. To this end a list of traits has been compiled based on those identified by Luo and Eicher through their pivotal paper (Luo & Eicher, 2020) using the concept analysis process developed by Walker and Avant (Walker, 2005) It is described in the following section.

2.6.1.1 Defining attributes of resilience in adult cancer care

Traits such as optimism, a sense of coherence and purpose, positive self-regard, and mental/physical endurance contribute the capacity to avoid passivity and autoidentification of self-as-victim. These may be placed under the heading of

Ego-strength.¹ The capacity for recalibration is an important attribute of resilience. It can be seen as the ability to adjust thoughts, behaviour and belief systems to maintain and/or recover functionality. It is the capacity to transition into a proactive stance and treatment and healing as necessitated by the situation. Perhaps the most basic attribute of resilience is the patient's ability to accept, internalize and employ new resources. In trauma contexts this can be especially important and lead to construction of a 'new functional identity.' Lastly, interaction with the environment is directly related to the ability to employ the social engagement system in interpersonal experiences. This can enhance the patient's capacity to constructively engage with healthcare professionals, which can be a factor in receiving effective treatment.

2.6.2 Strategies to uncover / reinforce resilient characteristics

There are a myriad of music psychotherapy interventions that can be instrumental in the process of fomenting resilience in cancer patients, and they are applicable across cancer treatment milieus. Through experientials combined with psychoeducation, these interventions can be used to provide resources for patients that permit them to become active partners in their care instead of passive recipients of medical treatment. This can affect how patients identify themselves by creating a strong sense of agency that leads them to take up a proactive stance on treatment itself and feel empowered in facing the challenges of illness and treatment burden. Music based visualization, for instance, can be an effective modality (Rossetti, 2017).

Providing patients with effective symptom management can be pivotal in helping them consolidate viable protective factors and coping structures. The function of the music experience is often to serve as a metaphor for "real life" or as a transitional object where symbolic representation can both hold and process that which the patient projects on to the music. Music can provide structure through familiarity and predictability. Loewy's story song and song sensitization (Loewy, 2002) can provide a vehicle for narrative to identify and reinforce. The act of choosing music, lyrics, images, instruments can support autonomy, and music experience's socializing characteristics and facility in communicating unspoken thoughts can be applied to sound results.

Robb (2014) posited that music based interventions can contribute to patients identifying their 'resilient self' but that more studies are needed to confirm specific mechanisms in play.

¹ The concept of ego strength derives from psychoanalytic theory and refers to the healthy, adaptive functioning of the ego, directly related to resilience. Freud conceptualized the ego as an "intrapsychic substructure that serves the essential organizing and synthesizing functions that are necessary for an individual to adapt to the external world." (Freud, 1961). Ego strength reflects a person's capacities for adaptability, cohesive identity, personal resourcefulness, self-efficacy, and self-esteem.

2.7 Simulation for radiation oncology

The purpose of simulation is to pinpoint the area of the body that will be treated, and generate a set of images that will permit the patient's radiation oncologist and team of physicists to create a viable treatment plan for fractionated dosification and accurate delivery of radiation. It is also during simulation that the radiation therapists create an individualized immobilization device that will be used during all subsequent treatment.

The CT (Computerized Tomography) simulator produces diagnostic quality X-rays to verify the position of the anatomy to be treated. Once simulation is completed, the patient's skin is marked with small dots of permanent ink ("tattoos") to assist the therapists to properly position patients for treatment, and to ensure that treatments are delivered correctly each day. Treatment unit parameters are finalized and recorded, and all setup information is documented. This is an integral part of the planning process. The CT scan itself is not used as a diagnostic scan but instead to contour the shape of the patient's body and visualize its structures. As mentioned earlier in this paper there are various types of immobilization devices used to maintain the patient in the correct treatment position. Among them and found to be the cause of frequent phobic responses is the molded mask used for patients with head & neck cancer. It is a singular aspect of both CT simulation and radiation therapy. Assessment and clinical observation on the radiation oncology suite suggests that the mask engenders significant patient anxiety.

In a study of 90 patients undergoing radiation therapy (RT), 24% were reported as having some level of session disruption resulting from anxiety (Mackenzie, 2014). Behaviors associated with session disruption during simulation and in first sessions of radiation therapy included fear of enclosed spaces; fear of face being covered up; fear of movement restriction, and those fears were more acute in patients who had had prior anxiety attacks (Mackenzie, 2014). The insight into the prevalence of patient anxiety which was severe enough to cause session disruption for future treatments provided by this study indicates that initial interventions are well warranted and furthermore may have the potential to shift future perceived patient distress and enhance comfort factors (Mackenzie, 2014).

2.8 Defining a need: purpose and justification

Music psychotherapy's capacity to address anxiety in cancer patients receiving radiation therapy has not been well described. The IRB approved study that is the basis for this paper evaluated a protocolized music therapy intervention's impact on anxiety and distress experienced by patients undergoing CT Simulation.

Through my treatment of cancer patients who required routine treatments, I observed a need to address the mind and spirit's capacity to withstand

aggressive treatment and furthermore needed a context in order to do so. This dissertation is founded on the following clinical trial that focused on the direct effects of music psychotherapy for those who enrolled. They were randomly assigned to four groups: Patients with head & neck cancer receiving one pre-simulation music psychotherapy session and prescribed pre-recorded music during, and patients with breast cancer receiving one pre-simulation music psychotherapy session and prescribed pre-recorded music during simulation, and their controls. A rationale for this focus on simulation is best described by an introduction to the procedure itself that will reveal its inherent influence on the continuum of radiation therapy for cancer.

Simulation is the first medical intervention cancer patients receive when they come in the first day of their extended radiation therapy. During the initial planning stages prior to implementing the music psychotherapy program in radiation oncology at Mount Sinai Beth Israel Medical Center, I was able to speak with numerous patients about their treatment experience. I was surprised that many described the single most stressful experience was simulation. I found this significant considering that radiation therapy itself can last for weeks of daily radiation doses that ultimately produce what can be debilitating physical reactions, and their corresponding psychological sequelae. Likely contributing factors to the marked anxiety experienced by a significant number of patients are fear of the unknown, and the restraint and isolation inherent in the procedure.

I found that there are virtually no studies on the effects of biopsychosocial strategies to palliate anxiety during simulation for radiation therapy. This directed my search for a multi-level intervention to increase tolerability of the simulation process, and lay a foundation for shifting that experience into one of enhanced patient empowerment.

3 A RESEARCH BASED CLINICAL FOUNDATION FOR THE TRS MODEL

The TRS music psychotherapy model for addressing illness burden in oncology builds upon the author's decade of clinical work in Radiation Oncology and Chemotherapy. The impetus to develop such a model stems from the recognition that there is a dearth of literature, and accordingly, a clearly defined systematic guide for addressing the impact of active MMPT strategies for patients of varying stages of cancer and cancer treatment.

3.1 A randomized control trial examining anxiety and distress in radiation oncology

Observation and interviews of radiation oncology patients and medical staff revealed that many belonging to those cohorts identified an initial treatment planning intervention as one of the most stressful moments in the entire series of radiation treatments patients typically undergo. This is surprising considering the physical and emotional challenges inherent in a process that encompasses three to nine weeks of daily invasive treatment. A review of the literature found that while there is a growing body of studies on music therapy and music & medicine interventions in radiation oncology, (Nardone, 2020) the Smith et al study conducted in 2001 was the only other study that addressed the impact of music use during simulation (Nardone, 2020). Most studies of music in the context of radiation oncology have been limited to simple passive music listening to pre-recorded music and found modest results (O'Steen, 2020). In light of these facts, it became evident that a study on the impact music therapy in this context was warranted. The study is an attempt to add to the pool of effective evidenced based clinical interventions to palliate the psychophysical difficulties encountered by patients receiving radiation therapy for cancer.

This IRB approved study, *The Impact of Music Therapy on Anxiety in Cancer Patients Undergoing Simulation for Radiation Therapy*, (Rossetti, 2017)

evaluated a protocolized music therapy intervention's impact on anxiety and distress experienced by patients undergoing CT Simulation, and was published in the *International Journal of Radiation Oncology Biology and Physics*, and as an indicator of the interest it generated in the radiation oncology milieu, it was privileged to be among that journal's 20 most downloaded articles in 2017, and rose to number 3 on that list in 2018. It has engendered a follow up study conducted by a medical team that was also published in the same journal.

The study served as motivation to design a discrete protocolized music psychotherapy intervention that targeted and incorporated specific elements in the patient experience that likely lead to increased distress and anxiety. The intervention significantly reduced anxiety and distress in newly diagnosed head & neck and breast cancer patients, with greater effect in subgroups with higher baseline anxiety and distress. The outcomes obtained through the use of the protocolized intervention that formed the basis for this study provide a clear direction to be taken with this most fragile of populations. The broader picture is in providing them with resources that can be used to reverse the common perception patients have of being passive recipients, of cancer treatment, or in extreme cases, as perceiving themselves as "victims". These resources allow radiation oncology patients to be proactive participants in their treatment, which may lead to enhanced resilience, and reduced susceptibility to psychobiological difficulties.

3.1.1 Background and justification

Newly diagnosed cancer patients are often fearful of the prospect of receiving radiation therapy (Peck, 1977). Patients' first step in treatment is a procedure called simulation, and it can strongly influence how they perceived the remainder of their treatment. Although the amount of studies on anxiety in radiation oncology is growing (Andersen, 1985; Grilo, 2019; Stiegelis, 2004) there are few focusing on simulation. Though one study found 77.8% of cancer patients receiving treatment suffered from symptomatic anxiety, a review of radiation therapy studies found that 10% to 20% of patients experienced clinically significant levels of anxiety at the initiation of RT (Stiegelis, 2004) During the simulation procedure anxiety etiology owes to the immobilization devices used to restrict movement coupled with isolation in an unfamiliar environment, and negative expectation.

Music therapy has been shown to be effective in reducing anxiety in various hospital contexts in clinical trials (Chlan, 1998; Han, 2010; Horne, 2008; Rossetti, 2017) that have indicated its efficacy in procedures often perceived as invasive such as venipuncture (Malone, 1996) debridement (Fratianne, 2001) and oncology treatment regimens (Ferrer, 2007). Although some studies have examined the use of recorded music during radiation therapy, (Clark, 2006; Chen, 2013; O'Callaghan, 2007; Smith, 2001; Nardone, 2020) there is limited data examining MT prior to and during simulation and virtually no research evaluation the use of music therapy protocols utilizing live music during this critical step in radiation therapy. This intervention is perceived as an extension of personalized patient centered medicine, and focuses on the unique emotional aspects of each

patient in the context of their treatment experience. It is an initial experience aimed at improving this aspect of oncology care.

3.1.2 Procedure and principal results

The study cohort encompassed patients with head & neck cancer and breast cancer. Participants were randomized to two conditions: MT plus standard procedure vs. standard procedure with No MT intervention. Participants were limited to patients who were fluent in English, and randomized using a schedule generated by a staff biostatistician.

