MEANING IN LIFE, MEANING-MAKING AND POSTTRAUMATIC GROWTH IN CANCER PATIENTS: SYSTEMATIC REVIEW AND META-ANALYSIS

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Resumo

Esta revisão sistemática e meta-análise tem como objetivo sintetizar e avaliar a associação encontrada na literatura entre o significado da vida (SV), *meaning-making* (MM) e o crescimento pós-traumático (CPT) em pacientes oncológicos. A procura de artigos foi realizada em 18 bases de dados, seguindo as normas PRISMA. Os artigos empíricos que abordavam SV ou MM e CPT em adultos diagnosticados com cancro foram considerados para inclusão. Os dados de correlação *r* foram extraídos dos artigos incluídos. Dos 889 artigos considerados, nove artigos, publicados entre 2006 e 2022, preencheram os critérios de inclusão. A amostra é constituída maioritariamente por pacientes diagnosticados com cancro da mama. Para além da relação entre as variáveis SV, MM e CPT, estas foram ainda positivamente associadas à espiritualidade, suporte social, satisfação com a vida e negativamente associadas à ansiedade e à depressão. Na meta-análise, os cinco artigos incluídos (N = 844), revelaram que o SV está moderadamente associado ao CPT (r = 0,43, 95% *IC* [0,36, 0,50]). Alguns estudos indicaram uma relação direta entre o SV e o CPT, sugerindo que a presença de SV poderá facilitar o desenvolvimento de CPT. Tendo em consideração o impacto que estas variáveis têm nas diversas dimensões da vida dos pacientes oncológicos, estudos futuros devem explorar mais detalhadamente a relação entre as variáveis. Na prática clínica, a exploração de dimensões existenciais, como o SV, e o recurso a intervenções centradas no significado poderão ser uma forma de auxiliar o ajustamento e de potenciar o crescimento pessoal nestes pacientes.

Palavras-Chave: meta-análise, significado da vida, sentido da vida, crescimento pós-traumático, psico-oncologia.

Abstract

The purpose of this systematic review and meta-analysis is to synthetize and assess the association between meaning in life (MiL), meaning-making (MM) and posttraumatic growth (PTG) in the context of cancer. A systematic search was conducted in 18 electronic databases, following the PRISMA guidelines. The empirical articles that assessed MiL or MM and PTG in adult cancer patients were considered for inclusion. The correlation coefficients between MiL and PTG were extracted. From the 889 records considered according to the inclusion criteria, a total of nine articles, published between 2006 and 2021, were included in the systematic review. The sample is mostly constituted of breast cancer patients. The included articles, besides the association between MiL, MM and PTG, found that these variables were also positively associated to spirituality, social support, life satisfaction and negatively associated to anxiety and depression. The meta-analysis included five articles ($N = 844$) and the results indicate a significant moderate correlation between meaning in life and posttraumatic growth ($r = 0.43$, 95% IC [0.36, 0.50]). Additionally, some studies reported a direct relationship between MiL and PTG, revealing that MiL might facilitate the process of PTG. Considering the impact of these variables in several aspects and dimensions of the life and experience of cancer patients, future research should explore this relationship further, as well as meaning centered interventions that can potentiate a positive adjustment and possibly growth from the cancer experience. In the clinical practice, cancer patients would benefit from an open approach and exploration of existential matters.

Keywords: meta-analysis, meaning, posttraumatic growth, psycho-oncology, cancer

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Introduction

Cancer is a life-threatening and highly prevalent disease all around the world (WHO, 2021). Cancer patients have a higher risk of experiencing psychological distress (Costa et al., 2016) or developing mental disorders (Singer, 2010). One of the reasons being that the diagnosis and experience of cancer can be potentially traumatic, as the confront with one's mortality arises existential matters, such as meaning in life (MiL) (Carreno & Eisenbeck, 2022) and triggers a search for meaning (Schlegel et al., 2013). Several studies have shown however that perceiving MiL can also have a dampening effect on psychological distress (Winger et al., 2016), facilitating the adjustment to the illness (Miao & Gan, 2020). On the other hand, the process of search for meaning, also called meaning-making (MM), can have an inverse effect, amplifying the distress, if before the diagnosis was already a lack of global meaning (Dezzuter et al., 2013).

The presence of MiL can not only protect cancer patients from experiencing psychological distress but also facilitate their adjustment to the disease, as well as possibly promote posttraumatic growth (PTG). The struggle with highly stressful circumstances, such as the one cancer patients experience, can lead to psychological growth, defined as PTG (Tedeschi & Calhoun, 1995). It is as Frankl (1966) described, the ability to overcome and transform negative life events into something positive. Empirical research has found PTG to have a similar as MiL in cancer patients' well-being and quality of life (Kim & Son, 2021; Liu et al., 2020).

A systematic review on meaning and health showed that MiL and the ability to extract or give meaning to a person's experiences can be crucial to their well-being (Roepke et al., 2014). Several systematic reviews have also explored the positive impact of PTG and its correlates and predictors in a variety of contexts, including cancer patients (Liu et al., 2020; Shand et al., 2015). And despite the positive effect that both MiL and PTG can independently have on the lives of those who have undergone traumatic experiences, the research has not actively focused on the association and relationship between them. A previous systematic review on the psychological and clinical correlates of PTG in cancer patients included meaning as a positive dimension related to PTG (Casellas-Grau et al., 2017). There was however no clear distinction between the concepts of MiL and PTG, which can undermine the results presented. The main goal of this systematic review and meta-analysis was to analyze and assess the association between these variables in cancer patients.

The first step was to clearly differentiate the concepts of MiL, MM and PTG. For this reason, the theoretical framework is divided in three major sections, where each concept was defined and the literature on their individual impact on cancer patients was explored. In the end of this chapter, the relevance of this study as well as the goals of this thesis were explained. The second chapter, the methods, included the eligibility criteria, search strategy, study selection, data extraction and meta-analysis procedure. The results examined the findings of each of the included studies related to the main variables of this review (MiL, MM and PTG), and synthesized the effect size of the correlation between MiL and PTG. Lastly, in the discussion the findings of the included articles and results obtained from the meta-analysis were explored in accordance with the existing literature. In this chapter were included the study limitations, suggestions for future research and the clinical implications of this review.

As a result of this thesis, an article was submitted to a special topic about "Posttraumatic Growth" in the scientific journal Frontiers in Psychology. The submitted article with the title "Meaning in Life, Meaning-Making and Posttraumatic Growth in Cancer Patients: Systematic Review and Meta-Analysis" has the authorship of Margarida Almeida, Catarina Ramos, Laura Maciel, Miguel Basto-Pereira, and Isabel Leal.

Theoretical Framework

Cancer

Cancer is one of the leading causes of death in most countries (Bray et al., 2021). According to the World Health Organization (WHO), in Portugal there were approximately 60.500 new cases of cancer in 2020 (WHO, 2021).

Cancer is an uncontrollable growth of abnormal cells that can form a tissue mass referred to as tumor (National Cancer Institute, 2021). Tumors can be localized and not cancerous (benign) or cancerous (malignant). Cancerous tumors present a health threat, invading and attacking surrounding tissues, with the ability to spread and grow in other regions of the body (i.e., metastasis; National Cancer Institute, 2021).

There are numerous types of cancer, described according to the organ or tissue affected or the type of cell where it originated. The four most common types of cancer, taking into consideration the cell of origin, are: carcinomas start in epithelial cells; sarcomas affect the muscles, bone and cartilage; lymphomas originate in the body's lymphatic system; and leukemias target the blood and the blood-producing systems (Straub, 2014).

Cancer derives from genetic changes that can be inherited, caused by error in the process of cells dividing or triggered by certain factors, such as exposure to chemicals and radiation or dietary and smoking habits (National Cancer Institute, 2021).

The treatment options are determined based on the type, location and stage of cancer. For an early-stage and localized cancer the best treatment might be surgery or radiation, whereas a more advanced-stage cancer might require a more intense treatment (e.g., chemotherapy or immunotherapy). An early detection can not only prevent death but also reduce the discomfort of a more aggressive treatment (American Cancer Society, 2020).

Psychological Impact of Cancer

The cancer experience is a process that goes through different stages, from the diagnosis and treatment to survivorship. There are a variety of factors that not only have an impact on the overall cancer experience but also on the psychosocial outcomes (Costa et al., 2016). The first factors to consider are related to the illness, such as cancer characteristics, physical symptoms, prognosis and treatment. Personal variables – individual characteristics, personality and psychological history – have a considerable influence on a person's response and adjustment to the disease. Other factors to take into consideration are related to the social context, mainly the social support (Holland, 2002, 2003; Niedzwiedz et al., 2019).

In moments of uncertainty people may experience a certain degree of psychological distress. The concept of distress is broad and incorporates "unpleasant emotion, feeling, thought, condition, or behaviors" (National Comprehensive Cancer Network, 2021). Cancer patients are at more risk of experiencing psychological distress, particularly feelings of anxiety, depression, fear or guilt (Costa et al., 2016). There is also a higher risk for developing mental disorders (Singer, 2010), which impact the quality of life and increases cancer-specific mortality by 53% (Kuhnt et al., 2016; Zhu et al., 2017). Due to its prevalence, the research on the psychological outcomes of cancer has predominantly focused on anxiety and depression (e.g., Kuhnt et al., 2016; Michel et al., 2019; Singer, 2010; 2013; Zhu et al., 2017). However, over the years the focus has started to shift to coping mechanisms and positive emotional outcomes (Johansson et al., 2011), such as psychological adjustment, benefit-finding and posttraumatic-growth (PTG) (Costa et al., 2016; Singer, 2018).

Posttraumatic Growth

"Negative aspects of human existence such as suffering, guilt, and death can still be turned into something positive, provided that they are faced with the right attitude" (Frankl, 1966, p. 252). As Frankl pointed out, people can go through highly negative experiences and still be able to find a positive outcome. Following this line of thought, people have the opportunity to grow from an adverse experience.

The psychological growth that rises from the struggle with highly stressful circumstances was defined as posttraumatic growth (PTG) by Tedeschi and Calhoun (1995). In their book *Trauma and Transformation*, they describe how psychological growth derives from a change in perspective that results "in a more profound understanding of the self and world" (Tedeschi & Calhoun, 1995, p. 87). The change is considered to be transformative, seeing has it occurs at a cognitive and emotional level, which in turn leads to changes in behavior (Tedeschi et al., 2018).

Posttraumatic growth is a long-term change triggered by a traumatic event. In this case, it is important to clarify that a 'traumatic event' is considered a highly stressful life-changing experience (Tedeschi et al., 2018). There are several events and situations that can be considered as potentially traumatic, such as the loss of a loved one, an unexpected tragic event (e.g., transportation accident, terrorist attack, natural disasters) or an illness (e.g., heart attack, chronic illness, transplants, cancer; Tedeschi & Calhoun, 2004). The struggle that comes from trying to cope and overcome these kinds of events, is what initiates the process of PTG.

The Model of PTG firstly introduced in 1995 by Tedeschi and Calhoun, has suffered some modifications over the years. The most recent version can be found in the book *Posttraumatic Growth: Theory, Research and Applications* published in 2018. This model, represented in Figure 1, includes the person pre-trauma, the potentially disruptive event, a person's core beliefs, intrusive rumination, deliberate rumination, emotional distress and coping, PTG and the effects or outcomes of PTG. One of the changes of this version is the fact that an event may or not challenge and disrupt a person's beliefs. If the core beliefs of an individual are able to give context to the event, the emotional distress will be diminished and PTG will not occur (Tedeschi et al., 2018). On the other hand, if there is a disruption of core beliefs, there is an increase in emotional distress that will accompany the processes of intrusive and deliberate rumination. It is the combination of challenged core beliefs, rumination and distress that represent the key to experiencing PTG (Tedeschi & Calhoun, 2004; Tedeschi et al., 2018).