Enrolled participants were provided with an orientation to the process that included details of the music therapy session by a board certified music therapist in the simulation room prior to simulation itself. A research assistant helped the subject complete the Spielberger State Anxiety Inventory (STAI-S) (see figure B in Appendix) and a Likert-style Distress Thermometer (see figure C in Appendix). Based on this assessment a program of patient preferred prescribed music was constructed and provided to the patient for listening during simulation. Clinical goals of this section of the intervention were focused on the reduction of state anxiety.

Active arm enrollees received a two-part MMPT intervention. The first was a protocolized session targeting the reduction of state anxiety and distress. It was so designed that it attempted to address three specific elements of the simulation procedure identified by the music therapist and the medical/technical team as contributors to adverse patient reactions to simulation. They are: anticipatory anxiety, physical discomfort related to the length of the simulation procedure and the unavoidable discomfort caused by maintaining a motionless position on a hard surface, and claustrophobic responses, panic induced by physical restraint and isolation. Each of these elements was addressed through a process of a scripted altered state induction accompanied by live music. The first directed patient breath focus leading to a meditative state characterized by a reduction in respiratory frequency, profundity, and a shift from thoracic to abdominal breathing. The second used gentle suggestion in the meditative state to direct the patient to experiencing altered tactile sensations of the treatment chair, towards it being perceived as softer and more comfortable. The third segment was a scripted guided visualization with live improvisatory music leading the patient to a "safe and comfortable place." The patient's experience with these three segments was then processed and the patient psychoeducated on their use during simulation, so as to convert them into actively available resources for the patient to use as needed during simulation, or during RT itself.

The music psychotherapy intervention lasted 20 minutes. The live music it contained was played on a nylon string guitar in drop D tuning in an improvisation based piece primarily in D mixolydian in ABA format with the B section modulating through numerous key centers. A recording and tablature transcription are available from the author. It was played focusing on the concepts laid out in the music characterization system regarding the manipulation of discrete music elements to enhance entrainment and progressively deepen the relaxation response. The second part of the intervention

provided the patient with a “prescribed music program” (Rossetti, 2014) of patient preferred music. A detailed account of the justification for this system and its clinical use is provided in section 3.3.3. This pre-recorded music was played for the patient during simulation to continue and enhance reduction of state anxiety and temporal distortion. It also served as a ‘proxy’ for the music therapist as a way of the patient perceiving the therapist as being ‘present’ during simulation.

Patients randomized to the No MT control group received only treatment as usual with neither the live music intervention nor prescribed music program. These patients were offered the option of music psychotherapy upon their request during future radiation therapy appointments

A biostatistician estimated a medium-to-large effect size with Cohen’s $d=0.66$, based on previous research (Bradt, 2011) and used two sample t-tests to compare post treatment STAI scores for both the MT and the No MT groups He also used a repeated measures ANOVA to assess treatment effects of the STAI and SDT. A complete of stratification analysis is avail in the published study (Rossetti, 2017).

TABLE 2 Patient characteristics

Characteristic	Entire cohort (N=78)	MT (n=39)	No MT (n=39)
Age median (range)	58.5 (26-77)	58 (26-71)	60 (35-77)
Age by group, n (%)			
26-48 y	18 (23.1)	9 (23.1)	9 (23.1)
49-58 y	18 (23.1)	10 (25.6)	8 (20.5)
59-64 y	22 (28.2)	13 (33.3)	9 (23.1)
65-77 y	20 (25.6)	7 (18.0)	13 (33.3)
Gender, n (%)			
Male	27 (34.6)	15 (38.5)	12 (30.8)
Female	51 (65.4)	24 (61.5)	27 (69.2)
Cancer Primary by Stage, n (%)			
Breast			
0	4 (10.5)	1 (6.3)	3 (13.6)
I	14 (36.8)	8 (50.0)	6 (27.3)

II	10 (26.3)	4 (25.0)	6 (27.3)
III	7 (18.4)	2 (12.5)	5 (22.7)
IV	3 (7.9)	1 (6.3)	2 (9.1)
Head & Neck			
I	10 (25.0)	5 (21.7)	5 (29.4)
II	8 (20.0)	8 (34.8)	0 (0)
III	9 (22.5)	5 (21.7)	4 (23.5)
IV	13 (32.5)	5 (21.7)	8 (47.1)
Higher STAI	39 (50.0)	20 (51.3)	19 (48.7)
Score: ≥ 40 , n (%)			
Higher SDT Score ≥ 4 , n (%)	29 (37.2)	17 (43.6)	12 (30.8)

Abbreviations: MT = music therapy; SDT = Symptom Distress Thermometer
STAI = State/Trait Anxiety Inventory

A complete statistical analysis is available in the article published in the International Journal of Radiation Oncology Biology and Physics (Rossetti, 2017). Here we will examine the most salient points shown by the data. There was a strong reduction in state anxiety for the MT cohort expressed as a mean change effect of 8.2 units ($p = <.0001$) State anxiety actually increased in the No MT cohort expressed as a -1.2 unit mean change effect, though this increase was not statistically significant ($p = 0.46$). Mean pre-simulation levels for both groups was 38.7, and stratified by MT and No MT cohorts the levels were 39 and 38.3 respectively. These findings represent a statistically significant 21.03% reduction in state anxiety in the MT cohort. Subset analyses yielded important outcomes. The MT cohort reporting STAI pre-intervention scores equal to and higher than the 40-point cut off experienced a mean decrease of 10.8. No MT control group in the ≥ 40 pre-simulation cohort experienced a mean decrease of 0.8.

TABLE 3 RCT Results

Mean change between pre- and post-simulation measurements

Analysis group	n	MT		Control			P value		
		Mean change	SD	n	Mean change	SD	Between subjects	Within subjects	Group × time interaction
STAI									
Entire cohort	39	8.2	8.7	39	-1.2	10.1	.1006	.002	<.0001
Higher STAI (≥40)	18	10.8	9.5	19	0.8	10.4	.1068	.0012	.0043
Emotional block (8-12)	18	10.4	8.9	19	-2.7	10.3	.0154	.0202	.0002
Age 26-48 y	9	14.7	10	9	2.7	11.5	.4839	.0035	.0309
Age 49-58 y	10	8.6	7.4	8	-6	9.3	.2162	.5165	.0018
Age 59-64 y	13	3.5	7.4	9	1.8	8.1	.5834	.1303	.6177
Age 65-77 y	7	7.9	6.5	13	-3	10.4	.4803	.2778	.0222
SDT									
Entire cohort	39	1.6	1.7	39	-0.3	2.4	.1623	.0064	.0002
Higher SDT (≥4)	17	2.8	1.6	12	0.75	3.7	.0732	.0016	.0548
Emotional block (8-12)	18	2.3	1.2	19	-1.2	2.2	.139	.0631	<.0001
Age 26-48 y	9	0.8	1.5	9	0.2	2.3	.4868	.2938	.5549
Age 49-58 y	10	1.7	1.5	8	-1.1	1.6	.3308	.4487	.0015
Age 59-64 y	13	1.5	1.9	9	-0.8	2.8	.8082	.4481	.0288
Age 65-77 y	7	2.6	1.7	13	0.3	2.7	.2639	.0201	.0603

Abbreviations: MT = music therapy; SDT = Symptom Distress Thermometer; STAI = State-Trait Anxiety Inventory.

Means with Standard Error Bars for STAI HIGH (40+) Groups

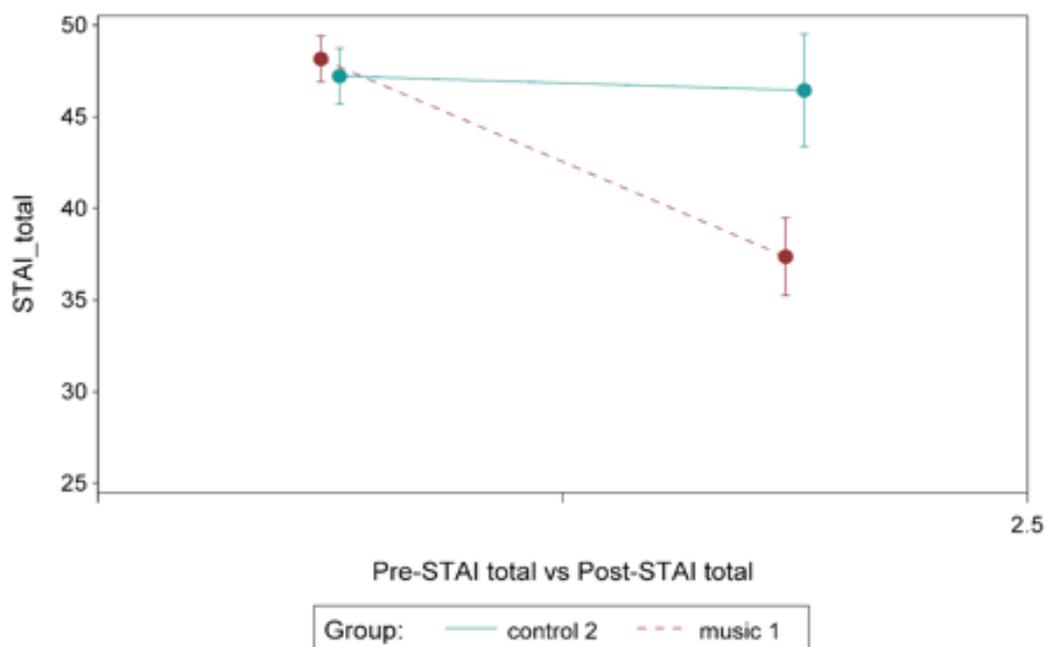


FIGURE 1 State-Trait Anxiety Inventory (STAI) scores for patients with high pre-STAI scores

Regarding distress related to emotional factors, thirty-seven participants indicated that to be the etiology of their pre-simulation distress, eighteen of which belonged to the MT group and 19 to the No MT group. The MT group experienced a mean STAI decrease of 10.4 units, and the No MT group, -2.7.

Means with Standard Error Bars for DISTRESS by Emotional block Groups

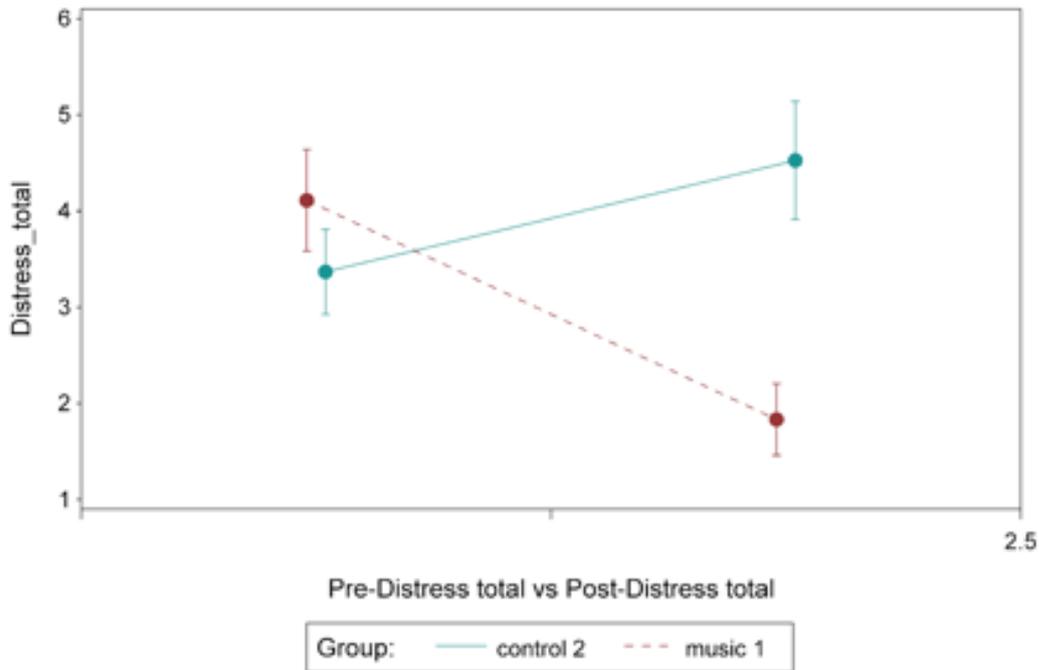


FIGURE 2 Distress Thermometer scores for high pre simulation emotional vector distress

The data in the study show the pre-simulation mean distress scores for twenty-nine participants presented with clinically significant scores of ≥ 4 . Of these, 12 had been randomized to the MT cohort and 17 to the No MT cohort. The MT cohort pre-simulation mean scores were 5.6 and post-simulation mean scores were 2.8 ($p=0.0016$). This represents a 50% reduction, which importantly shows a change from clinically significant distress to sub-symptomatic threshold levels. The No MT cohort change scores represent a negligible effect of 5.8 to 5.08. Interestingly the stratified sub-set group of 26-48 year olds experienced a mean reduction in anxiety of 14.6 units (pre- 42.4, post- 27.8) (W-S $p=0.0035$, interaction $p=0.0309$). Due to the resulting small sample size, subset analysis of cohorts of anatomical site provided only exploratory results that may inspire further study.

3.1.3 Implications of the RCT

This study was the first of its kind, and remains the only published clinical trial to evaluate the efficacy of a multi-level MT intervention that employs both live and pre-recorded music to address state anxiety and distress in patients undergoing simulation for radiation oncology (Rossetti, 2017). The data strongly suggest that the intervention can reduce both with statistical as well as clinical significance (Rossetti, 2017) These findings are of importance on various levels in that they point to a strategy that can be used to address the prevalence of anxiety severe enough to cause interruption of the simulation process, and may have the potential to shift future perceived patient stress (Clover, 2011). They also lend to a larger construct, that reducing emotional distress and potential points of

trauma during simulation will likely contribute to successful completion of simulation in relative comfort. This will in turn likely contribute to greater patient compliance with RT treatment regimens. Music psychotherapy in this context may be seen as a safe, cost-effective means of alleviating patient anxiety and distress, thus reducing the overall burden of treatment.

Optimal cancer care meets both the physical and psychosocial needs of patients. This paradigm is still overlooked in radiation oncology and is manifest in the observation that 49% of patients receiving RT experience arguably unnecessary anxiety and distress (Elsner, 2016). Given that an alarming number of head & neck patients show observable symptoms of emotional distress even prior to treatment and that this number increases significantly during RT (Clover, 2011) it is evident that psychosocial support is warranted from the very beginning of the patient experience (Greer, 2008).

It is important to consider that the STAI-S is not a diagnostic instrument. And though it may be used in conjunction with other instruments to that end, it is meant to reflect the influence of transient situational factors on the patient that exist at the time of testing. Although the STAI manual does not specify cutoff points or significance of unit variation (Spielburger, 1983), cutoffs for clinically significant anxiety of 39/40 have been the standard in prior studies (Clements, 2010; Kyaal, 2001) In light of this, we did not assume the STAI scores indicated the presence of a developing pathology in patients, but as a bell weather justifying expansion of psychosocial support.

Regarding patient distress, the data show that in general the entire study cohort experienced sub-symptomatic levels of distress. However it is important to note that the subset of patients receiving MT with clinically significant distress scores of ≥ 4 experienced a strong reduction in distress resulting in sub-symptomatic threshold levels. This can be seen as justification for screening of all incoming RT patients so that those in need of support may receive it. Be that as it may, even a "subclinical" level of distress can weigh heavily on patients. It is ubiquitous in cancer patient cohorts and has been recognized as such for some time (Saleeba, 1996). Though it is not considered a pathology, it can cause "significant islands of life disruption" (Tope, 1993 p. 135), and have been found to have a profound negative impact on cancer patient quality of life (Portenoy, 1994).

Arguably any reduction in distress would contribute to a more constructive patient experience, especially when it is the patient's entry point into that environment. It may enhance patient anticipation/perception of the remainder of their often-lengthy treatment, enhancing QOL and leading to better treatment tolerance and compliance.

Future trials should include strategies for discovering discrete mechanisms to enhance understanding leading to a stronger theoretical base and identification of best practice approaches. Future research should also examine the effects of more rigorous time allotments, waiting times, and scheduling concerns, as these undoubtedly contribute to the patient's perception of treatment.

3.2 Contributions of the study to the TRS model

This IRB approved RCT served as the underpinning and springboard for the conceptualization of the TRS model. In a broad view its robust findings pointed towards a clinical modality that enmeshes with the concepts of safety, resilience through proactive involvement, and avoidance of points of medically induced trauma. It can be seen as a 'big picture' strategy for prophylaxis for trauma in that, as in most current trauma treatment strategies, it strives to install resources to foment resilience. This may be a vehicle to enhance the patient's ability to tolerate and functionally adapt to the challenges of RT. And in a model in which a patient's ability to perceive the environment and treatment 'events' as constructive experiences, the protocol can be seen as a means of ensuring that the patient's "entry into the world of cancer" is constructive and proactive.

It contributed to the conceptualization and development of "prescribed music" (PM) (Rossetti, 2017) in radiation oncology as a sometime stand alone intervention, that has proved especially helpful when scheduling conflicts and the rushed priorities of the realities of everyday medical milieu make more complete interventions an impossibility. It led to the introduction of psychoeducation as a discrete cognitive mechanism to increase the clinical efficacy of the use of PM explaining the likely outcomes and mechanisms of active listening to pre-recorded music. In this context, clinical goals were broadened to include enhanced patient comfort, with music serving as a counterpart for the presence of the therapist, and not only as a 'sedation' mechanism but also as a vehicle for celebration of a first step towards regaining health.

The protocol was refined and streamlined to fit more accurately into the hospital scheduling. The sections of the intervention were separated, developing into stand-alone interventions, that could be used more accurately to address discrete assessed patient needs. These were either expanded in length or compressed to comply with the demands of time frame sensitive allopathic medicine systems.

The study also showed the need for a specific assessment protocol in Rad Onc. It is biopsychosocial in nature as are Loewy's assessment procedures (Loewy, 2000), but also focuses on three main areas of inquiry: State anxiety levels, history of/susceptibility to claustrophobic events, and in such case, identification of specific triggers, Invasive ideation regarding patient's recent or distant medical procedures, especially those that point to possible medically induced emotional trauma.

3.3 Implications of the use of pre-recorded prescribed music

Current thought in music therapy points to live music being preferred in therapeutic processes. However, prerecorded music has long been applied in music therapy and music & medicine to varied areas of patient and client need.

The efficacy of its use with myriad populations has been examined in many studies conducted by medical staff, neuroscientists, psychologists, and music therapists alike. Simulation for radiation therapy is a context where live music use is not a viable option, due to space limiting the use of musical instruments, and where providing live music during treatment could endanger the therapist's health and eventually, life. The question with pre-recorded music has long been *what* music should be used for optimal results. It makes sense that true patient preferred music would be the best received by the patient, given that clinician selected, genre-based, or streaming music programs all have the potential for patients hearing music they find unappealing. Also, if the characteristics of the music are left to chance, there is a significant risk of music not being particularly efficacious clinically. In designing a protocol for prescribed music a system was constructed that seeks optimal clinical efficacy in the use of pre-recorded music in radiation oncology that also renders itself applicable to other scenarios. The concept of prescribed music, as it evolved during the study, takes into account the patient's culture, past medical history, past incidences of trauma, and assessment of psychological stressors to be used during simulation can facilitate focus. It also takes into account patients' specified composers, and individual pieces, and analyses these pieces discreet musical elements in a system that lends to increased clinical efficacy

Especially in music & medicine contexts, the choice of specific pre-recorded music has often been about using music designated by its composers or a streaming music service to be "calming" or "relaxing" with relatively little regard as to *what* constitutes calming or relaxing music. Perhaps even more important is the question of whether the suggested "calming" and "relaxing" music is indeed so for all people, and in all contexts. A review of the literature revealed that most studies on the use of pre-recorded music in clinical contexts provided vague identification of the music used which is often limited solely to a choice of genre (Bufone, et al., 2009; Nardone, 2020; Smith, et al., 2001). There is often no discussion on the process used to calibrate music to patient and clinical goals or even how to address the challenging question of accurately classifying music as belonging to a specific genre. I would argue that the clinical use of pre-recorded music without rigorous assessment, music analysis, and subsequent crossing of data has the potential to provoke adverse responses. Given the strong associative process and metaphoric content of music and its lyrics, random use of music could potentially have deleterious effects in some contexts.

The following relevant statement was provided in a 2014 article:

"Music and its infinitely variable elements can indeed produce vastly different responses - from activation to catharsis and relaxation responses to sedation on the other end of the spectrum. But to elicit a specific clinical response, I would argue that one must approach the process through specificity and systematic guidelines - that is to say firstly through detailed assessment to determine specific goals and secondly by means of equally detailed identification through analysis of the elements and qualities of the music employed to provide effective music stimuli. (Rossetti, 2014 p. 72)."

Such an approach – with guidelines for analysis of significant musical and extra-musical elements – is found in the “Music Characterization System” developed for this study.

3.3.1 Related analytical systems for identifying pre-recorded music’s salient properties

Analytical systems for identifying music in terms of its musical elements and specific clinical outcomes are not wide-spread with few exceptions. The best known and most commonly used are Bonny’s Method Guided Imagery & Music (GIM) and its derivatives (Abrams, 2002; Grocke, 1999; Goldberg, 2002). In that model, Summer (2009) makes important points on the use of a systematic analytical approach, stating:

It is essential to study the elements of a classical piece of music (rhythm, tempo, timbre, tessitura, harmony, melody) as they are presented in its exposition, the opening measures of the piece. By matching these elements in the music’s exposition with qualities of the client’s behavior which are reflective of the inner feeling state, the music therapist provides an ‘affective attunement’ through classical music (Summer, 2009, p. 24).