The process of PTG is based on seven principles (Tedeschi & Calhoun, 1996). The first principle establishes that growth is the change in schemas. Traumatic events challenge and expose high-order schemas, such as comprehensibility and meaningfulness, possibly leading to the reconstruction or development of new schemas. The second principle reveals that the flexibility of a person's assumptions can reduce the possibility of growth. Flexible assumptions can mitigate the suffering, as the event is integrated in the existing schemas, not allowing for a change to occur. Principle three stipulates that "for growth to occur, there must be some positive evaluation, and this must include some positive change in self" (Tedeschi & Calhoun, 1996, p. 82). Principle four refers to the way that different types of trauma can produce different growth outcomes. The fifth principle highlights how growth is related to personality characteristics. Certain personality factors, such as extraversion, creativity and optimism, influence a person's perception and response to a stressful life event, which in turn can have an impact on facilitating growth. Principle six states that for growth to occur the trauma must take a central 'place' in a person's life narrative. Lastly, the seventh principle mentions that wisdom is a product of growth, as a new perspective and way of thinking occurs (Tedeschi & Calhoun, 1996; Tedeschi et al., 2018).

PTG is both a process and an outcome. As an ongoing process, PTG may involve moments of greater distress before there is an integration and acceptance of the event in the life narrative (Tedeschi & Calhoun, 2004). When a highly stressful event challenges and disrupts a person's core beliefs, there is an increase of emotional distress that stimulates the process of PTG (Tedeschi et al., 2018). In cancer patients, the stressful event can be receiving the diagnosis

which precipitates a reevaluation of life and death, triggering in turn a search for a new meaning (Heidarzadeh et al., 2017). The disruption of core beliefs and emotional distress initiates two different types of rumination. Intrusive rumination characterized by automatic and invasive thoughts, is normal as a first response to trauma. With time it is accompanied by or replaced with deliberate rumination, which is a conscious effort to reappraise and find meaning in the circumstances in an attempt to integrate the event into the life narrative. The rumination process is accompanied by emotional distress, that subdues as a new world view, new beliefs and goals emerge, giving the opportunity for growth to occur (Tedeschi et al., 2018).

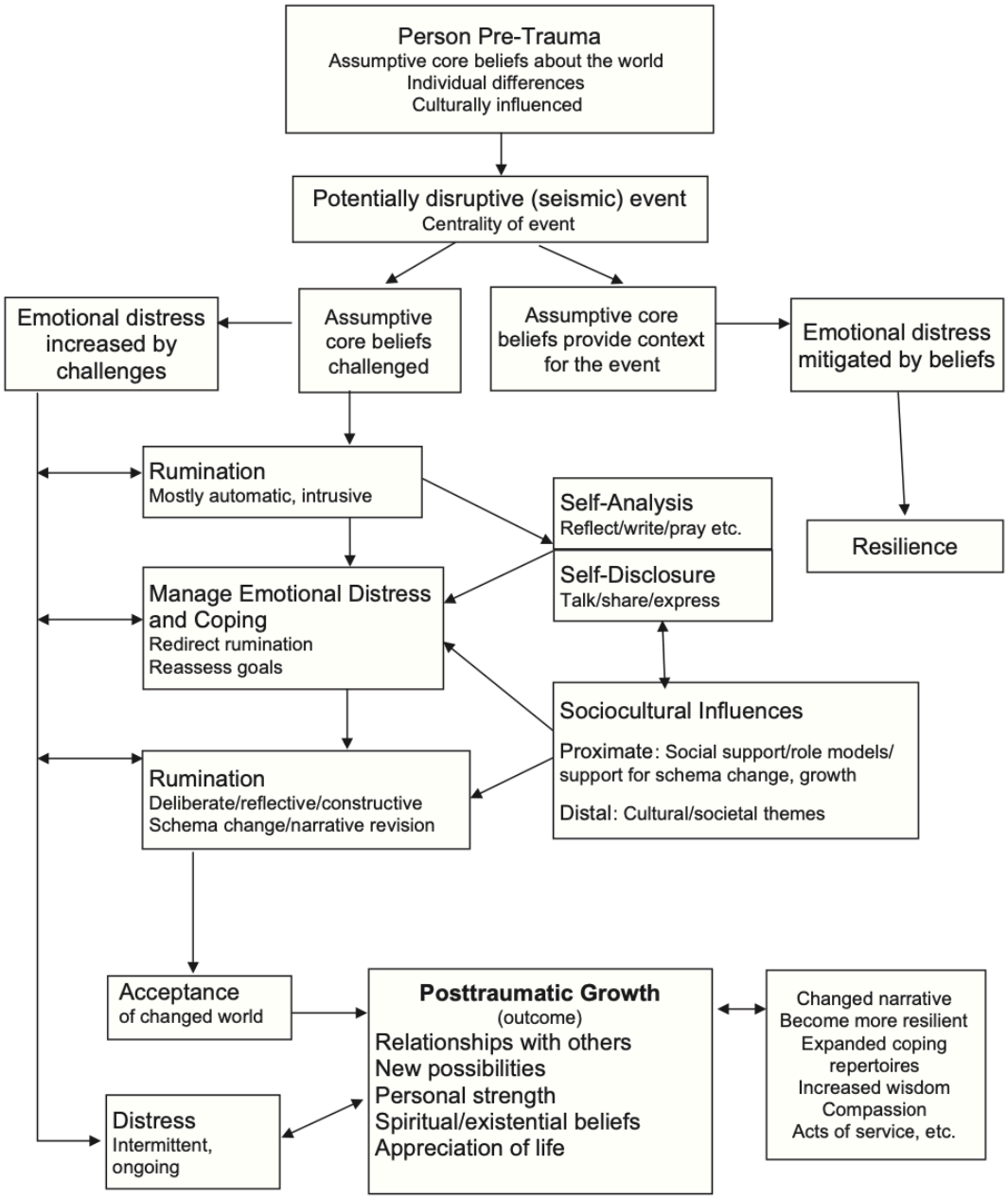


Figure 1.

Revised Model of Posttraumatic Growth (Retrieved from Tedeschi et al., 2018 p. 44)

Regarding the outcomes of PTG, there are five domains where change is expected to occur: personal strength, relating to others, new possibilities, appreciation of life and spiritual and existential change. *Personal strength*, as the name suggests, relates to how a person may experience an increased sense of strength and confidence after being able to overcome the event. A reevaluation of the existent relationships and/or a shift of behavior towards others (e.g., accepting help from others), is an outcome of PTG called *Relating to others.* Finding in the disruptive event the opportunity to transform one's life, such as changing career or experiencing new interests, is part of *New possibilities*. *Appreciation of life* is the ability to gain a new perspective of life and to truly enjoy what life has to offer. And lastly, *Spiritual and existential change* speaks to both people who are religious and those that are not, but still experience a new reflection on existential matters (Tedeschi & Calhoun, 2004; Tedeschi et al., 2018).

Several intra-individual and inter-individual factors can influence PTG, such as individual and cultural differences. Intra-individual aspects are what is described as 'person pre-trauma', which includes: a) demographic characteristics, b) individual aspects such as personality traits, c) previous mental health status, and d) core beliefs. Inter-individual factors, related to cultural differences and social support, can have an impact on PTG as both pre-trauma factors as well as predictor variables (Tedeschi et al., 2018).

In cancer patients, PTG has been consistently related to a better quality of life (Kim & Son, 2021; Liu et al., 2020) and to lower levels of depression and anxiety (Thakur et al., 2022). Considering that the changes of PTG can be seen as some of the best outcomes of the cancer experience due to their impact on the lives of cancer survivors, systematic reviews have shown how empirical research has thoroughly examined its correlates and predictors (Casellas-Grau et al., 2017; Shand et al., 2015; Turner et al., 2018). Some of the variables that correlate and predict PTG are spirituality/religion (e.g., Danhauer et al., 2013; García et al, 2014; Shand et al., 2015), adaptive coping strategies (e.g., Danhauer et al., 2013; Drapeau et al., 2019; Ho et al., 2004; Widows et al., 2005), and meaning in life (e.g., Boullion et al., 2020; Casellas-Grau et al., 2017).

Meaning in Life

More than two thousand years ago Plato described man as a being in search for meaning. It is by attributing meaning that we can comprehend and make sense of the world. And so, one could say that meaning is an integrant part of the human existence (Steger, 2012b). The need to give meaning to the world also applies to one's own life. People have a need to find meaning

in their lives (Frankl, 1946/2012), in order to understand their existence and to feel it is significant and purposeful (Steger & Kashdan, 2007).

The psychological study on the meaning in life (MiL) was essentially inaugurated by Frankl's book *Man's Search for Meaning* (Baumeister & Vohs, 2002). Since then, a growing body of literature as explored the importance and role of meaning in people's lives. However, despite the increasing interest, the concept of MiL is still reason for discussion and debate (Heintzelman & King, 2014). Research on the MiL has resulted in different definitions and theoretical models (Martela & Steger, 2016), which in turn has resulted in the development of several distinct instruments.

One of the main reasons for divergence concerns the use of the terms "meaning" and "purpose" (Steger, 2018). Some authors view meaning as an equivalent of purpose, while others consider them to be two distinct constructs that are related to one another (George & Park, 2013). Those who perceive meaning and purpose as different concepts, conceptualize meaning as one's interpretation of life as being coherent and significant, whereas purpose is seen as a set of goals that provide a direction and motivation to life (George & Park, 2013). According to this perspective, purpose and meaning are separate constructs which is why they have different predictors and correlates to health and well-being (George & Park, 2013). However, purpose can also be seen as a set of goals and fulfillments that offer direction and meaning to the present (Baumeister & Vohs, 2002). According to this perspective, having a sense of purpose is one of the components of meaning that allow individuals to regard their lives as meaningful (Crescioni & Baumeister, 2013; Martela & Steger, 2016; Steger, 2018).

Recently there has been a consensus that MiL is a multidimensional construct, that incorporates purpose along with other factors (Martela & Steger, 2016). Baumeister (1991) suggested that people have four needs for meaning. The first need is *Purpose*, which gives meaning to a person's actions, as they are oriented towards a future goal. *Value* refers to the motivation behind people's action and to perceiving them as good and justifiable. The third need, a *Sense of efficacy*, is related to the concept of control and the belief that one has control over events. *Self-worth* makes reference to the need to have a meaning that enables people to make sense of their lives in a positive way. It is when these needs are satisfied that people will be able to perceive life as meaningful (Baumeister, 1991). On the other hand, Wong (2012) introduces the PURE Model with the four components of meaning: purpose, understanding, responsible action and enjoyment or evaluation. According to this model, *purpose*, consisted of goals, direction, values and aspirations, is the motivational and most important component. *Understanding* is related to cognitive processes that enable people to not only have a sense of

coherence but to make sense of situations, one's own identity and the surrounding world. The behavioral component – *Responsible action* – refers to the responsibility for one's actions and the consciousness of the freedom of choice. Lastly, *Enjoyment or evaluation* is the emotional component that is associated to the subjective assessment of life as satisfactory and fulfilling (Wong, 2012). Other authors suggest a three-dimensional model of meaning, formed by coherence, purpose and significance (George & Park, 2016; Martela & Steger, 2016; Reker & Wong, 1988; Steger, 2018). Despite the differences, there seems to be an understanding that there are three basic components to meaning in life: 1) a cognitive component, present when an individual can make sense of his experiences; 2) a motivational component, based on worthy and meaningful goals that give direction to life; and 3) an affective or evaluative component, which can be found when a person considers that their life is worth living (Martela & Steger, 2016).

Meaning in Life: Purpose, Significance and Comprehension

Meaning in life is a set of subjective judgments people make of their lives. It involves having a sense of significance and feeling that their lives matter, seeing life as comprehensible and coherent, and having a purpose (King et al., 2006; Steger, 2012a; 2018). Accordingly, the concept of MiL is multidimensional and composed of three facets: purpose, significance and comprehension/coherence (see Table 1) (George & Park, 2016; Martela & Steger, 2016; Steger, 2018).

Table 1.

Meaning in Life as a Multidimensional Construct

Meaning in Life			
Dimension:	Purpose	Comprehension	Significance
Component:	Motivational	Cognitive	Affective
Definition:	Set of core goals and aims that provide a direction to life	Ability to make sense, understand and find coherence in one's life	Perceiving life as valuable, worthy and relevant.