Deanna Hanson’s conceptual methodology to define the therapeutic function of music produced a TFM worksheet to match treatment goals with music elements. It seeks to define the purpose and intent of each musical element so as to generate predictable clinical outcomes (Hanson, 2015) Erkkilä also identified musical features in improvised music’s importance in determining therapeutic outcomes (Erkkilä, 2011). Music is thought to evoke emotion, association, and metaphor via its structural properties through which listeners form discrete relationships with specific works. Much the same way as a movie soundtrack serves as a guide to and elicits emotional response in listeners, a well constructed prescribed music program can guide physio-emotional response in patients during procedures, and thus lead to desired clinical outcomes.

3.3.2 Justification for the use of pre-recorded prescribed music

Radiation oncology patients have described fear of the unknown, and the isolation and physical restraint they are subjected to as being intensely upsetting. In most hospital centers, live music therapy delivery is not feasible in some situations without costly modifications to the treatment room itself to install a remote audio delivery system of sufficient quality.

Hence, the use of pre-recorded music presents itself as a viable alternative. The study that is the subject of this paper has shown that prescribed music programs are effective in reducing state anxiety and provide temporal structuring to reduce the distortion of perceived treatment time. (Rossetti, 2017.)

The prescription process employing the Music Characterization System (MCS) requires careful assessment of the patient’s mood state, past situational trauma, in-place coping structures, significant stressors, and level of state anxiety, as well as preferred music genres, specific pieces, composers,

performers, and instrument groups. The patient's significant cultural aspects are also noted. The prescribed music program is constructed on the spot from a large data bank of music files (many previously analyzed) with works from numerous ethnic cultures (including eastern European, middle eastern, south American and Asian cultures) as well western cultures. The system is rooted in the hypothesis that playing music that is authentically patient selected, analyzed for activating-sedating qualities, and properly sequenced can be applied with a higher grade of clinical efficacy than pre-recorded music that has not been processed with this system. A possible scenario for its use could be if a patient awaiting treatment were assessed with high state anxiety, music that the patient had expressed wanting to hear (styles, bands, composers, instrumentation, specific pieces) would be compiled and analyzed following the music categorization system to determine its salient characteristics. The first piece of music in the program should contain such a combination of elements so as to "meet the patient where she/he is" according to their state and level of activation, so as to entrain with the patient and provide a medium for the patient to begin an interactive process. The remainder of the program is calibrated to mimic a classic relaxation curve so as to reduce the patient's activation progressively through their entrainment, both physiological and emotional, to slower tempi, reduced musical intensity and movement, etc., to lower anxiety response, and modulate their state.

3.3.3 The Music Characterization System

The Music Characterization System serves to classify music by analyzing twelve musical elements and four descriptive non-musical elements. While it was originally designed and implemented for use with pre-recorded music, it can be used to orient the music therapist seeking an optimal manner to use the elements of music in clinical improvisation, as in EMT.

Each of the music element parameters is given a numerical value. This is to facilitate being able to see a given piece's characteristics at a glance. Extra-musical elements are identified and explained with descriptors or a brief narrative.

In its use of numerical values, less active music receives a lower number, and more active, a higher number. In general music described commonly as being 'relaxing' equates to less active sounding music. The use of descriptors for extra-musical elements serves to identify metaphoric content, the listener's perceived or felt emotion, and any images created through an associative process (Rossetti, 2014).

It can be argued that perhaps the most important element in any therapeutic process is intentionality. The musical and extra-musical parameters in this system can be used as an identifier and guide for intent, and constitute a means for assuring that the music we are playing coincides with the clinical intentionality of our intervention (Rossetti, 2014).

A state may be defined as a group of characteristic behavioral and physiological changes that recur in regulated patterns (Rossetti, 2014). Awareness of similarly regulated patterns of a specific music work may be quite useful to match or mirror states so as to "meet the patient where she/he is" and

then redirect through musical changes to a more desired state. Awareness of specific parameters may be employed to more closely entrain or calibrate to patients' physical and emotional states as well as to observable indicators such as heart rate and respiratory rate. This is important for the concept of 'prescribing' which can be seen as a set of guidelines for seeking a more effective music sequence for a specific patient situation. Through identification of the character of specific elements of music we can thus find music with matching patient's level of activation, and while avoiding the formation of new negative associations between beloved music and new clinical experiences, still provide music that will appeal to the patient.

3.3.3.1 Discussion of individual music elements in the MCS

The description of these parameters is meant as a suggestion and not as an extensive comprehensive guide. Music perception is a sublimely subjective process, and interpretations of these elements is left to the discerning music therapist.

- Tessitura: Is based on Porges' Polyvagal Theory that optimal music for providing a sense of safety falls within the range of the human voice. A value of 1 describes music within the human vocal range 80 Hz to 1200 Hz (E2 - C6) or within two octaves above and two octaves below "middle C." (Porges, 2010).
- Intensity: A combination of other musical traits including perceived volume, rhythmic and harmonic complexity, movement and register. Music with little syncopation, dynamic range limited to midrange frequencies would receive a low rating while higher ratings would be given to loud, syncopated, and emotionally stimulating music.
- Dynamic range: This measures change in the music and diversity in its elements. A rating of 1 would identify music perceived as static, and higher ratings with more constantly active changes.
- Tempo: 1 indicates a perceived pulse of around 60 bpm, and 10 a rapid pulse characteristic of up-tempo bebop, or a vivace orchestral movement for example.
- Harmonic simplicity/complexity: Implies harmonic movement. Music with one diatonic tonal center in which would receive a rating of 1, while higher ratings would apply to music with frequent shifts/modulations to multiple tonal centers and keys. They would also apply to the use of polytonality.
- Volume: Refers to sound pressure levels in music. Being aware of one's decibel level in key especially in light of acoustic instruments being capable of producing sound pressure levels that exceed those stipulated as permissible in the hospital environment. (55 dB). It is especially important to avoid sensory overload due to loud volumes when providing therapy to fragile populations. 1 would correspond to the volume of one's soft speaking voice, while 10 would be more in the range of our shouting voice.

- Rhythmic simplicity/complexity: This parameter identifies variance in rhythmic patterns and the frequency of syncopations in those patterns. Higher values represent highly syncopated and variable rhythmic structures.
- Melodic contour: This identifies intervallic movement. A rating of 1 would be applied to a melody of mostly repeated notes and stepwise movement while 10 designates a melody with frequent intervallic leaps and use of chromaticism.
- Dissonance: For our purposes we are equating dissonance with harmonic tension and identifying minor seconds without resolution, chromaticism and polytonal chord forms generated from minor modal structures as 'dissonant'. We identify the interval of the perfect 5th as grounded and consonant sounding, as are, simple diatonic triads in root position. We identify major tonal structures as being less dissonant than minor due to the inherent tension in altered dominant chords.
- Timbre: Refers to the contrast in sound qualities of 'roundness' and 'mellowness' as opposed to "sharpness" or "shrillness".
- Structure: For our purposes, this refers complex vs. simple, and to the existence of musical structure in contrast to its absence. Structured music such as ABA form that contains well organized phrasing would be rated as 1. Aleatoric or illogically structured music would receive a 10.
- Predictability: "Logical" harmonic, melodic and rhythmic movement that satisfies our expectations, and contributes to feelings of safety and security. A rating of 1 will be applied to Music that contains little development that was not foreseeable would receive a low rating while higher ratings would apply to music with frequent harmonic, melodic, rhythmic or dynamic "surprises" or sudden musical events such as unexpected sforzando, modal interchange of chord structures and drastic change in timbre, for example.

The music therapy community has long searched for a means for accurate and effective choices in using pre-recorded music. Most would agree that using specific patient identified music and chosen genres are a first step towards enhanced efficacy. Most would also agree that identification solely by genre has inherent limitations. The MCS is a work in progress based on research outcomes and personal clinical observation and seeks to encounter a more efficacious manner in choosing/playing music that coincides with discrete clinical goals. In its use, patient's prerecorded music is identified, analyzed and sequenced to form a listening that is "calibrated to detailed patient assessment of mood state, state anxiety level, in-place coping structures, psycho-social status, past situational trauma, history of and sensitivity to claustrophobic events, among other points, to seek to produce specific physiological and emotional responses in these patients during radiation treatment" (Rossetti, 2014 p. 75). The concept of prescribed music requires further clinical testing and development. It may and may prove generalizable to a plethora of clinical music psychotherapy contexts.

4 IMPLICATIONS FOR MUSIC PSYCHOTHERAPY AS PROPHYLAXIS/TREATMENT FOR TRAUMA AND POST-TRAUMATIC STRESS: CASE STUDIES, PROFESSIONAL TESTIMONY

The following section comprises three clinical vignettes that exemplify discreet and overlapping clinical goals found in patients in radiation treatment for cancer.

The first focuses on palliative and end of life care concerns, the second and third on the sequelae of untreated developmental trauma and PTSD, and their psycho-biological manifestations, with the common thread of anxiety running through each of these scenarios. Each illustrates the process followed with the majority of patients treated with music psychotherapy in oncological contexts: referral by medical staff, assessment, determination of methodology, therapeutic goals, session flow, and development of the therapeutic relationship, and outcomes. Meticulous assessment is considered of the utmost importance, and though it has some differences due to the nature and rhythm of time frames in oncology units, my assessment process is based on Loewy's 13 areas of inquiry model and its focus on hermeneutic methodology. (Loewy, 2000) I have found, as Loewy recommends that gathering detailed psychosocial information on a patient to effectively learn who 'she/he was before becoming severely ill' is key to effective music psychotherapy treatment (Loewy, 2000). This gains importance when considering the common shift in perception of self and identity experienced by so many when they face prolonged invasive medical care. Loewy identified that the overture, or primary themes that emerge within an initial contact set the tone for the work that will follow, and that narratives rather than checklists or charts best reflect the significance of music psychotherapy (Loewy, 2000).

4.1 Clinical vignette 1 Head & neck cancer patient

The first patient history presented exemplifies our 'continuity of care' paradigm in which we seek to follow and treat patients throughout the entire trajectory of their cancer care - both systemic and local, within inpatient and ambulatory scenarios. I treated this patient while he was an inpatient receiving aggressive chemotherapy, as an ambulatory patient while he received external beam radiation therapy, and virtually via Skype as he was nearing death at this home in Brooklyn.

Justin was a 70 year old Caucasian male writer for an influential urban magazine, and a best selling author of a series of acclaimed books on the Vietnam war and nuclear disarmament. He was born on August 24th, 1943 and died of complications related to his cancer and its treatment on March 25th 2014. He was very much a New Yorker, and taught over the years at a number of Ivy-League universities. Justin presented as intelligent, and though at times he was clearly distressed and anxious, he was always courteous, communicative, and gentle. I felt he was sturdy and resilient, often presenting with bright affect during much of our sessions, in spite of difficulties with pain management. He had three adult children with whom he had some conflicts. Be that as it may, they were supportive and concerned when they were present while Justin was receiving inpatient chemo. The conflicts appeared to stem from Justin's separation from his partner Eileen; his ex-wife, and his close relationship with Ilene, his current partner. Justin was long separated from his first wife with whom he maintained a 'close' and seemingly complex relationship while also living with a new female partner Ilene, a professor at Princeton. The details of those relationships were never fully defined to me. Justin also had a brother (also a renowned writer), a sister and three half brothers, all of whom never accompanied him to MT.