Purpose refers to a set of core goals and aims that give a direction to life (George & Park, 2013). In this sense, meaning is experienced when people pursuit their own unique purpose (Steger, 2009). Frankl (1946) was the one who began to describe how a person could draw strength and fulfillment from the pursuit of goals in life. Reker and Wong (1988) argued

that the process of pursuing and possibly achieving individual goals are what gave a sense of purpose and ultimately meaning to existence. This process was guided by a value system, constructed by the individual according to his needs and beliefs (Reker & Wong, 1988). Purpose is the motivational component of meaning, because it provides an incentive to move towards a future. The goals that give life a purpose are not necessarily attainable or constraint to a fixed time period, for example wanting to became a better person or being a good parent (Steger, 2018).

Significance is the evaluative and affective component of meaning. It involves the value, worth and importance a person attributes to their lifes, giving it meaning (Martela & Steger, 2016). George and Park (2016) refer to significance as *mattering* – the feeling an individual has of his existence as significant and relevant. Compared with the other three dimensions of MiL, significance has received less attention from researchers (George & Park, 2014; Martela & Steger, 2016). Even so, it is undeniable for several authors that for a life to have meaning it has necessarily to be seen as a life worth living (George & Park, 2016; King et al., 2006; Martela & Steger, 2016; Steger, 2018).

The third dimension of meaning in life is comprehension or coherence, which is the cognitive component (Martela & Steger, 2016). It refers to the ability of making sense of life and the world through a "web of connections, understandings, and interpretations that help us comprehend our experience" (Steger, 2012a, p. 165). Humans are creatures of meaning, they make sense of the world by attributing and deriving meaning from their experiences (Baumeister & Vohs, 2002). The same applies to life in general, people have a need to find meaning in their experiences in order to have a sense of coherence and order in life (Steger, 2018). Roepke et al. (2014) in their systematic review on meaning and health, state that "the ability to derive meaning from our experiences may be essential to survival and wellbeing" (p. 1055).

Meaning is considered to be one of the key components for a good mental health (Fusar-Poli et al., 2020) and psychological well-being (Fischer et al., 2021). In cancer patients, the diagnosis and treatment can evoke concerns regarding MiL, as the idea of one's mortality comes into mind (Carreno & Eisenbeck, 2022). When people perceived their life's as meaningful, they experience less distress (Winger et al., 2016), facilitating their adjustment to the illness. This might be explained by the fact that MiL influences a cancer patients' perception of their illness (Krok & Telka, 2017), consequently impacting the use of coping strategies (Miao & Gan, 2020), which in turn affects the psychological outcomes and emotional experience crucial for a positive or negative adjustment. Empirical research has shown that higher levels of MiL

correlate to lower levels of depression and anxiety (Elekes, 2017; Gravier et al., 2020; Testoni et al., 2018; Vehling et al., 2011) and distress (Jaarsma et al., 2007; Winger et al., 2016).

Receiving a diagnosis of cancer frequently triggers a search for meaning (Park et al., 2008; Schlegel et al., 2013). Davis et al. (1998) spoke of two ways of deriving meaning from an adverse experience: sense making and benefit finding. Sense making was described as an attempt to understand and comprehend an event in order to restore life's order and coherence, while benefit finding involved uncovering a positive significance or value from a negative experience. The first is similar to what is described by the meaning-making model developed by Park and Folkman (1997) and the latter to the positive changes derived from a highly stressful situation, described by PTG model.

Search for Meaning

Presence of meaning is a subjective experience of one's life as meaningful, whereas the search for meaning refers to a will to find meaning (Newman et al., 2017; Steger et al., 2006). Frankl (1963) believed that this "will to meaning" was characteristic of the humans, and that when this efforts were unmet it resulted in psychological distress. Following this line of thought, Steger and Kashdan (2007) described that "individuals are strongly motivated to find meaning in their lives, that is, to be able to understand the nature of their personal existence, and feel it is significant and purposeful" (p. 783). Search for MiL is, therefore, a person's effort to strengthen and/or find an understanding of life's meaning, significance, and purpose (Steger et al., 2008).

People draw meaning from multiple sources, such as family, interpersonal relationships, personal growth, religion/spirituality, work, or community (Carreno, 2022; Grouden & Jose, 2015; Schnell, 2020). Grouden and Jose' study (2015) showed that family and interpersonal relations can positively predict presence of meaning, while personal growth and religiosity/spirituality have a positive impact on search of meaning. And while different cultures may derive meaning from different sources, it seems that the most common source is interpersonal relationships, particularly family (Glaw et al., 2017; Grouden & Jose, 2014).

Research focused on search for meaning should always consider the presence of meaning as well. Regardless of the fact that these are two distinct concepts, there is a relationship between them. Steger et al. (2008) explored the correlates of search for meaning, concluding that psychological stronger individuals tend to experience more presence of meaning. Their results indicated that the attitude, approach-oriented or avoidance-oriented, towards search for meaning can positively or negatively relate to presence of meaning. On their

own, presence and search of meaning have a different, sometimes inverse, impact on a variety of health outcomes related to well-being. Presence of meaning was positively related to life satisfaction (Steger et al., 2011), positive affect, and self-esteem (Newman et al., 2017), explaining up to 16% of the variance in subjective well-being (Li et al., 2021). On the other hand, search for meaning was positively related to negative affect (Newman et al., 2017), and symptoms of depression and anxiety (Chen et al., 2021). This might be explained with Steger et al. (2008) finding that individuals who feel that their lives have less meaning are more likely to search for it (Steger et al., 2008). In other words, search for meaning can sometimes suggest a lack of MiL, which has been shown to have an effect on depression (Glaw et al., 2017). Highly negative life events, for instance, can weaken the relationship between presence and search for meaning, causing an increase of symptoms of depression and anxiety for those who search for meaning (Dezutter et al., 2013; Pintado, 2018; Roepke et al., 2014). However, the negative impact of search for meaning in well-being is not always present in the literature. In fact, the negative impact of search for meaning in well-being can be inversed if there is a presence of meaning (Dezzuter et al., 2013). In other words, those who search for meaning while experiencing life as meaningful are not negatively affected in their well-being (Steger, 2018). Steger et al. (2011) realized that presence of meaning was more positively associated with life satisfaction for those searching for meaning. In Chen et al. (2021) study, search for meaning increased symptoms of depression and anxiety. However, when presence of meaning was considered as a moderator, search of meaning had the opposite effect, reducing the symptoms of depression and anxiety.

In conclusion, search for MiL can lead to positive or negative experiences and outcomes, depending on several factors, such as psychological and personality traits, sources of meaning, and presence of meaning. Cancer patients often feel the need to find a meaning in their experience, in order to psychologically adjust to the illness (Schlegel et al., 2013). This process can lead to a positive outcome if the cancer experience is integrated in a person's overall MiL. However, when there was a lack of meaning before the diagnosis, facing cancer and trying to find a meaning not only in the experience but in life as well, can be a very distressful process (Dezzuter et al., 2013). Some may adopt a negative attitude, with a feeling of apathy towards the illness and life, while others may repeatedly battle to gain and restore meaning. Both scenarios can be highly distressful and lead to poor mental health outcomes (Quinto et al., 2022). The impact of an adversity, such as a cancer diagnosis, in a person's experience of MiL, is better explained by the Meaning-Making Model.

Meaning-Making Model

Meaning is an important component of the human existence (Baumeister & Vohs, 2002), especially when confronted with a stressful and possibly traumatic experience (Park, 2013a). The meaning-making (MM) model, based on the transactional model of stress and coping, describes the role of meaning in the process of coping and adjusting to stressful events (Park, 2010). Developed by Park and Folkman (1997), this model represented in Figure 2, is based on two levels of meaning – global and situational meaning.

Global Meaning

Global meaning refers to the beliefs, goals and subjective sense of meaning that represent an individual's orienting system (Park, 2013b). Global beliefs comprise the beliefs about the world, the self and the position of the self in world (Park & Folman, 1997). It is through these beliefs that individuals interpret their experiences of the world. Global goals are internal representations, organized hierarchically, of states and ideals that motivate people. The subjective sense of meaning refers to the sense of purpose and of meaningfulness that stimulates a person's action towards the future (Park, 2013a).

Global meaning is constructed over time since an early age and shaped based on personal experiences. It has an influence on an individual's cognitive schemes, actions, and emotional reactions (Park, 2010). For this reason, global meaning has an important role in the way individuals face and deal with difficult situations, affecting their adjustment and possibly their health (Park, 2013b).

Situational Meaning

Situational meaning refers to the meaning that is attributed to a particular event (Park, 2010), and the way that it interacts with a person's global meaning (Park & Folkman, 1997). It includes the process of meaning appraisal, the comparison between the appraised meaning and global meaning, search for meaning (*meaning-making*) and the outcomes of these processes (*meanings made*) (Park, 2010; 2013b).

Appraisal of meaning is the assessment of the meaning of a particular event, taking into consideration its personal significance, possible ways of coping with it, and the potential outcomes of it (Park & Folkman, 1997). Other factors are also contemplated, such as the extent to which the event is threatening and controllable, the reason for the event to occur, or its implications for the future (Park, 2010).

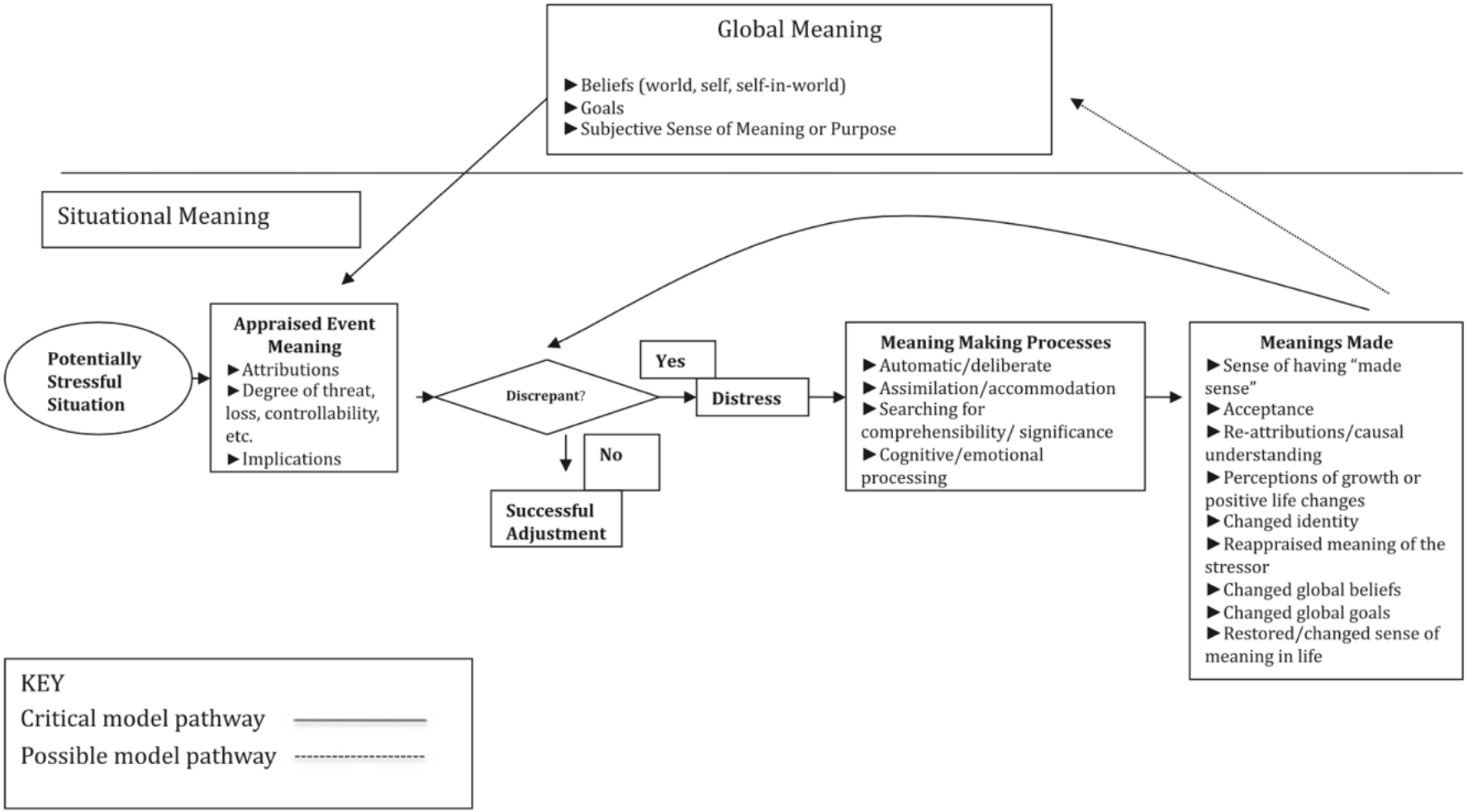
Following the appraisal of meaning in an event, individuals assess the discrepancies between global meaning and the appraised situational meaning. MM is discrepancy-based (Park, 2013b), which means that it is when people perceive a discrepancy between their global meaning and the appraised meaning of a particular situation, which causes distress, that MM efforts will be triggered in order to reduce said discrepancy (Park, 2010). The sources of discrepancy can be the violation of a person's global beliefs or goals, as well as a loss of sense of purpose in life (Park, 2010; 2013a). The level of distress varies according to the extent of the discrepancy. The larger the discrepancy between appraised and global meaning, the more likelihood for trauma to occur.