I met Justin when he was referred to me by his radiation oncologist while he was receiving Image Modulated Radiation Therapy (IMRT)² for an advanced and aggressive sarcoma that had extended to covering 80% of face and head, encroaching on his eyes and beginning to negatively affect vision. His daily RT treatment regimen included invasive placing of lead shields beneath his eyelids to spare his eyes from radiation that would have likely led to blindness. This prophylactic measure caused him acute state anxiety to the point of his being unable to tolerate placement and treatment.

Prior to RT, he had received a series of surgeries to remove tumors and large areas of dermis that were replaced with skin flaps and lower tissue harvested from his thighs. These long and complex surgical procedures left him startlingly disfigured, to the extent that during RT he was required to have a towel draped over his head when he walked from the consult where he was kept waiting separated from other patients to the treatment room because he was so

² IMRT is a type of radiation therapy in which the intensity of the radiation beam is adapted to match the precise contours of a tumor and minimize the damage to surrounding tissue.

disfigured from the surgeries that it upset other patients to see him. I did not experience any revulsion looking at him.

Justin did not mention his disfigurement or the surgeries during our sessions. During assessment he appeared free of defining symptoms of both posttraumatic stress and depression. His sequelae from disease and subsequent medical treatment were centered around transient anxiety, a phobic response to RT treatment procedures, and ultimately, on existential/spiritual questions.

He received 4 weeks of daily RT requiring invasive preparations. Referral for procedural support came from his attending for distress and anxiety over daily placement of eye shields prior to RT. Procedural support started on his second day of treatment. The day before he had been medicated with a high dose of Ativan (a common anxiolytic) and was still unable to tolerate the procedure. Further sedation was considered by his medical team, but was ultimately rejected as a viable strategy because increased and sustained dosification carried risks of toxicity and adverse effects from interaction with his opioid pain medication. Procedural support was carried out in two phases: the first being delivery of a protocolized music psychotherapy intervention (described in chapter 3) to reduce state anxiety and provide the patient with resources for down regulation of hyper-activated states. Justin was willing to try MT, mostly due to the insistence of his attending doctor, but he was initially skeptical, as was his partner Ilene.

Ultimately he was responsive to the intervention and was able to relax observably. I then provided him with psychoeducation on the use of the relaxation technique contained in the protocol to convert them into resources allowing the patient to adopt a more proactive and participatory stance to the impending medical procedure and thus move towards a sense of active participation in the procedure and away from a place of passive 'victimization'. This intervention was provided in my office on the radiation oncology unit. I received a phone call that technical and medical staff were ready to take him into the treatment room where the linear accelerator was. I accompanied Justin to the room, and while he was being set up on the treatment table, I provided verbal processing, orientation and prompting for him to use the breathing and visualization techniques he had just been psychoeducated on. While the eye shields were being placed, Justin asked me to hold his hand, stating "it makes me feel connected to the world" Justin received 18 of these daily sessions, and received music psychotherapy prior to each and procedural support during.

The music psychotherapy sessions were structured similarly. We would start with an assessment including mental status, anxiety/distress level, sleep patterns, a comprehensive pain assessment, general systemic changes, and significant daily events. Justin declined to actively make music in these sessions, but requested each day that I improvise on the guitar while he listened with his eyes closed. I would follow with either the complete protocol or an abridged version, depending on need and staff timeframes. Once Justin had reached a relaxed state, I would provide biopsychosocial pain management. His baseline pain was around a reported "5/10" daily with some days spiking into "8" Two approaches appeared to be the most effective for him: music supported guided visualization/directed release, and a cognitive awareness/subtractive approach

to interoception of cumulative physical sensations in the pain experience. I continued to provide him with sessions on an almost daily basis, and he requested my presence in the treatment room on most of those days.

Both modalities appeared to be effective ways of palliating Justin's treatment challenges. At Justin's insistence, approximately once a week I also provided Ilene his partner with stress reduction interventions. Ilene was less enthusiastic about the process and was somewhat reticent in sharing her internal process and thoughts with me, even though she was sharing and shouldering many of the aspects of illness burden. Even if Justin's cancer were to reach undetectability (which his physicians shared with me as being highly unlikely) he was in a very real sense a different person than he was due in part to his perception of himself as being physically diminished and disfigured.

The next phase of Justin's treatment was an intense round of chemotherapy delivered on a daily basis while he was an inpatient. We continued with music psychotherapy on a regular basis. Justin requested that we start each session with a 'meditation,' which is the way he identified the relaxation inductions. I feel he identified them in this way so as to bring them more into the realm of 'everyday life' and less a foreign metaphysical (in the sense of being "above or beyond the body") experience.

He was increasingly uncomfortable and in pain. His opioid dosage was increased to the point where he began to experience significant visual hallucinations. I focused more on intensive pain management during part of each of our sessions to help him manage his perception of pain intensity with the secondary goal of helping lower his need for opioids and thereby reduce the occurrence and intensity of the hallucinations. The sessions began to take on a more spiritual cast, as Justin began to raise questions of mortality and what exists beyond the "final transition" which is the term he became comfortable with using regarding his death. He was a steadfast agnostic.

In December 2013 the music psychotherapy sessions took a turn of focus. Justin's chemotherapy treatment results ultimately were much less effective than expected and he became more urgently concerned with a growing fear of death and dying. During this time I spoke on occasions with his daughter and son, offering them MPT, which they declined asking that I dedicate the time to caring for their father.

We were, however, able to engage in a number of conversations, and while these were exempt from music, they still had therapeutic value in that they were able to explore how they envisioned this ending to approach the subject of their father's impending death. He found it helpful to use music driven guided visualization and exploration with 'meaning making' of his reactions to improvised live music. These sessions were conducted mostly at bedside with Justin propped up on pillows, or occasionally when he was feeling stronger, with him sitting up in a chair. The music in these interventions was almost exclusively improvised, and guided by concepts borrowed from an approach to Environmental Music Therapy using the "Music Characterization System (Rossetti, 2011)". Ultimately it involved focusing on music-as-metaphor and symbolic representation in a process in which the music served as an underscore in reinforcing and defining emotional response, and in invoking a deeper

entrance into the visuals he experienced. During one induction the phrase "An ounce of joy is worth a pound of hope" emerged in the context of Justin's efforts to visualize being fully present in the "now" and not focusing on projected fears of the future, or regressing to grieving the many losses of "self" he had suffered during the long course of his illness. This phrase became a touchstone for Justin to channel his awareness to moments and experiences that still could be identified as vibrant and pleasurable – moments when his pain was manageable and he was able to share warm contact and love with his life-partner Isabel.

During a subsequent visualization session, I suggested the idea of a "warm white light inside" and that he might see himself "turning towards the light" I could see that this idea reached him on a profound level. Justin became activated and emotional and he cried out "what fairytale is this, that just saying the words makes it so!" I checked in with him asking if this was an uncomfortable place for him to be to make adjustments if necessary, but he stated that he wanted to continue "turning towards the light".

Post intervention we usually processed Justin's experience verbally identifying and incorporating 'constructive events' as I referred to them, but this time Justin asked to "Just sit with this for a while" During that time he sat smiling at me with such warmth that I had to concentrate purposefully on not becoming emotional myself. Justin later stated that the experience had been "profound" and that he felt "peaceful" but declined to explain what had led him to that. It was clear that he did not need to share the experience with me, and I respected that need.

We spoke about transitions and what he needed or needed to do to prepare and have a structure he could use to support himself and make sense of what was happening. He decided that "visiting unresolved situations" would be helpful. I introduced the idea and process of "guided visitations" to those situations. These were more music driven visualization processes but in this case much more directive and interactional with Justin answering my suggestions telling me what he was seeing/experiencing.

During one such intervention he asked that I follow/lead him as his adolescent self in a journey back to his hometown. He stated that he "Had money from a paper route" and recalled when he had gone with a childhood friend down to a 'cigar store' where there was a wrist watch for sale, and that he had craved owning, and ultimately purchased in this visualization. Post intervention he expressed the joy he had felt in "seeing and feeling the watch on my wrist again".

In the following session we began talking about how he saw his transition, and how was he "making sense of it". He suddenly seemed unable to answer. I suggested a "visitation." In it Justin led us to a trip down a river in his hometown paddling a raft alone, and reaching a deep bend in the river, he stated he couldn't see what lay around the bend, but he heard people talking as if at a gathering. He felt drawn to them but was afraid at what 'they' actually were. He wanted to leave the raft and walk, saying that felt safer. In verbal processing later he stated that "they" were people from his past long gone. He did not want to join them, 'yet.'

Additional surgery for the cosmetic dermis flap that ultimately was not adhering well and had actually begun to show signs of necrosis was required. It seemed to be an unfortunate turning point, in that it became clear that the trajectory of his care would be palliative as opposed to the new 'curative' approach.

I felt such a strong commitment to Justin's care that I began to research what other possible options might be available. I discovered mega-dose vitamin C had been used to good results in some clinical trials with this type of. I spoke to his radiation oncologist about his prognosis and possible 'alternative' treatments. Though he stated that he was impressed and slightly amused that I involved myself in thinking about his treatment in this way, he informed me that there were no viable alternatives to what would be palliative radiation therapy to reduce the severity of Justin's symptoms and suffering.

Justin's status deteriorated rapidly, and soon he was unable to continue with on-site RT. Although his RT treatment was suspended, he requested that we continue daily music therapy sessions. I approached his attending about providing at home therapy for Justin. This turned out to be impossible due to unfortunate insurance issues. Because of how treatment was initiated, neither the hospital's nor my own malpractice insurance would cover liability that might result from my visits. I turned to a resource that has become extremely common during COVID times. I was able to provide therapy to Justin via Skype on two consecutive days, Thursday and Friday.

As a platform for psychotherapy Skype was perhaps even more limited than today's platforms, with significant audio dropouts and frozen images. Compounding these difficulties was the fact that Justin's sight was failing rapidly due to the cancer invading his eyes, and he was highly sedated against his increasing pain, and there were intermittent moments of connection combined with Justin drifting into shallow sleep states. Justin requested that we "connect with the light" during those moments he was able to be 'present.' I played a piece that had started in our original sessions as an improvisation, and that Justin had identified as 'an invocation.' This was not a cognitive choice, but rather had seemed like a thought that bubbled up into my conscious mind and seemed to be spot on. He smiled in response, perhaps at the familiarity, or because in some way the piece conveyed a sense of wholeness or completion. My sense was that his strength was failing, and that he was approaching his death. At the close of the second session, I asked what time I should contact him the following day. Justin said that he thought it would be "better to leave Saturday open" I told him I would call on Sunday to check in with him. He did not affirm or reject, but said "It was a gift to see you, thank you for all you have done for me" which sounded strangely final. Justin passed away that day, Saturday. Irene called me Saturday evening to give me the news that he had 'slipped away' in a moment when she was not at his bedside. I was deeply saddened, and profoundly disappointed that I was not able to accompany Justin in his transition. I felt a mix of emotions that I was able to process later with a peer. The processing led to a deeper understanding of my end of the therapeutic relationship I shared with Justin, and also how, interestingly, a recognition of my experience with terminally ill people navigating situations to die in the peace of their own company.