MM processes are an approach-oriented intrapsychic effort to reduce the discrepancy between the appraised and global meaning. These processes can be automatic and unconscious (e.g., intrusive thoughts, avoidance of reminders), as well as a deliberate, involving the use of meaning-related strategies to deal with the situation (e.g., positive reappraisal, activation of spiritual beliefs, selective focus). To reduce the discrepancy, the situational meaning is adapted in order to approximate global meaning (assimilation) or the global beliefs and goals are changed to accommodate the trauma (accommodation). MM also involves the search for comprehensibility, an attempt to find meaning in the event (e.g., "what caused the event?"), and the search for significance, to determine its value and worth. Lastly, MM concerns cognitive (e.g., rework and reframe of one's beliefs) and emotional (e.g., habituation, regulation of negative affect) processing (Park, 2010; 2013a; Steger & Park, 2012).

The MM process facilitates a better adjustment to a traumatic event, through a set of outcomes termed as *meanings made*. The result of the MM process, characterized by the change in situational or global meaning (Park, 2013a), can be observed through a set of meanings made, such as: having "made sense" of the traumatic event; the acceptance of the event; casual understanding of the cause of the event; perceptions of growth or positive life changes, more commonly described by the model of PTG; identity reconstruction or integration of the stressful experience into one's identity; reappraised meaning of the stressor; changed global beliefs or changed goals; and, restored or changed sense of MiL (Park, 2010; 2013a).

Figure 2.

The Meaning-Making Model (Retrieved from Park, 2010).



The process of MM has been researched in a variety of contexts, such as bereavement (e.g., Huang et al., 2021), disasters (e.g., Lee et al., 2022), childhood trauma (e.g., van der Westhuizen et al., 2022) and cancer (e.g., Gan et al., 2018; Moye et al., 2018; Nilsen et al., 2021). The distress caused by the diagnosis and experience of cancer can trigger the search for meaning in the event itself or in the overall MiL. A qualitative study on cancer patients revealed that MM is a key component of the Dignity Therapy (Bluck et al., 2022). Another qualitative study with children with advanced cancer and their parents showed that MM does not always result in a positive meaning (Schaefer et al., 2021). At short term, it may be more difficult for some to accept and find a meaning in the diagnosis. And while most ultimately find a positive meaning in the situation, some may persistently struggle, unable to make sense and deal with the circumstances of the disease (Steger & Park, 2012).

Research on the impact of MM on PTG is commonly focused on people who have undergone traumatic events (i.e., catastrophes). Zeligman et al. (2019) study with trauma survivors revealed that both search and presence of meaning were predictors of PTG. In another study with survivors of terrorist attacks, presence of MiL played a mediator role in the relationship between social support and PTG (Aliche et al., 2019).

Being diagnosed and treated for a life-threatening disease like cancer can be a traumatic experience. The ability to positively grow from such a stressful experience is the key to a better psychological adjustment and well-being (Park et al. 2008). According to a systematic review on the factors that can potentially promote PTG, MM was positively associated with PTG in different studies (Henson et al. 2021). However, the amount of research on MiL and PTG, specifically in the cancer population, is not only small but inconsistent in the use of MiL constructs. Some authors do not properly distinct the concept of MM from PTG, since both share common points and similar paths in the trajectory of cancer (Casellas-Grau et al., 2017). However, PTG is the positive personal transformation that derives from the struggle with a highly stressful event, MM is the search for meaning in face with adversity (Steger, 2018), and MiL, unlike the other two concepts, is not a process but a part of the human existence (Steger, 2012b). MiL it is the perception of one's life as significant, coherent and with purpose (Steger, 2018). In conclusion, all three concepts are not only distinct but can differently impact the lives of cancer patients and their experience of cancer. Without a clear distinction of these concepts, it is not possible to fully understand the extent of the relationship and impact that these variables have on each other.

Study Relevance

Considering the role that both MiL and PTG have on the adjustment and outcomes of the cancer experience, it might be relevant to understand how they interact with these patients in particular. In fact, MiL has been one of the variables that has shown to be positively correlated and related to PTG in different contexts and samples, including cancer patients. However, despite the variety of systematic reviews that assess both of these variables independently, to our knowledge there is no systematic review or meta-analysis that summarizes and analyzes the relationship between MiL and MM to PTG in the cancer population. A recent systematic review suggested that MiL and PTG could be associated in cancer patients (Casellas-Grau et al., 2017). However, there was no clear distinction in the differences between these two concepts, which lead for instance to the analysis of articles that considered both concepts to be synonyms. Understanding how MiL or MM relates to PTG can possibly benefit and serve as guide to the interventions developed for this sample.

Objectives

"How are meaning in life and meaning-making related to posttraumatic growth in cancer patients?" is the main question that this systematic review and meta-analysis aims to answer. In addition to revealing the existent research on the relationship between MiL, MM and PTG in cancer, the objectives of this thesis are to: a) analyze the similarities and differences between studies; b) examine how MiL, MM and PTG impact the lives of cancer patients; and c) assess how strong is the association between MiL and PTG.

Methods

The systematic review and meta-analysis protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) and published on December 16, 2021 with the registration number CRD42021287048. This thesis followed the checklist provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021; see Appendix A).

Eligibility Criteria

The inclusion and exclusion criteria were delineated before the development of the search strategy, according to the objectives of this thesis. Empirical studies that examined PTG and MiL and/or MM in cancer adult patients were considered for inclusion. There were no restrictions implemented on publication date or language, as long as there was an English or Portuguese abstract. A more detailed description of the inclusion and exclusion criteria are presented bellow and in the table in Appendix B.

Types of participants

Studies were included if the sample consisted of adult cancer patients. The WHO (2022), considers the stage between childhood and adulthood to be between the ages of ten and nineteen. However, according to the European Union Agency for Fundamental Rights (s.d.), most European countries consider the majority age to be 18 years.

Regarding the illness, there were no restrictions on the type of cancer, the cancer stage, time since diagnosis or the cancer treatment.

Type of outcomes

Studies had to present statistical data allowing the calculation of effect sizes on the following outcomes: PTG, MiL and/or MM. If the published study did not present the necessary information, the author(s) were contacted to request the data.

Posttraumatic Growth (PTG) are the positive psychological changes experienced as a result of a traumatic or challenging experience (Tedeschi & Calhoun, 1995; 2004) To measure PTG the studies should apply a validated instrument. The most common instruments used to measure the positive outcomes of a traumatic experience are: Posttraumatic Growth Inventory (PTGI), Perceived Benefits Scale (PBS), and Benefit Finding Scale (BFS). The Posttraumatic Growth Inventory (PTGI), developed by Tedeschi and Calhoun (1996), is a 21-item

questionnaire that approaches 5 factors: new possibilities, relating to others, personal strength, spiritual change and appreciation of life. Each item is rated based on a 6-point scale (0-5), with a total score of 105 where higher scores reflect a higher level of experienced posttraumatic growth.

Meaning in Life (MiL) is a feeling of significance and importance of one's life. It involves perceiving life as comprehensible and with purpose (Steger, 2018). There are several validated instruments that assess MiL (Brandstätter et al., 2012), including the Perceived Personal Meaning Scale (PPMS), the Meaning in Life Questionnaire (MILQ), the Personal Meaning Profile (PMP) and the Personal Meaning Index (PMI). The most recent studies apply the Meaning in Life Questionnaire (MILQ), a 10-item measure for the presence and search for MiL, developed by Steger et al. (2006). Two subscales with 5 items each are rated based on a 7-point scale (1-7), higher scores represent a stronger sense of meaning and a more intense search for meaning.

Meaning-Making (MM) is a model, developed by Park and Folkman (1997), that describes the role that meaning has in a person's adjustment to stressful life events. So far, no instrument was developed to assess the process of MM. Researchers have made use of the positive reframing subscale from the Brief COPE to measure MM. The subscale of positive reframing is considered as a strategy of problem-based coping and consists of two items rated on a 11-point scale (0-11).

Type of studies

Studies were included if they were quantitative, observational, comparative, correlational, longitudinal studies or randomized controlled trials. Descriptive studies were included as long as they were simultaneously empirical. Mixed-method studies that performed a quantitative analysis of the main variables were also included.

The exclusion criteria regarding the type of study consisted of qualitative studies, systematic reviews and meta-analysis, only descriptive studies, theoretical articles, case studies and study protocols.

The articles had to be published in a peer-reviewed journal and contain at least an English abstract. If there wasn't an English or Portuguese version of the article, the authors were contacted to request additional information.

The search for studies was conducted between November and December of 2021, without restriction on date of publication.

Search Strategy

The electronic databases (Academic Search Complete, Complementary Index, MEDLINE, APA PsycINFO, ScienceDirect, Psychology and Behavioral Sciences Collection, Supplemental Index, Directory of Open Access Journals, APA PsycArticles, ERIC, Business Source Complete, Criminal Justice Abstracts, Library Information Science & Technology Abst, Scopus, SciELO, RCAAP, PubMed, Bon and Web of Science) were searched for relevant articles published in peer-reviewed journals without restriction to year of publication or language. A comprehensive search strategy was used, with the combination of the following keywords: cancer or oncological disease or neoplasm or tumour or tumor AND posttraumatic growth or post-traumatic growth or benefit finding or positive life changes or stress-related growth or perceived benefits or existential growth AND meaning* or existential meaning or purpose or meaning-making or meaning making or search* for meaning (Appendix C). More apprehensive search databases such as Google Scholar were also browsed. In order to find additional studies, a hand search was conducted on the included articles and the excluded articles that explored PTG and MiL or MM.

Study Selection

The articles extracted from the electronic databases were analyzed in accordance with the inclusion criteria. The article selection followed the PRISMA guidelines (Page et al., 2021). Initially the titles were examined in order to exclude papers that did not correspond with the type of study or type of participants defined by the inclusion criteria. The second stage was to review the abstracts to ensure the articles included the main variables necessary to conduct this review. The full text of the articles that appeared to meet the criteria were then obtained and reviewed by two authors for the final selection of studies. Figure 1 shows the process of study selection.

Data Extraction

The study characteristics from the included articles were extracted based on the following information: bibliographic information (authors, year of publication and country); sample characteristics (sample size, age, gender, race, relationship status, education); data collection (hospital, data bases and/or social network); study design; sample's type of cancer; outcomes assessed; measures to assess main outcomes (MiL, MM, PTG) and the results involving the main outcomes. For the purpose of the meta-analysis, the correlation coefficients

and corresponding sample size were extracted. Missing characteristics or results were coded as 'Not Reported'.

Meta-Analyses Procedure

Sample Independence

To ensure the independence of study results, sample characteristics of included studies were closely analyzed. In meta-analysis when more than one study shares the same sample, the effect size can no longer be treated as independent. Non-independent effect sizes when treated as independent lead to wrong statistical inferences, since one particular sample will be more weighted than others (Cheung, 2019).