4.2 Clinical vignette 2 Breast cancer patient I

The next clinical vignette highlights a patient who received music psychotherapy initially for procedural support and subsequently had daily sessions to help her identify and process the etiology of a crushing phobic response to radiation therapy. Clair is a 48 year old Caucasian female, married for 21 years with no children. She lives in a suburb of NYC and is a mid-level corporate executive. She suffered brutally intense human vindicated trauma as a first-hand survivor of the NYC World Trade Center Towers terrorist attack. She was diagnosed with stage II breast cancer, and rejected surgery as a treatment option. She was also diagnosed with two psychiatric comorbidities: clinical depression and PTSD, which were treated with multiple psychoactive medications.

The etiology of her PTSD occurred as a point of trauma experienced while working in the World Trade Center's north tower on 9/11 and subsequently being trapped in the wreckage and surviving as the tower came down. She was pinned down under a massive slab of concrete on her chest for 6 hours unable to free herself. One result of the experience was that she was unable to tolerate any tactile experience of contact on her chest, including clothing that was not loose and open at the neck. Even the contact of a tee shirt (unless it had "spaghetti straps") could trigger a panic attack with shortness of breath and tachycardia.

Clair was referred to me by her attending radiation oncologist for me to provide her with a protocolized music psychotherapy intervention due to Clair presenting as significantly anxious and fearful of the RT process during her first consult. Her attending surmised that she would be unable to tolerate the process without assistance, because treatment required the placement of a "bolus" on her chest to partially absorb radiation from one of the fields and spare damage to her heart. When I met with her on her first day of treatment she was assessed with high state anxiety and distress, and presented with observable physical manifestations of anxiety.

During our initial assessment she was able to divulge a number of details about her trauma. Given that processing trauma and treating PTSD often requires a relatively lengthy process, the immediate clinical goal was to provide Clair with resources to down-regulate sympathetic ANS response as trauma informed 'psychological first aid' and a first line strategy to help her tolerate what she reported to be an overwhelming tactile experience that lead her to flashbacks and re-living the POT (point of trauma) provoking panic. I provided her with the intervention (see description in chapter 3) She was responsive to the intervention relaxing observably and reporting that she felt calmer and "more in control".

I provided her with psychoeducation on the use of the 3 regulating techniques in the intervention and changed them through identification and the psychoeducational process into resources for her to draw on. I also provided her with a prescribed music program (described in chapter 3) for her to listen to during treatment. Part of orientation to prescribed music in the protocolized intervention also includes psychoeducation on its use and expected outcomes, thus converting it too into a resource. Clair identified Mozart's orchestral music as her preferred music for the PM program. I chose approximately 50 minutes of

that music from my music library, which I had previously analyzed according to the prescribed music protocol, and then sequenced it into a program aimed at reducing activation and promoting a relaxation response.

Clair was able to tolerate the experience well enough to successfully complete her first day of treatment in relative comfort though the process was interrupted on at two points when Clair called out over the treatment room monitoring system that she felt panic rising, during which time the linear accelerator was made to stop delivery of radiation and I entered the room to help her by guiding her through two of the techniques and reminding her of how to use the prescribed music to ground herself.

Clair requested having MT on a daily basis throughout her treatment. MPT concerned strategies on two distinct areas: first on lowering her level of activation and anxiety, and further implanting of resources that would permit her to tolerate unwanted tactile stimulation, and second on a phase oriented process of revisiting the POT in titrated doses to integrate the experience with new memories of the POT and her resulting response to those memories. The larger focus was on creating/identifying resilience and a shift from "victimization" to a more proactive stance toward RT. Clair was able to explore her POT and examine and come to understand her body's reaction to the extent that she eventually became able to self organize and initiate a parasympathetic ventral vagal response sufficient enough to tolerate RT without interruptions. Clair chose to not continue with MPT once she had completed the entire trajectory of her RT.

4.3 Clinical vignette 3 Breast cancer patient II

The final vignette of the series concerns another victim of trauma. What differentiates her case from Clair's is that she suffered from multiple instance complex trauma that returned to the forefront when she experienced medically induced trauma from receiving a diagnosis of breast cancer, which was reinforced by acute adverse reactions to her RT.

Nadia is a 54 year old Latina woman originally from Argentina, who is married to a North American lawyer who has been diagnosed with type II Bipolar disorder who has what appear to be occasional low-grade psychotic breaks. Nadia has an 8-year-old daughter with some apparent adaptation difficulties. She lives with her husband and daughter in Brooklyn NY. Nadia is a professional painter and photographer whose career has been on the rise as of late, and she has had numerous expositions and media recognition. She was diagnosed with stage I left breast cancer and received a successful lumpectomy. Subsequently, she was scheduled for 28 fractions of moderate dose radiation therapy.

In our initial meeting she was assessed with moderate/high state anxiety and presented as distressed with limited range euthymic affect. She was referred to MT by her attending for anxiety and symptom management. After Nadia had received only the second day of moderate dosed RT, she requested medical

assistance for an uncommon and acute skin reaction in the form of blisters and skin discoloration to those two doses. Her attending was perplexed given it is highly infrequent to see such a violent reaction so early in the treatment trajectory. Also Nadia was severely distressed by the reaction, and suffered from an acute psychological response as well. She experienced marked mood swings that lead her to “snap at people” and a hypersensitivity to loud noises and conversations. She described interactions with people as “hearing voices screaming in my head” though during assessment it was determined that this was metaphoric in nature and not a description of actual auditory hallucinations. She self-reported “feeling very nervous” and experiencing sleep disruption whose etiology centered on repetitive intrusive ideation concerning “suffering” occurring when she awoke at around 3:00 a.m. after having slept approximately 4 hours.

During our first encounter I provided her with a MPT breath focus music driven intervention to address her anxiety. The music was improvised with its harmonic structure and pulse providing a metaphor for entrained breathing itself – one chord representing inhalation and another exhalation – in an ABA format. She was responsive to the intervention and I was able to observe a marked relaxation response in her. I followed with a music based guided visualization induction, also based on clinical improvisation with the harmonic progression and macro psycho-musical elements providing reinforcement of the verbal element of the induction. She was responsive to the induction and progressed through deeper trance states. The focus of this and following MPT session was on providing her with mind/body resources in a somatic approach to down-regulating sympathetic hyperarousal to be used to self organize and manage her symptoms.

She reported that using these techniques at home was effective in managing the intrusive nocturnal ideation that apparently was causing sleep disruption, and that she felt “calmer in general”. Albeit the apparent efficacy of the session, during a subsequent session she reported on the evening before that she had had a spontaneous intrusive memory that woke her and prevented her from sleeping restfully. The memory was of being repeatedly sexually abused and digitally raped as a child and that she “had just remembered something I had forgotten about for many years” She described how she had been sexually molested on numerous occasions by her parent’s male neighbor in Argentina. We were able to gently explore some of her memories about her repeated trauma experiences, while specifically avoiding entering into her re-experiencing the events.

Over the course of the following 4 weeks we met an average of twice a week during which time I used a phase oriented approach to processing and integrating her points of trauma. The model consists of an eclectic approach that incorporates mind/body philosophies including the polyvagal theory, somatic experiencing, and EMDR as practiced by Linda Curren, as well as psychodynamics, and cognitive processing. It relies on the following trajectory of treatment: Phase 1, “symptom reduction and stabilization,” Phase 2, “treatment of traumatic memories,” and Phase 3, “integration and rehabilitation,” with the goal of the patient being able to recognize (often not

occurring because of dissociative processes) tolerate and feel safe with their own physical sensations, and to reconstruct and incorporate “new constructive memories” of the POTs.

Music can play a varied role in these processes. It can be effectively used during the implementation of resources accompanying visualization to reinforce and enhance the process, and used as a ‘trigger’ for the patient to use to channel a ‘safe place’ resource to deal with overwhelm during exploration of the POT. Music can play a central role in processing of memories especially when a purely verbal approach is too ‘direct’ or threatening for the patient. Loewy’s story song approach can be particularly effective with its recitative, theme conflict and variations, and resolution section providing a strongly supportive structure in which to work as can song composition, and Loewy’s song sensitization modality.³

In this process Nadia chose an Argentinian pop-rock song from the 70’s titled “Alicia en el Pais de las Maravillas” (Alice in Wonderland, but not the familiar jazz standard of the same name). The song’s theme centered on the emotionally charged events of Argentina’s political struggle. Perhaps significant to the choice was that rape and sexual humiliation were common ‘tools’ used by the fascist regime to intimidate political dissenters.

As Nadia was able to progress in exploring and ultimately re-visiting and reconsolidating memories, her PTSD symptoms and anxiety began to dissipate. Once completed her trajectory of RT, she decided to continue with weekly MPT sessions to continue with personal growth and get her life, disrupted by cancer treatment, back on track. She was able to achieve a number of significant life goals in a relatively short time gaining professional recognition in NYC’s highly competitive art scene.

4.4 MSH/BI Staff surveys on music psychotherapy

The TRS Trauma, Resilience, Safety: A Music Psychotherapy Model for Addressing Illness Burden in Oncology addresses the prevalence of patient anxiety that was highlighted in my research and the studies of others. The literature indicates that stress can be severe enough to cause session disruption. A trauma informed model addresses patients’ needs for safety and resilience supported by my research including analyses of my interviews. Analyses indicate that the interventions gleaned from my study along with inferences described from my clinical work and reflections of staff-peers reveal that trauma-informed music psychotherapy are well-warranted. Furthermore, this model

³ Song sensitization is a therapeutic modality developed by Dr. Joanne Loewy within the model of medical music psychotherapy and consists broadly of a four step method of music therapy derived from two processes: sensation and citation. It utilizes the act of citing the sensations of song through the use of 1. Selecting 2. Listening 3. Reflecting 4. Actualizing with the song as ‘symbol of self’ or ‘transitional object’ in the process.

supports the potential to shift future perceived patient distress and enhance comfort factors.

Decreasing emotional distress during simulation will likely result in successful completion of simulation with relative comfort, as well as a less traumatizing first encounter with the radiation therapy process. Music therapy, provided by a board-certified music therapist, may offer a safe, cost-effective means of alleviating patient anxiety and distress. This study further validates its efficacy and impact and may serve as an incentive for treatment inclusion among radiation oncology treatment teams.

In that framework, this statement from nursing, “the most valued aspect of nursing care is the ability to relieve fear and worry through caring behavior” (Hofhuis, 2008), resonated deeply with me and lead me to consider the commonality of purpose I share in the true interdisciplinary work carried out in radiation oncology on a daily basis. Physicians, nursing staff, radiation therapists, physicists, all interact during handoffs and referrals that occur during routine patient treatment in a highly coordinated synchronous flow.