Consequently, to determine the existence of shared participants, the country and recruitment source were compared between studies. If there were studies that made use of the same sample pool, the study with a larger sample size was preferred. When one study measured the same outcome with different instruments, the most commonly used instrument across studies or the one closest to the concept definition was favored.

Data Analysis

Analyses were conducted using the statistical software JAMOVI (version 2.3, 2022). All the variables were continuous. For that reason and considering the objective of this thesis, the correlation coefficient (*r*) was used as an effect size metric. Correlations were converted to the Fisher's Z scale, which was then converted back to correlations for result presentation (Borenstein & Hedges, 2019). Correlation *r* demonstrates the strength and direction of the association between two continuous variables, from -1.0 to 1.0 (Littell et al., 2008). A correlation of zero implies no relationship between variables. A correlation below zero indicates that when one variable has a high value, the other variable has a low value. A correlation above zero indicates that a high value in one variable is associated to a high value of the other variable (Borenstein & Hedges, 2019).

There are two statistical models that can be used to conduct a meta-analysis: the fixed-effect model or the random-effects model. A fixed-effect model assumes that there is only one true effect size, which implies that all the differences observed between studies is due to sampling error (Borenstein et al., 2009). Random-effects model considers that the effect size may vary due to differences in the participants (e.g., age, socioeconomical status, health) or across studies (e.g., study design, treatment conditions). Another assumption in a random-

effects model is that the effect sizes are independent, varying from one study to another for two reasons: random error and a true variation of the effect size between studies (Borestein et al., 2007; Cheung, 2019). A random-effects meta-analysis gives an estimate of the mean effect size where the true effects are expected to be normally distributed around (Borenstein et al., 2009; Littell et al., 2008). To estimate the mean effect, it was adopted a random-effects model, more specifically the restricted maximum-likelihood estimator (Borenstein et al., 2010), which is recommended for meta-analysis with a small number of studies, such as our review (Thompson and Sharp, 1999).

Heterogeneity

Heterogeneity was assessed through the Q statistic and the I^2 index. The Q test is a way of assessing the presence or absence of heterogeneity between studies, whereas the I^2 index represents the proportion of the total variance due to between-studies variability (Borenstein, 2019; Huedo-Medina et al., 2006). A nonsignificant Q test can indicate that the estimated effect sizes differ due to sampling error alone. However, this statistic has a low sensibility to detect heterogeneity when there is a small number of studies. For that reason, is important to use supplementary indices, such as the I^2 index (Huedo-Medina et al., 2006). Higgins et al. (2003) suggests that an I^2 index around 25%, 50%, and 75% can represent a low, medium and high level of heterogeneity, respectively.

Additionally, a forest plot was used in order to assess the heterogeneity between studies, as well as the weight of each study to the overall effect. In a forest plot, all studies are represented with their individual effect size, confidence interval and study weight (Borenstein et al., 2009; Detorri et al., 2021). The location of box points the estimated effect size, while its size is proportionate to the weight of the study to the final estimated effect size. If the study provides more information and has more weight, the size of the box will be bigger. The lines that extend to each side of the box show the confidence intervals. The diamond in the bottom of the forest plot indicates the overall pooled effect, and the corresponding confidence interval (width). The line of 'no effect' is the vertical doted line. When the confidence interval of a study crosses the line, the effect is not statistically significant (Dettori et al., 2021).

Publication Bias

Publication bias occurs when the published literature is not representative of all completed studies (Rothstein et al., 2005). This phenomenon can occur when studies are not considered for publication due to unsignificant or uninteresting results (Vevea et al., 2019). In

a meta-analysis if the sample of studies included is biased, then the internal validity is compromised (Rothstein et al., 2005).

To evaluate potential publication bias a funnel plot was included for analyses. The funnel plot is a scatter plot where it is expected to find the studies effect sizes distributed symmetrically around true effect size (Vevea et al., 2019). When in the presence of publication bias, the distribution of effect sizes will be asymmetrical (e.g., effect sizes clustered in one side of the funnel). Examination of the funnel plot can be subjective, particularly when there is a small number of studies (Littell et al., 2008). To confirm the visual inspection of the funnel plot, Egger's regression was used. The Egger's test is a parametric test for funnel plot asymmetry that measures the magnitude and direction of asymmetry. A statistically significant test indicates the presence of publication bias (Vevea et al., 2019).

Results

Description of Included Studies

The literature and additional hand search resulted in 889 potentially relevant articles (after removing duplicates). After the screening of titles and abstracts 845 studies were excluded for the following reasons: qualitative or mixed-method, systematic reviews and/ or meta-analysis, literature review, theoretical article or commentary, medical outcomes, sample, intervention, instrument development and/or validation, books or chapters of books, missing variables/ outcomes. The remaining 44 eligible articles were reviewed based on a full-text analysis, which resulted in the exclusion of an additional 35 studies (Figure 3; references of excluded articles and reasons for exclusion are presented in Appendix D). The data extraction was summarized in Table 2, where is possible to see the characteristics of the included studies, including the sociodemographic characteristics of the sample.

Study Characteristics

Most of the studies were conducted in Europe (*n*= 4). The other studies were conducted in the United States of America (*n*= 2), Asia (Iran, *n*= 2) and Australia (*n*= 1). The studies from the USA used the same sample. The first study was published in 2006. However, more than half of the studies were published in the last five years (*n*= 5).

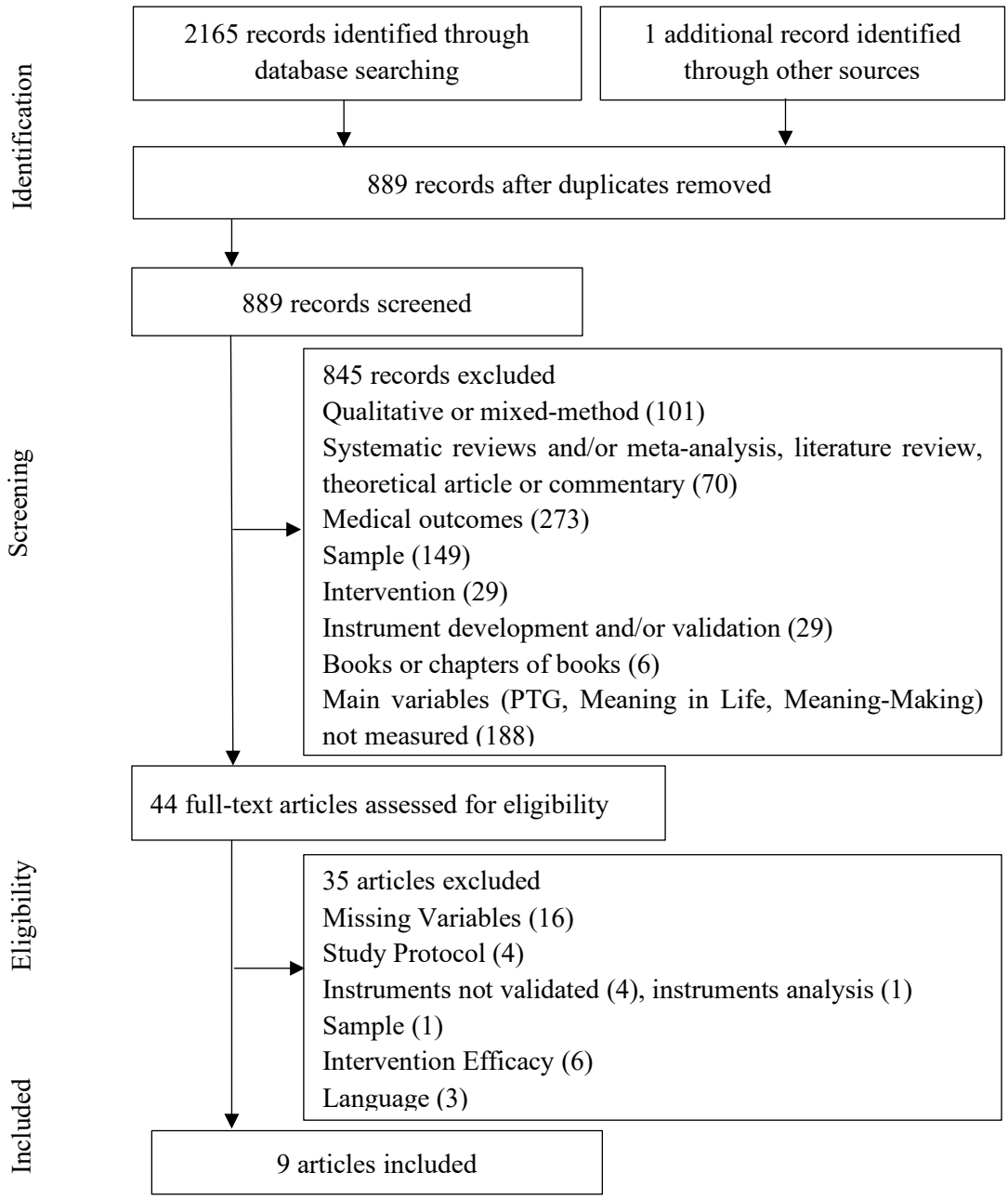
Regarding the study design, six studies were cross-sectional, two were longitudinal and two studies applied both a cross-sectional and a longitudinal design. One of the studies with a longitudinal design, reported cross-sectional correlations between the MiL and PTG. For that

reason, the study was considered as cross-sectional for the purpose of the meta-analysis. Due to the fact that only one study had a longitudinal design, the meta-analysis was conducted only with cross-sectional studies.

Data collection was predominantly achieved with the collaboration of hospitals and cancer centers where patients were recently diagnosed and treated for cancer (*n*= 7). The two remaining studies recruited the sample through social networking, by sharing the study in social media and cancer groups.

Figure 3.

Flow diagram displaying the study selection process based on PRISMA guidelines.



Sample Characteristics

A total of 1172 cancer patients were included in this meta-analysis. Approximately 80% of the participants were diagnosed with breast cancer. Regarding sociodemographic characteristic 74% of the participants were female, with a mean age of 53 years old (*SD* = 5.05). Most participants of included studies were in a relationship (71%, *n* = 1303, *k* = 8) and had a college degree (45%, *n* = 1148, *k* = 7). Further characteristics are present in Table 2 for consultation.

Outcome Measures

PTG was more commonly assessed through the Posttraumatic Growth Inventory (PTGI, *n* = 6). Other measures used for PTG were the Perceived Benefits Scale (*n* = 2), the Benefit Finding Scale (*n* = 1), and the Stress Related Growth Scale (*n* = 1).

There are a number of instruments that measure MiL, the more recent articles applied the Meaning in Life Questionnaire (*n* = 3). The authors also applied the Perceived Personal Meaning Scale (*n* = 2), the Personal Meaning Profile (*n* = 1) and the Personal Meaning Index (*n* = 1) to measure the concept. Regarding MM, there has not been developed or validated an instrument to measure the process. The authors chose therefore to apply the positive reframing coping subscale of Brief COPE.

Regarding the correlation between variables, two studies did not establish a direct correlation between MiL and PTG (Loeffler et al., 2018; Shand et al., 2018). On the other hand, some studies, through regression analysis, showed a direct (*n* = 3) or indirect (*n* = 1) relationship between MiL and PTG. Other outcomes were also considered for their possible connection to MiL and PTG, such as life satisfaction (*n* = 3), anxiety and depression (*n* = 2). Additionally, researchers showed a tendency to assess the association between PTG and social support (*n* = 3), and between MiL and religion or spirituality (*n* = 4).

Table 2.

Details of Included Articles

Study (Authors, date)	Country	*N*	Cancer	Time since diagnosis	Data Collection	Age *M* (*SD*)	Gender (*n*, %)	Other Characteristics	Outcomes
Kallay (2006)	Romania	36	breast, colorectal, and prostate	4 to 5 months	Cancer Institute	55.66	Female (*n*=23; 64%) Male (*n*=13; 37%)		Meaning in Life Posttraumatic Growth Depression Distress
Park et al. (2008)	EUA	250	breast (47%), prostate (12%), colon/rectal (6%), lymph nodes (5%), cervix/uterus (4%), others (24%)	NR	Hospital Data Base	T1: 45.2	Female (*n*=172; 69%) Male (*n*=78; 31%)	88% Caucasian 73% Married or cohabiting 72.7% College Educated	Positive Reframing (Meaning-Making) Meaning in Life Posttraumatic Growth Consistency of Just-World Beliefs Repetitive Thoughts Psychological Well-Being
Thuné-Boyle et al. (2011)	United Kingdom	155	breast	Recent diagnosis	Hospital	56 (13.5)	Female (*n*=155; 100%)	81% Caucasian 44% Married	Non-Religious Coping (Meaning-Making) Benefit Finding Religious/Spiritual Beliefs Private and Public Religious/Spiritual Practice Religious Coping Spiritual Involvement Spiritual Support Optimism Social Support
George & Park (2013)	EUA	T1= 250 T2= 167	breast (47%), prostate (12%), colon/rectal (6%), lymph nodes (5%), and cervix/ uterus (4%)	*M* = 3.5 years	Hospital Data Base	T2: 46.34 (6.29)	Female (*n*=108; 65%) Male (*n*=59; 35%)	89% Caucasian 73% Married or cohabiting 71% College Educated	Meaning in Life Posttraumatic Growth T1 Predictors: Religiousness, Spirituality, Social Support, Goal Violations, Belief Violations, Optimism, Stressful Life Experiences T2 Predictors: Intrusions, Posttraumatic Depreciation, Positive

Study (Authors, date)	Country	*N*	Cancer	Time since diagnosis	Data Collection	Age *M* (*SD*)	Gender (*n*, %)	Other Characteristics	Outcomes
									and Negative Affect, Satisfaction with Life Purpose of Life
Loeffler et al. (2018)	Germany	65	Breast	Close to 1 year	Cancer Center	60.5 (11.7)	Female (*n*=65; 100%)	78% Married or cohabiting 24% College Educated	Meaning in Life Posttraumatic Growth Anxiety and Depression Satisfaction with Life Health-Related Quality of Life Cancer specific Quality of Life (physical, role emotional and social functioning, fatigue, pain)
Shand et al. (2018)	Australia	108	Ovarian	*M* = 37.64 months	Social Network	56.36 (10.36)	Female (*n*=108; 100%)	69% In a relationship 57% College Educated	Coping (including meaning-centred coping) Posttraumatic Growth Posttraumatic Stress Disorder Quality of Life Social Support Depression Anxiety Optimism
Aflakseir et al. (2018)	Iran	196	Breast	18 months	Clinic	52 (12.32)	Female (*n*=196; 100%)	80% Married or cohabiting 48% Inferior to Secondary School	Meaning in Life Posttraumatic Growth Social Support
Moghadam et al. (2021)	Iran	213	Breast	6 months to 4 years	Hospitals Data Base	52(16)	Female (*n*=213; 100%)	69.6% Married or cohabiting 27.4% College Educated	Meaning in Life Posttraumatic Growth Positive Reappraisal Problem-based and Emotion-based Coping Core Beliefs Rumination Negative and Positive Religious Coping Social Support Denial Self-Distraction

Study (Authors, date)	Country	*N*	Cancer	Time since diagnosis	Data Collection	Age *M* (*SD*)	Gender (*n*, %)	Other Characteristics	Outcomes
Mostarac & Brajković (2022)	Croatia	149	breasts (38.2%), lymphatic system (22.1%), mouth, pharynx and larynx (17.4%), others (0.2%)	NR	Social Network	49.18	Female (*n*=105; 70%) Male (*n*=44; 30%)	65% In a relationship 41.7% Secondary School	Meaning in Life Posttraumatic Growth Satisfaction with Life

Literature Overview

Table 3 shows the main results involving MiL, MM and PTG obtained by the 9 studies included. The majority of the studies, except for two, assess the correlation between either MiL or MM to PTG. Four of them go beyond by assessing the direct or indirect relationship between these variables.

All studies found a positive significant correlation between MiL and PTG. Two studies found a direct significant effect of MiL in PTG (Aflakseir et al., 2018; Moghadam et al., 2021). Moghadam et al. (2021) shows that the relationship between MiL and PTG is positive for the presence of MiL ($\beta = 0.16$, $p = 0.001$), but negative for the search for meaning ($\beta = -0.12$, $p = 0.001$). Additionally, Mostarac and Brajković (2022) suggest that the search for meaning explains approximately 20% of PTG, while Aflakseir et al. (2018) refers that MiL and social support together explain 34% of PTG.

In regard to the relationship between MM, only one study assessed its effects on PTG. Park et al. (2008) found a direct effect of MM on PTG, more specifically, they found this effect to be positive when cross-sectional ($\beta = 0.44$, $p \leq 0.05$) but negative with a longitudinal design ($\beta = -0.26$, $p \leq 0.05$). Nevertheless, MM at Time 1 and MM at Time 2 when combined explained 33% of the variance of PTG.

Religion and Spirituality

MiL and PTG were assessed by some studies for their association with other variables, such as religion and spirituality. These studies point to a positive correlation between PTG, MiL, and MM and religion and spirituality.

George and Park (2013) suggest that MiL is positively correlated with religion and spirituality, adding that daily spiritual experiences have a positive effect on MiL ($\beta = 0.28$, $p \leq 0.05$). Thuné-Boyle et al. (2011) found MM and PTG to be positively correlated to religion/spirituality. Kallay's (2006) study on the other hand showed that one of the subscales of the Personal Meaning Profile, related to religious MM, had a strong correlation with PTG ($r = 0.70$, $p < 0.01$). Additionally, according to Moghadam et al. (2021) negative religious coping has a negative significant effect on PTG ($\beta = -0.49$, $p < 0.001$).

Social Support

Social support is more commonly associated with PTG. Indeed four studies showed social support to be positively correlated with PTG (Aflakseir et al., 2018; Moghadam et al., 2021; Shand et al., 2018; Thuné-Boyle et al., 2011). Shand et al. (2018) added that certain

domains of PTG, relating to others and appreciation of life, were associated with a higher perception of social support. Furthermore, Aflakseir et al. (2018) revealed that social support and MiL can explain 34% of the variance of PTG.

Anxiety and Depression

Concerning MiL, higher levels of presence of meaning were not only associated with lower levels of anxiety and depression, but predicted lower levels of depression after one year ($\beta = -0.47$, $p<0.01$; Loeffler et al., 2018). PTG also showed to have a negative correlation with anxiety and depressive symptoms, indicating that lower levels of PTG were correlated with higher symptoms of depression and anxiety (Shand et al., 2018).

Life Satisfaction

Three studies found a significant positive correlation between MiL and life satisfaction (George & Park, 2013; Loeffler et al., 2018; Mostarac & Brajkovic, 2022). PTG was also positively correlated with life satisfaction, explaining 46% of life satisfaction with MiL as a mediator (Mostarac & Brajković, 2022). Through the presence of meaning, PTG shows an indirect effect on life satisfaction ($\beta = 0.25$, $p\leq0.05$). In fact, the presence of MiL explained more than 50% of the total effect of PTG on life satisfaction (Mostarac & Brajković, 2022).

Table 3.

Results of The Nine Included Articles

Study (Authors, date)	*N*	Study Design	PTG Scale	Meaning Scale	Results
Kallay (2006)	36	Cross-Sectional	SRGS PTGI	PMP	Personal meaning was positively correlated with SRG (r=0.45, $p\leq$0.001) and PTG (r=0.59, $p\leq$0.001). There was a moderate positive relationship between negative affectivity and meaning construction (r=0.32, $p\leq$0.05). There were significant correlations between most PMP sub-scales and both scales of PTG. One of the highest, significant correlations was between religious meaning making subscale (PMPREL) and PTGI (r=0.70, p<0.01), more specifically, the religious dimension of PTG (PTGIEL; r=0.71, p<0.01).
Park et al. (2008)	250	Cross-Sectional and Longitudinal T1= within 2 years since treatment; T2 = 1 year later	PBS	Brief COPE-PR PPMS	Positive Reframing (MM) and Growth were significantly correlated at Time 1 and 2 (p=0.01). MiL Time 1 was positively correlated with Growth Time 2 (r=0.20, $p\leq$0.05). MM Time 1 was not significantly correlated to Growth Time 2. The cross-sectional model revealed that MM coping was indirectly related to restoration of just-world beliefs through its relationships to growth (β=0.45, $p\leq$0.05) and to MiL (β=0.16, $p\leq$0.05). Growth was related to psychological well-being only indirectly through its relationship to MiL (β=0.29, $p\leq$0.05). MiL was related to psychological well-being directly (β=0.40, $p\leq$0.05). The longitudinal model showed that MM Time 1 was directly related to Growth (β=0.46, $p\leq$0.05) and MiL at Time 1 (β=0.15, $p\leq$0.05) and Growth Time 2 (β=-0.26, $p\leq$0.05). Growth at Time 1 was related to MiL Time 1 (β=0.29, $p\leq$0.05) and Time 2 (β=-0.19, $p\leq$0.05). At Time 2 MM was related to Growth (β=0.44, $p\leq$0.05) and MiL (β=0.14, $p\leq$0.05). MM at Time 1 and 2 explained 33% of the variance of Growth Time 2. Growth Time 1 and MM Time 2 explained 28% of the variance of MiL Time 2.
Thuné-Boyle et al. (2011)	155	Cross-Sectional	BFS	Brief COPE-PR	Religiosity/spirituality, strength of faith, private religious/spiritual practices and personal spiritual involvement were significantly and positively related to positive reframing coping (r=0.28, p< 0.0005, r=0.28, p<0.001, r=0.30, p<0.0005, r=0.32, p<0.0005 respectively) and benefit finding at three months (r=0.37; r=0.41; r=0.32; r=0.38, p<0.0005 respectively). Seeking emotional support, positive reframing and using humor were all significantly related to higher levels of benefit finding at three months (r=0.27, p<0.001; r=0.24, p<0.005; r=0.19, p<0.025 respectively).

Study (Authors, date)	*N*	Study Design	PTG Scale	Meaning Scale	Results
George & Park (2013)	T1= 250 T2= 167	Longitudinal T1= within 1 to 3 years of diagnosis; T2 = 1 year later	PBS	PPMS	MiL was positively correlated to PTG (r=0.32, p<0.01, n=152), positive affect (r=0.50, p<0.01), and life satisfaction (r=0.38, p<0.01). MiL was inversely related to posttraumatic depreciation (r=-0.31, p<0.01) and negative affect (r=-0.21, p<0.01). Time 1 religiousness (r=0.19, $p\leq$0.05, n=140) and daily spiritual experiences (r=0.17, $p\leq$0.05) were positively correlated with Time 2 MiL. Time 2 MiL was significantly predicted by daily spiritual experiences (β=0.28, $p\leq$0.05, n=158).
Loeffler et al. (2018)	65	Longitudinal T1= 1 year after treatment; T2 = 1 year later	PTGI	MILQ-P	Presence of MiL was related to lower levels of anxiety (r=-0.43, p<0.01) and depression (r=-0.64, p<0.01), a higher level of satisfaction with life (r=0.44, p<0.01) and better health-related functioning in terms of role functioning (r=0.31, p<0.01), emotional distress (r=0.34, p<0.01) and social functioning (r=0.27, $p\leq$0.05). A higher presence of meaning 1 year after therapy predicted lower levels of depression another year later (β=-0.47, p<0.01). Most indicators for well-being were not significantly correlated with PTG.
Shand et al. (2018)	108	Cross-Sectional	PTGI	Brief COPE-MCC	Higher scores on the three PTSD subscales (avoidance, intrusion, and hyperarousal) and lower scores on three PTG subscales (relating to others, personal strength, and appreciation of life) were associated with higher levels of depressive and anxiety symptoms and avoidant coping. Higher PTSD symptoms but lower PTG scores were associated with lower levels of optimism, perceived social support, meaning-centered coping, and quality of life. Higher intrusive symptoms and PTG were associated with higher levels of anxiety symptoms, and coping through social support and meaning. Lower scores on the PTSD intrusion subscale and higher scores on the spiritual changes PTG subscale were associated with higher levels of depressive symptoms, and lower levels of coping through social support. Higher scores on PTG domains relating to others and appreciation of life were associated with higher perceived social support through social support coping.
Aflakseir et al. (2018)	196	Cross-Sectional	PTGI	PMI	There was a significant correlation between social support (r=0.37, p<0.001), personal meaning (r=0.33, p<0.001), and PTG. Social support (β=0.19, p=0.05) and meaningfulness (β=0.26, p=0.03) significantly predicted PTG. The model accounted for 34% of the variance in PTG.
Moghadam et al. (2021)	213	Cross-Sectional	PTGI	MLQ-S MLQ-P	PTG was significantly correlated with search for MiL (r= -0.18, p=0.01) and presence of MiL (r= -0.45, p=0.01). The presence and search for MiL were also correlated (r=0.38, p=0.01). The proposed model, which included positive reappraisal, mental rumination, social support, coping skills, spirituality and religious coping, explained 90% of the PTG variance.