Thus far, the understanding of a patient’s experience of illness and its affiliated burden has been developed from several sources and/or perspectives. First, a review of the literature was undertaken within a broad medical perspective. The topics gleaned from searches were purposefully relative and stratified broadly according to diagnosis, incidence/statistics of onset and treatment, usual and customary medical regimens and findings related to the various courses and contexts of treatments. These included a wide span from diagnosis to treatment, through in-patient assessment and follow-up, but with a strategic focus on two of perhaps the most common, yet fragile out-patient procedures, that are rarely a point of focus in integrative strategizing; chemotherapy and radiation oncology.

In this section, a review of the literature led me to a general survey/questionnaire that provided insight from not only patients’ perceptions of the most helpful aspects of being treated for a medical condition, but also, how staff perceived the impact of the music therapy service being provided. This is an underused, less common variable that provides strong insight toward any kind of developing model. This is because the institution, application and development of music therapy services take from the necessary ‘buy-in’ of the climate and culture of the service delivery and most certainly the service deliverer.

Arguably, one of the reasons why music therapy has been slow to grow in medical settings, and in particular, outpatient cancer arenas is that music therapists have perhaps not done their due diligence in bringing high-stake medics into our practices.

What this implies, is that our allies would have neither interest or time to devote toward the understanding of our discipline. This may be, in fact the case. However, our capacity to show beyond a doubt that the institution of a music therapy service that would enhance in perception, time, trust and comfort the efficacy of the treatment (radiation or chemotherapy) will expedite the inclusion of music therapy services within these environments and as part of the treatment teams.

In his early institution of programming Dr. Marc Goloff developed a questionnaire that is modified slightly below, to better understand the perceptions of the patients music therapists were working with. (Goloff, 1981) Today, such a project might qualify as a QI (quality improvement) measurement, and one that is commonly used amongst treatment teams at that. Though it was constructed nearly 4 decades ago, because it was based on Goloff's interests in including the psychological aspects of medical problems, and exploration of how nonverbal and verbal modalities of psychotherapy can be combined most effectively, his survey was and still is rather unique. This is because it does not focus on whether or not music therapy helped aspects related to their patients' disease, but rather on their perception of how music therapy impacted their emotional and attitudinal parameters. His survey is also a good fit in terms of time. His cohort included patients from the Intermediate Medical Care Unit (IMCU) or the Physical Rehabilitation Unit and remained for several months; pulmonary, neurologic and trauma patients, between two and ten weeks; and those with general conditions, from one to four weeks. This is similar in timeframe to the length of the courses of treatment of the current populations I am investigating.

In order to help develop the hypothesis underlying this dissertation (which addresses the building of a model that addresses illness burden) and to further institute the ease in which our allies and directors (doctors, nurses and milieu staff) accept the blending of music therapy as a risk-free option, and one that holds the potential to make their course of allopathic treatment more effective and easeful, the Goloff survey was employed in an anonymous quality improvement project and completed by randomly selected radiation oncology staff, namely 3 doctors, a nurse, a nurse practitioner, and a radiation therapist. I also interviewed the physicians and radiation therapist to provide them with a platform for a freer individual narrative and specific perceptions of music psychotherapy in radiation oncology.

4.5 Survey answers

The survey consists of 4 questions regarding the interviewees' generalized perception of their receiving music psychotherapy. The questions pertain to perceptions of patients' physical comfort, affect, prior to, during, and after simulation or other radiation oncology imaging procedures and setups, as well as their carryover response to receiving a cancer diagnosis, patients' response to MMPT as compared to other available offerings. Available answers were "worse" "same" "somewhat better" "better." The results of the survey are most easily view in this context as a chart, as provided below.

TABLE 4 Radiation Oncology Staff Survey Responses

1. Patient's physical comfort				
Prior to simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 0	Better 6
During simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 5
After simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 5
2. Patients' mood				
Prior to simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 0	Better 6
During simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 6
After simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 5
3. Patients' level of subjective response to MPT compared to other modalities				
Prior to simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 0	Better 6
During simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 6
After simulation/other imaging procedures	Worse 0	Same 0	Somewhat better 1	Better 6
4. Patients' perception of cancer diagnosis during/post MPT				
During	Worse 0	Same 0	Somewhat better 0	Better 6
After	Worse 0	Same 0	Somewhat better 1	Better 6

4.6 Integrative perspectives: medical and technical staff perceptions of MMPT

The perception of MMPT of staff members at the Mount Sinai Downtown Radiation Oncology department is a rich source of constructive feedback for continued development and fine-tuning of MMPT interventions in the context of interdisciplinary care for our cancer patients there, and also serves as reinforcement of the efficacy of MMPT as an integrated part of standard care on the unit. The following are ‘testimonials’ provided by 6 staff members, and are direct quotes on the question “what is your impression of MMPT involvement with patients in this radiation oncology department?” Their statements centered on MMTP efficacy in reducing anxiety, increasing comfort, and treating post traumatic stress and re-traumatization. Interestingly, one radiation oncologist expressed that MMPT led to greater interaction receiving treatment, and changed patients’ perception of the healthcare system itself, and suggested that this would have positive carry-over even past medical treatment.

4.6.1 Interview of Radiation Oncologist I - Head & Neck Cancer Specialist

“My patients go through simulation, a dress rehearsal for treatment— one patient with tonsil cancer was very anxious, for six to seven weeks of daily having that mask (author’s note - he is referring to the restraining device used during treatment) on. Surprisingly he got through it smoothly, with a dramatic decrease in stress level, and stopped self-medicating— it was music therapy that made that possible. Anecdotally, people seem to need less anxiety medication. I have noticed that patients who we predicted would need it, sometimes surprisingly get along without it. With MMPT I can see a change in their affect, in their mood, and their ability to go through a difficult intervention (simulation) in what was initially an emotionally fragile state. It’s always helpful to have these allies, team members— sometimes I wish I could call on it for myself— feel like I’m being supported to provide the best care. It’s not just the playlist that they create for a patient, but the music psychotherapy intervention to help deal with whatever triggers or cues that response they are seeing — it’s a big difference. Those who undergo the therapy seem to need less anxiety medicine and sometimes surprisingly get along without it.”

4.6.2 Interview of Radiation Oncologist II, Breast Cancer Specialist

“This (radiation therapy) is one of the most challenging experiences of their lives, vulnerable, anxious, worried about their future. With MMPT they felt like the environment was softened — why would you want to give them another medicine when there is something that will relax them without any side effects? Patients are not shy, they tell us what they don’t like and what they like — they tell me they love it, they choose what they want to hear in what is a foreign environment for them. This takes them to a familiar home base within themselves. I would like to see more science, more research using biomarkers,

blood pressure, respiration rate – and not just subjective reports to promote the hard science behind this.

Music Psychotherapy takes patients to a familiar home base within themselves. It relaxes them without side effects. There was one of my patients who was a victim of 9/11, trapped in the rubble with concrete pushing down on her chest, and as a result of this trauma, she was unable to tolerate (the physical sensation of) even a blouse buttoned up. She had breast cancer, and part of her treatment was having something (author's note - a 'bolus' which is an energy absorbing material to limit radiation exposure to a specific small area) placed over her breast and she was completely unable to tolerate that. She had a huge fear of any tactile stimulation to that area of her body, claustrophobia, and we helped her go through her treatment and helped her to tolerate those sensations that brought her back to that day. Music and relaxation techniques helped her to process that trauma. She had daily music psychotherapy, and we still talk about her experience in our department. When people have a serious illness there is a change in their sense of self, one becomes a sick person – MPT can help mitigate that.

4.6.3 Interview of Radiation Oncologist III - Prostate Cancer Specialist

"Where I find it really beneficial is in those patients they come in with a lot of anxiety, which really impairs our ability to get them through simulation. There have been a number of cases (as you well know) where the patients simply cannot tolerate the simulation procedure because of the degree of anxiety they are experiencing. And you know in some situations I've tried medications, anxiolytics to try and control that, and get the patient through the simulation as soon as possible. But I've found that using music psychotherapy as a tool, I've been able to get patients who otherwise would not have been able to get through treatment or simulation, have been able to get through treatment in relative comfort. So it's been really beneficial in a number of patients. Some of these people that come to my mind, just simply were too scared to even come in, and later having met with you were able to get through not only simulation but the whole treatment with your support. So, it's been beneficial in that sense, I think it's allowed me to rely less on medication to get patients through treatment, and that's a good thing, and it's been highly effective for a number of people I've treated.

I think it is a nice way for them to ease into the very cold clinical aspect of simulation and of their treatment. I think it's the most prominent alternative that we have available to our patients. It's something that I have observed a number of patients really benefit from, more so some than other patients, but it's certainly been a very useful tool for a number of my patients to get through their diagnosis and their treatment. I think it changes how they perceive their contact with the healthcare system. It does make a sterile environment, which the radiation department can seem like, feel 'safer' and more comfortable, which gives them a better experience and interaction receiving treatment, and the change in the perception of the healthcare system itself will make it better for them moving forward, and will persist even after their treatment is finished.

4.6.4 Interview of Radiation Therapist - Lead Therapist for Simulation Procedures

The first thing that comes to mind that I will never forget is Donald (patient) who was going to give up on treatment because he could not even get through simulation because of his fear of the machines you wouldn't give up on him and not only got him through simulation but he then sailed through treatment. This was a man who watched his father die of the same disease, which I think contributed to his phobia. Music psychotherapy was so important for this patient, who, as I said, almost certainly would not have even gotten radiation therapy if it wasn't for your work with him.

On a different issue, I think the work relationship between the simulation therapist and the music therapist is key - as we know there are many scheduling hiccups and when the relationship is collaborative this greatly benefits the patient. And in looking at it on a broader scale and not just for the simulation process, it is also important for the radiation therapist to follow the patient throughout treatment and assess if they are having a hard time to encourage them to meet with you again. Also your working closely to synchronize workflow with the clinical technical supervisor when there are scheduling discrepancies (which we have seen many times) contributes to those patients' overall positive experience on the unit.) Lastly, you offer such great support, calmness, and effective relaxation techniques with your immense clinical experience for these patients!!!

5 CONCLUSIONS

The TRS Trauma, Resilience, Safety: a Music Psychotherapy Model for Addressing Illness Burden in Oncology builds upon the author's decade of clinical work and research in Radiation Oncology and Chemotherapy. The impetus to develop such a model stems from the recognition that there is a dearth of literature addressing the impact of active MMPT strategies for patients of varying stages of cancer, and an apparent lack of any comprehensive models or strategies for addressing the specific challenges faced by patients receiving radiation therapy for cancer. Loewy's Medical Music Psychotherapy served as a foundation for the development of the TRS model and its clinical protocols with her program's integrative clinical practice inspiring a likened multi-tiered approach.