Study (Authors, date)	*N*	Study Design	PTG Scale	Meaning Scale	Results
					Presence of MiL (β=0.25, p=0.001) and search for MiL (β=-0.25, p=0.001) had a significant effect on Positive Re-evaluation. Positive Re-evaluation, in addition to its direct effect on PTG, was a mediator between PTG and core beliefs, positive and negative religious coping, presence and search for MiL, and deliberate rumination. Problem-based coping, emotion-based coping, core beliefs, social support, presence of MiL (β=0.16, p=0.001), and deliberate rumination had a positive and significant effect on PTG. Intrusive rumination, negative religious coping, and search for MiL (β=-0.12, p=0.001) had a negative and significant effect on PTG.
Mostarac & Brajković (2022)	149	Cross-Sectional	PTGI	MILQ	PTG is positively correlated with the presence of MiL (r=0.44, p<0.01), the search for MiL (r=0.46, p<0.01) and life satisfaction (r=0.46, p<0.01). The search for MiL explained about one-fifth of the variability of occurrence of positive changes. The presence of MiL and the search for MiL are positively intercorrelated (r=0.34, p<0.01) and positively correlated with life satisfaction (r=0.37, p<0.01; r=0.65, p<0.01, respectively). 46% of the variance in life satisfaction was explained by the PTG and specific mediator (mediator – MLQ-P: Adjusted r^2=46.18, F(2, 146)=62.64, p<0.001 / mediator – MLQ-S: Adjusted r^2=45.80, F(2, 146)=19.38, p<0.001). The indirect effect of the PTG on life satisfaction was significant only through the presence of meaning (β = 0.25, p≤0.05, standardized SE = 0.07, standardized 95% CI = [0.12, 0.38]). The indirect effect through the presence of meaning in life explained 53.5% of the total effect of the PTG on life satisfaction.

Notes. PBS – Perceived Benefits Scale; PTG – Posttraumatic Growth; PTGI – Posttraumatic Growth Inventory; PPMS – Perceived Personal Meaning Scale; MiL – Meaning in Life; MILQ – Meaning in Life Questionnaire; MILQ-P – Meaning in Life Questionnaire – Presence; Brief COPE-PR – Positive reframing subscale from Brief COPE; Brief COPE-MCC – Meaning-centered coping subscale from Brief COPE; SRG – Stress-Related Growth; SRGS – Stress-Related Growth Scale; PMP – Personal Meaning Profile; PMI – Personal Meaning Index; BFS – Benefit Finding Scale; NR – Not reported

Quantitative Synthesis: Meta-Analysis

Considering that only two studies assess the concept of MM, and that the instruments used are not design to specifically measure the concept, only one meta-analysis was conducted between MiL and PTG. Table 4 shows the correlation coefficients extracted from the articles included in the systematic review.

Table 4.

Meaning in Life and Meaning-Making correlations to Posttraumatic Growth.

Study (Authors, date)	Study Design	MiL Correlation Coefficient (*r*)	MM Correlation Coefficient (*r*)	*N*
Kallay (2006)	Cross-Sectional	0.59	-	36
Park et al. (2008)	Cross-Sectional	0.36	0.46	250
Thuné-Boyle et al. (2011)	Cross-Sectional	NR*	0.24	155
George & Park (2013)	Cross-Sectional	0.32*	-	152
Loeffler et al. (2018)	Longitudinal	NR*	-	65
Shand et al. (2018)	Cross-Sectional	NR*	-	108
Aflakseir et al. (2018)	Cross-Sectional	0.33	-	196
Moghadam et al. (2021)	Cross-Sectional	0.45	-	213
Mostarac & Brajković (2022)	Cross-Sectional	0.44	-	149

Notes. NR: Not Reported; *Not included in meta-analysis

From the nine studies considered, only five were included in the meta-analysis (n = 844). Three studies had lack of data which did not allow to determine the association between the variables (Loeffler et al., 2018; Shand et al., 2018; Thuné-Boyle et al., 2011). Two studies (George & Park, 2013; Park et al., 2008) shared the same sample. In order to ensure the independence of the sample, the article with the smaller sample size was excluded (George & Park, 2013). Park et al. (2008) included results for two different times, only the first cross-sectional correlation was included. Kallay (2006) used two different instruments to measure PTG – Stress Related Growth Scale and Posttraumatic Growth Inventory. The authors decided to include only the correlation with the PTGI, considering that it is the most used instrument for PTG in the included studies. Two articles had correlations between PTG and the presence and search for meaning (Moghadam et al., 2021; Mostarac & Brajković, 2022). Based on the construct of MiL defined in the inclusion criteria, only the data for the presence of meaning was considered.

Effect Size

Table 5 shows the results obtained from the meta-analysis, including the main effect size for the correlation between MiL and PTG. MiL was significantly correlated with PTG, revealing a medium effect size (r = 0.43, 95% CI [0.36, 0.50], $p \leq 0.001$).

Table 5.

Mean effect sizes of Meaning in Life in Posttraumatic Growth

	k	ES	95% CI	Z	Q	I^2	Egger's Test
Meaning in Life	5	0.43*	[0.36, 0.50]	11.9*	5.056	5.23%	1.615

Notes. k = number of studies; *ES* = Effect Size (mean weighted correlation coefficient); CI = confidence interval; Q = test of homogeneity; I^2 = proportion between studies variability; Egger's test = Egger's regression test of publication bias. * $p < 0.001$

Heterogeneity

The Q test suggested that there was no significant amount of heterogeneity (Q = 5.056, df = 4, p = 0.282), which suggests that the differences observed can be due to sampling error alone. The I^2 was bellow 25%, indicating a low level of heterogeneity and no substantial differences between studies. The forest plot represented in Figure 4 shows the correlation and confidence interval of each study, as well as their impact on the overall effect size represented in the last line. From the size of the black boxes, it is possible to say that the study of Kallay (2006) was the one with the smaller weight. Moghadam et al. (2021) and Park et al. (2008) studies had a bigger impact on the true effect size. The 95% confidence interval shows that the studies point to the same direction of the estimated mean effect.

Publication Bias

The visual inspection of the funnel plot (Figure 5) does not show an asymmetry, indicating the inexistence of bias due to the variability of the individual studies. Considering the small number of studies and the subjective nature of the funnel plot analysis, the Eggers Regression was used to confirm the absence of publication bias. The Egger's test was not statistically significant (Egger's test = 1.615, p = 0.106) confirming the examination of the funnel plot. The absence of publication bias strengthens the internal validity of the meta-analysis.

Figure 4.

Forest plot for heterogeneity assessment (Source: JAMOVI)

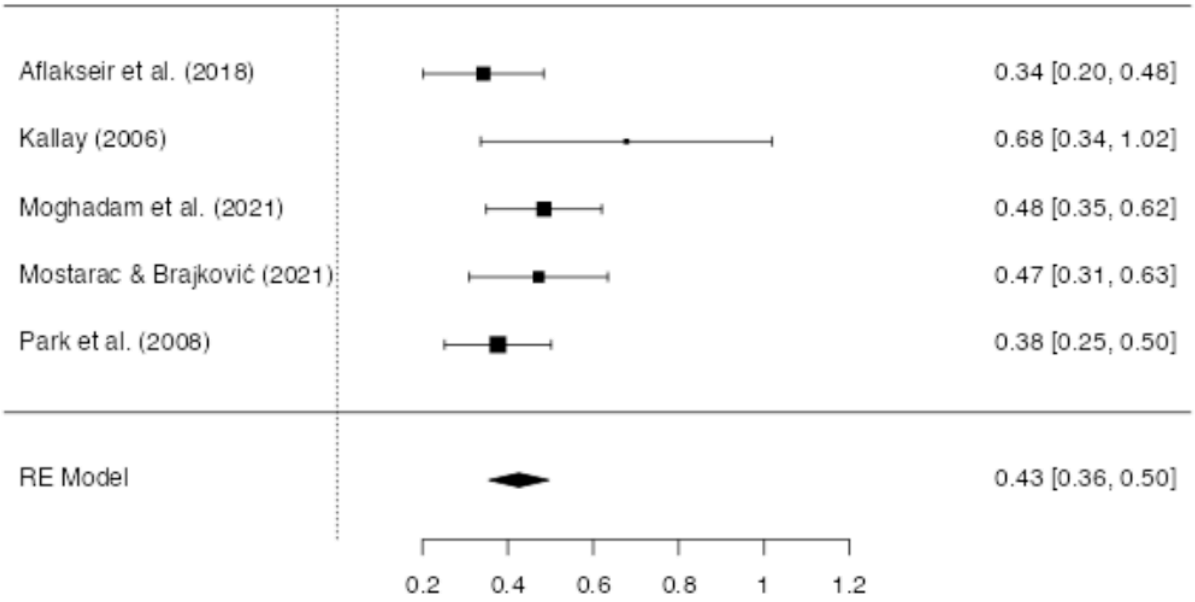
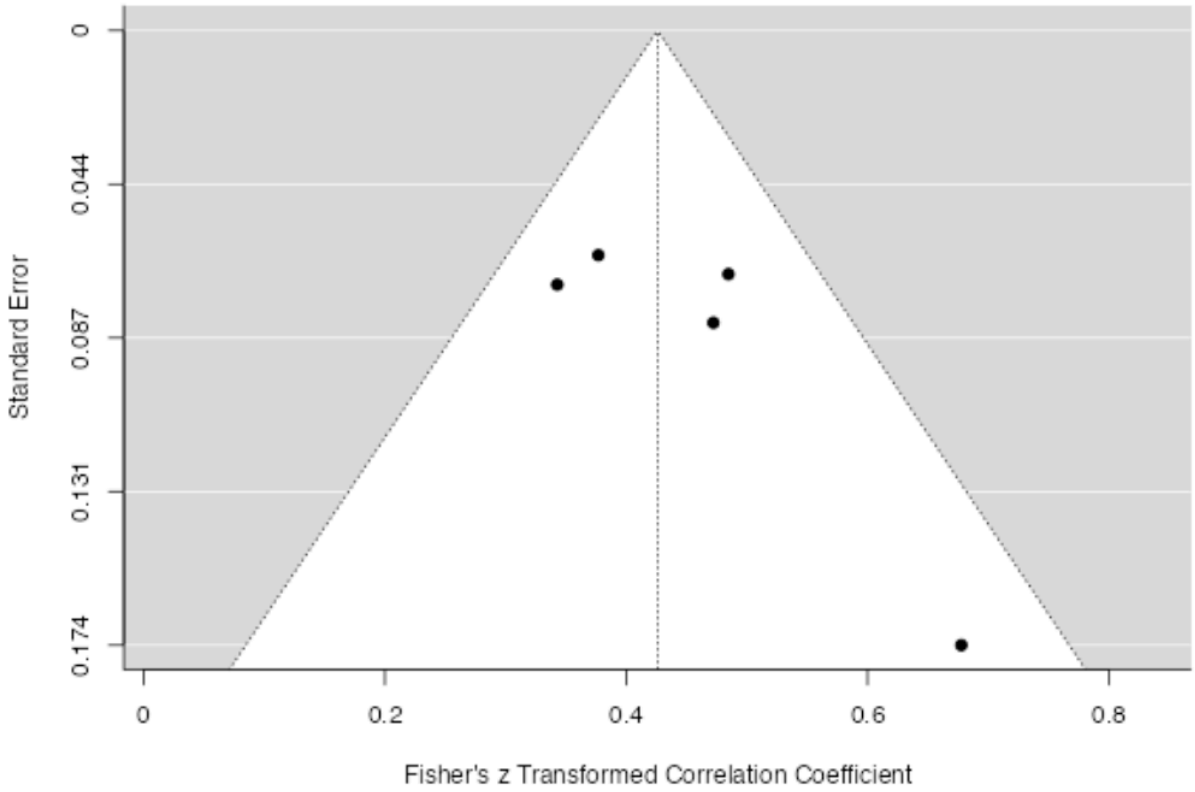


Figure 5.