The aim of this dissertation was to shed light on the theoretical and clinical underpinnings of a dedicated approach to clinical medical music psychotherapy practice with the hope of contributing to the growth of its use in other comprehensive cancer treatment trajectories. It seeks to add to the proliferation of clinical evidence based strategies in oncology settings by highlighting a randomized control trial carried out under approval by the Mount Sinai Beth Israel Healthcare System's Internal Review Board.

The study provides further implications for discreet interventions and theoretical guidelines within a radiation oncology hospital milieu. In necessarily developing this model alongside team-based medical strategists, a multi-level protocolized music psychotherapy ensued, employing biopsychosocial constructs which showed to be highly effective in reducing the level of state anxiety and distress experienced by breast and head & neck cancer patients undergoing simulation for radiation therapy to sub-symptomatic levels. Implicit in the results, and deserving of further study, is the hypothesis that in modulating the patient's perception of the invasiveness of their first encounter within the world of chemotherapy and radiation oncology will likely have carry-over in rendering subsequent medical experiences less traumatizing. The basis for this premise, is that the protocol-developed, tested and further scrutinized and developed within this dissertation empowered patients to take a proactive stance, and shift from perceiving themselves as "passive victims of invasive

treatment” to active participants who channeled their resilient characteristics. This shift can be seen as a step away from igniting potential dormant traumatization inclusive of feelings of overwhelm and dissociation. It is also hoped that the present study and subsequent model elucidating its foundation, grounded in data will serve as a point of takeoff, and will inspire further investigation into the mechanisms that brought about the robust psychophysiological changes it documents, and thus contribute to the implementation of evidence based best practice in multidisciplinary milieus where music psychotherapy can be employed to contribute to enhanced patient-centered care in our global hospital systems.

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APPENDIX

- A CONSENT FORM**
- B STATE TRAIT ANXIETY INVENTORY**
- C VAS DISTRESS THERMOMETER**
- D SURVEY FORM**

Appendix B Steinberger State Trait Anxiety Inventory

State Trait Anxiety Inventory

Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	1	2	3	4		
	Not at all	A little	Somewhat	Very Much So		
1. I feel calm			1	2	3	4
2. I feel secure			1	2	3	4
3. I feel tense			1	2	3	4
4. I feel strained			1	2	3	4
5. I feel at ease			1	2	3	4
6. I feel upset			1	2	3	4
7. I am presently worrying over possible misfortunes			1	2	3	4
8. I feel satisfied			1	2	3	4
9. I feel frightened			1	2	3	4
10. I feel uncomfortable			1	2	3	4
11. I feel self confident			1	2	3	4
12. I feel nervous			1	2	3	4
13. I feel jittery			1	2	3	4
14. I feel indecisive			1	2	3	4
15. I am relaxed			1	2	3	4
16. I feel content			1	2	3	4
17. I am worried			1	2	3	4
18. I feel confused			1	2	3	4
19. I feel steady			1	2	3	4
20. I feel pleasant			1	2	3	4

Appendix C Visual Analogue Distress Scale



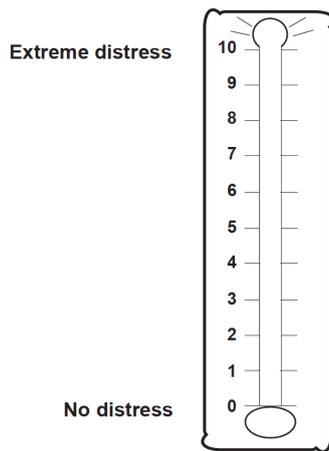
National
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NCCN Distress Thermometer and Problem List for Patients

NCCN DISTRESS THERMOMETER

Distress is an unpleasant experience of a mental, physical, social, or spiritual nature. It can affect the way you think, feel, or act. Distress may make it harder to cope with having cancer, its symptoms, or its treatment.

Instructions: Please circle the number (0–10) that best describes how much distress you have been experiencing in the past week including today.



PROBLEM LIST

Please indicate if any of the following has been a problem for you in the past week including today.

Be sure to check YES or NO for each.

- | YES | NO | <u>Practical Problems</u> | YES | NO | <u>Physical Problems</u> |
|--------------------------|--------------------------|--------------------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | Child care | <input type="checkbox"/> | <input type="checkbox"/> | Appearance |
| <input type="checkbox"/> | <input type="checkbox"/> | Food | <input type="checkbox"/> | <input type="checkbox"/> | Bathing/dressing |
| <input type="checkbox"/> | <input type="checkbox"/> | Housing | <input type="checkbox"/> | <input type="checkbox"/> | Breathing |
| <input type="checkbox"/> | <input type="checkbox"/> | Insurance/financial | <input type="checkbox"/> | <input type="checkbox"/> | Changes in urination |
| <input type="checkbox"/> | <input type="checkbox"/> | Transportation | <input type="checkbox"/> | <input type="checkbox"/> | Constipation |
| <input type="checkbox"/> | <input type="checkbox"/> | Work/school | <input type="checkbox"/> | <input type="checkbox"/> | Diarrhea |
| <input type="checkbox"/> | <input type="checkbox"/> | Treatment decisions | <input type="checkbox"/> | <input type="checkbox"/> | Eating |
| | | <u>Family Problems</u> | <input type="checkbox"/> | <input type="checkbox"/> | Fatigue |
| <input type="checkbox"/> | <input type="checkbox"/> | Dealing with children | <input type="checkbox"/> | <input type="checkbox"/> | Feeling swollen |
| <input type="checkbox"/> | <input type="checkbox"/> | Dealing with partner | <input type="checkbox"/> | <input type="checkbox"/> | Fevers |
| <input type="checkbox"/> | <input type="checkbox"/> | Ability to have children | <input type="checkbox"/> | <input type="checkbox"/> | Getting around |
| <input type="checkbox"/> | <input type="checkbox"/> | Family health issues | <input type="checkbox"/> | <input type="checkbox"/> | Indigestion |
| | | <u>Emotional Problems</u> | <input type="checkbox"/> | <input type="checkbox"/> | Memory/concentration |
| <input type="checkbox"/> | <input type="checkbox"/> | Depression | <input type="checkbox"/> | <input type="checkbox"/> | Mouth sores |
| <input type="checkbox"/> | <input type="checkbox"/> | Fears | <input type="checkbox"/> | <input type="checkbox"/> | Nausea |
| <input type="checkbox"/> | <input type="checkbox"/> | Nervousness | <input type="checkbox"/> | <input type="checkbox"/> | Nose dry/congested |
| <input type="checkbox"/> | <input type="checkbox"/> | Sadness | <input type="checkbox"/> | <input type="checkbox"/> | Pain |
| <input type="checkbox"/> | <input type="checkbox"/> | Worry | <input type="checkbox"/> | <input type="checkbox"/> | Sexual |
| <input type="checkbox"/> | <input type="checkbox"/> | Loss of interest in usual activities | <input type="checkbox"/> | <input type="checkbox"/> | Skin dry/itchy |
| | | <u>Spiritual/religious concerns</u> | <input type="checkbox"/> | <input type="checkbox"/> | Sleep |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | Substance use |
| | | | <input type="checkbox"/> | <input type="checkbox"/> | Tingling in hands/feet |

Other Problems: _____

Version 2.2020, 03/11/20. The NCCN Clinical Practice Guidelines (NCCN Guidelines®) are a statement of evidence and consensus of the authors regarding their views of currently accepted approaches to treatment. Any clinician seeking to apply or consult the NCCN Guidelines is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment. The National Comprehensive Cancer Network® (NCCN®) makes no representations or warranties of any kind regarding their content, use or application and disclaims any responsibility for their application or use in any way. The NCCN Guidelines are copyrighted by National Comprehensive Cancer Network®. All rights reserved. The NCCN Guidelines and the illustrations herein may not be reproduced in any form without the express written permission of NCCN. ©2020.

Appendix D Modified Goloff Staff Perceptions Survey

Modified Questionnaire:

Please rate patients, according to your **generalized perception** of their receiving music therapy pre-emptively, during and after treatment.

1. Level of physical comfort:

Did music therapy affect the patients' level of physical comfort-**pre-emptively** (simulation or medical imaging procedures for Rad Onc OR set up for Chemotherapy
Worse Same Somewhat better Better

Level of physical comfort: Did music therapy affect the patients' level of physical comfort **during** Rad Onc OR Chemotherapy
Worse Same Somewhat better Better

Level of physical comfort: Did music therapy affect the patients' level of physical comfort **after** Rad Onc OR Chemotherapy
Worse Same Somewhat better Better

Affective state: Did music therapy cause any immediate change in patients' moods or outlooks?

2. Level of affective state:

Did music therapy affect the patients' mood or outlook-**pre-emptively** (simulation or medical imaging procedures for Rad Onc OR set up for Chemotherapy
Worsened Same Somewhat better Better

Level of affective state: Did music therapy affect the patients' mood or outlook **during** Rad Onc OR Chemotherapy
Worsened Same Somewhat better Better

Level of affective state: Did music therapy affect the patients' mood or outlook **after** Rad Onc OR Chemotherapy
Worsened Same Somewhat better Better

3. Subjective response to music therapy.

How do you perceive your patients' response to music therapy as compared to other available activities while they are in Rad Onc

Level of subjective response:

Did music therapy affect the patients' level of response as compared to other activities, **pre-emptively** (simulation or medical imaging procedures for Rad Onc OR set up for Chemotherapy
Worse Same Somewhat better Better

Level of subjective response:

Did music therapy affect the patients' level of response as compared to other activities, **during** (simulation or medical imaging procedures for Rad Onc OR for Chemotherapy
Worse Same Somewhat better Better

Level of subjective response:

Did music therapy affect the patients' level of response as compared to other activities, **after** (simulation or medical imaging procedures for Rad Onc OR Chemotherapy

Worse Same Somewhat better Better

4. Carryover- Feelings about being having Cancer: Would patients feel that participation in music therapy makes their diagnosis any more or less pleasant or difficult?

Level of carry over/outlook:

Did music therapy affect the patients' level of response to their diagnosis, **pre-emptively** (simulation or medical imaging procedures for Rad Onc OR set up for Chemotherapy

Worse Same Somewhat better Better

Level of carry over/outlook:

Did music therapy affect the patients' level of response to their diagnosis, **during** (simulation or medical imaging procedures for Rad Onc OR for Chemotherapy

Worse Same Somewhat better Better

Level of carry over/ outlook:

Did music therapy affect the patients' level of response to their diagnosis **after** (simulation or medical imaging procedures for Rad Onc OR Chemotherapy

Worse Same Somewhat better Better

NARRATIVE QUESTIONS

1. What comments come to mind about patients we have shared in the simulation process?
2. Regarding music therapy in general. What do you think is most beneficial about MT for your patients?
3. Given that there are two parts to the MT protocol in the context of simulation - individual music psychotherapy and the prescribed music programs - how does that fit in with your work process with the patients?
4. Do you remember any specific patients that benefited more than others from MT, any comments from patients that come to mind?
5. What could have been better about the interfacing between your work and mine?