Funnel plot for publication bias assessment (Source: JAMOVI)



Discussion

The aim of the present review was to analyze the empirical literature concerning meaning in life and posttraumatic growth in adult cancer patients. The inclusion of a meta-analysis allowed to further assess the association between these two variables. To our knowledge, this is the first meta-analysis to evaluate the correlation between MiL and PTG, and to summarize the relationship found between these variables. A previous systematic review on psychological and clinical correlates of PTG in cancer patients suggested that meaning was linked PTG (Casellas-Grau et al., 2017). There was, however, no clear distinction and definition of the concept of MiL which resulted in the inclusion of articles that mostly considered PTG and meaning to be either synonyms or part of the same concept. Without a differentiation of these concepts, it is not possible to properly assess the influence and impact that they have on each other. When a study tries to examine the impact of one variable that is perceived as an integrant part of the other, then there is no surprise that they will both be correlated. It is the same as using two different instruments to study one and the same concept.

Meaning is a vital part of the human existence, while PTG is specific to the context of stressful life events. Seeing as they are distinct concepts with different implications, as was presented in the beginning of this article, this meta-analysis ensured that the inclusion criteria made a clear distinction of these concepts. In consequence, the studies were included only if they used separate and validated instruments to assess the concepts of MiL and PTG. It was this that allowed to extract and analyze solely the articles that perceived these variables as different concepts.

The ability to live meaningfully allows people to have a better perception of their life experiences, including their health. It is for this reason that meaning has been associated with better health indicators (Roepke et al., 2014) and increased well-being (Dezutter et al., 2013; García-Alandete, 2015; Krok, 2015; Visser et al., 2010). In cancer patients, MiL has been shown to have a positive impact on their illness perception (Krok et al., 2019; Krok & Telka, 2017), acceptance of cancer (Quinto et al., 2022), and in lowering the distress levels (Winger et al., 2016). The literature has showed that MiL is related to a number of factors that ultimately impact a cancer patient' adjustment and experience. Some of the studies included in this systematic review have also shown a relationship between MiL and religion/spirituality, anxiety, depression and life satisfaction. Two of the included studies showed that not only is spirituality positively correlated (Thuné-Boyle et al., 2011) but also a predictor of higher levels

of MiL (George & Park, 2013). Other studies have supported these findings. A study with cancer and heart failure patients found spirituality to have a positive impact on meaning (George & Park, 2017). While another study with advanced cancer patients showed that a higher MiL was associated with lower spiritual pain (Gravier et al., 2019). The relationship between these two variables appears, therefore, to go both ways. Spirituality, as a feeling of transcendence and connection, may facilitate a higher sense of MiL. On the other hand, experiencing MiL can also improve spiritual well-being in times of adversity. Regarding the relationship between MiL and anxiety and depression, Loeffler et al. (2018) found that MiL is a predictor of lower levels of anxiety and depression. This relationship has been evidenced in other studies with cancer patients (e.g., Dursun et al., 2022; Elekes, 2017; Vehling et al., 2011). There may be however a more complex connection between these three variables, specifically concerning the meaning of the illness itself. A longitudinal study with a focus on sources of meaning revealed that while most sources predicted lower levels of anxiety and depression, other meanings, such as 'leaving a legacy', predicted higher levels (Scheffold et al., 2014).

As the studies in this review show, MiL has a correlation to a variety of other variables besides PTG. And these variables can ultimately influence and impact the well-being and psychological adjustment to cancer. However, despite the numerous evidence regarding the relationship between MiL and mental health indicators, the literature would benefit from further examination of the mechanisms behind meaning. For instance, presence and search for MiL appear to have different and even inverse correlation with certain variables (Steger, 2018), such as well-being and cancer acceptance (Dezutter et al., 2013). This was evidenced in Moghadam et al. (2021) study, where search for meaning was negatively correlated with PTG, while the presence of MiL yielded a positive correlation. Some studies however do not show this inverse tendency, as in the study of Mostarac and Brajković (2022), where both presence and search for meaning where positively related to life satisfaction. The incoherence between studies can be due to the complexity of the interaction between presence and search for meaning. More comprehensive studies have suggested that a higher search for meaning can only lead to higher levels of well-being and life satisfaction when there is already a high presence of MiL. However, for a person with a low presence of MiL, the search for meaning can be a stressful experience that leads to a worse well-being, than experiencing a low presence and low search for meaning (Dezutter et al., 2013; Krok & Telka, 2017; Park et al., 2010). As it was stated before, meaning is a part of the human existence, it is how individuals are able to make sense of the world they live in. Without personal meaning, one will feel out of place or void, more commonly named a "meaningless existence". In this case, when a person is faced with an

adversity, as a cancer diagnosis, and there is a lack of foundation there will be an increased difficulty in coping and adjusting to the situation. This occurs as the news of cancer highlight the void of meaning, generating distress and consequently leading to symptoms of anxiety and depression. On the other hand, when there was already a presence of meaning, previous to the illness, the diagnosis of cancer can be distressful, but as one searches for meaning in the illness and adjusts this meaning to their overall MiL, the level of distress will subdue. Finding meaning in an adverse experience is the first step to not only adjust to it but possibly grow from it.

The ability to grow from an experience can be considered the best outcome which is why in the last two decades the focus of research has shifted from posttraumatic stress to PTG. Numerous studies have explored the correlates and predictors of PTG in cancer patients, in an attempt to develop and guide psychosocial interventions that could lead these patients to a positive outcome. Several systematic reviews and meta-analysis have summarized and analyzed the literature on the subject (e.g., Casellas-Grau et al., 2017; Li et al., 2020; Turner et al., 2018; Yastıbaş & Karaman, 2021). In the present review the included studies found a positive correlation between PTG and spirituality (Kallay, 2006; Moghadam et al., 2021; Thuné-Boyle et al., 2011), social support (Aflakseir et al., 2018; Moghadam et al., 2021; Shand et al., 2018; Thuné-Boyle et al., 2011) and life satisfaction (Mostarac & Brajković, 2022). Other systematic reviews have also shown that higher levels of PTG are related to higher levels of positive outcomes, such as optimism, spirituality, positive affect and hope (Casellas-Grau et al., 2017; Turner et al., 2018; Yastıbaş et al., 2021). Additionally, Casellas-Grau et al. (2017) systematic review revealed that most articles find a negative correlation between PTG and symptoms of depression and anxiety. This supports the findings of Shand et al. (2018), which suggest that PTG can ease depressive and anxious symptoms, so prevalent in the cancer population. Regarding the predictors of PTG, the most frequent in the literature is social support (Turner et al., 2018; Yastıbaş et al., 2021), which explains why so many of the included studies in this review also revealed a positive correlation between these two variables.

Research on psycho-oncology has studied the impact of MiL and PTG as independent variables, on a variety of other health related outcomes. There seems to be, however, a growing interest in the relationship between these two variables. And as the scientific literature started to assess and see a relationship between MiL and PTG, the research begun to explore this relationship further in a variety of contexts, including cancer patients. In this analysis, all the empirical studies included revealed a significant positive correlation between MiL and PTG,

resulting in an overall moderate effect size. In other words, a higher perception of MiL is associated with higher levels of PTG in cancer patients.

Moreover, the studies included in this review not only pointed to a positive correlation between MiL and PTG in cancer patients, but also showed a direct relationship between MiL and PTG (Aflakseir et al., 2018; Moghadam et al., 2021; Mostarac & Brajković, 2022). This suggests that MiL may play a role in facilitating and promoting PTG in cancer patients. Despite the fact that experiencing an adverse situation can be unsettling, and meaning can get called into question, it is the struggle to find meaning in cancer and to adjust to it that can promote personal change, in a variety of domains. Other studies have been able to find the same correlations across a variety of contexts and samples, such as survivors of natural disasters (e.g., Boullion et al., 2020; Dursun et al., 2022; Weber et al., 2020) or witnesses of extremely violent events (e.g., Aliche et al., 2019; Seol et al., 2021). In addition to cancer patients, the research on the relationship between MiL and PTG has also focused on similar experiences, like individuals with chronic illness (e.g., Wang et al., 2021; Zeligman et al., 2018).

There is undoubtedly a positive relationship between MiL and PTG, as the results of the studies included in this meta-analysis point. Higher levels of meaning, in people who have undergone a traumatic experience or an adverse situation, are associated with higher levels of PTG. There is however still much to uncover regarding the relationship between these two variables, more specifically, how they relate and influence one another. In the context of an illness, it is also important to explore the possible differences caused by personal and illness characteristics (e.g., age, gender, illness stage and related symptoms).

Nevertheless, the research can only meaningfully impact the clinical practice if a consensus arises regarding the definition and distinction of these concepts. The scientific literature is particularly inconsistent in the conceptualization of MiL. Some use meaning as a synonym for spirituality, and some even see meaning as an equivalent of posttraumatic growth. There is however a difference between experiencing MiL, finding meaning in an adverse situation or experiencing positive personal changes caused by stressful situation. The model of meaning-making (Park & Folkman, 1997) seems to have brought confusion to the distinction between MiL and PTG. However, MiL, MM and PTG are all distinct concepts and should be seen as such. While MiL relates to the presence of meaning in one's life, which includes a sense of purpose and a feeling of coherence and importance of life, MM is a process of search for meaning (Steger, 2018). Defined by Park and Folkman (1997), MM describes how a person can attempt to search for a meaning in a traumatic event that she can incorporate into her global MiL. On the other hand, PTG refers to the psychological processes that lead to an individual's

growth as a result from the struggle with a highly challenging circumstance (Tedeschi et al., 2018). In the process of PTG, it is during deliberate rumination that meaning can play a more active role by providing a meaning to the event that will facilitate its integration in the life narrative of the cancer patient. Additionally, having a strong sense of MiL previous to the diagnosis may also provide the necessary support and strength to only adjust to the cancer experience and find meaning in it, but also favor the development of personal growth.

Without a consensus or the awareness of these distinctions, we will keep seeing studies assess these concepts with different perspectives and measures, which will prevent us from truly grasping the impact and relationship between meaning and PTG in cancer patients or other populations. It is in fact the discrepancies between studies that represent the reason behind most of the limitations of this systematic review and meta-analysis.

Limitations and Future Research

A meta-analysis can be performed as long as there are two studies (Valentine et al., 2010). Despite this, the inclusion of a small number of studies limits the strength and further analysis of the relationship between MiL, PTG and its correlates. Considering the heterogeneity of the cancer population it would be relevant to determine if there are significant differences when adding other factors to the analysis, such as age, gender, cancer type, stage or time since diagnosis. However, not all of the included studies showed consistent information regarding these individual differences and cancer characteristics, which is why they were not taken into account for this meta-analysis. Regardless, these factors can influence either one of the variables, as it has been shown in the correlation found between time since diagnosis and PTG (Cordova et al., 2001; Cormio et al., 2017; Danhauer et al., 2013). It would be interesting to understand if and how individual, cultural and cancer differences have an influence on both MiL and PTG.

The divergences in the conceptualization of MiL also brought some limitations, especially when concerning the instruments used to assess meaning. Some studies applied the Functional Assessment of Chronic Illness Therapy – Spiritual Well-being scale (FACIT-SP), a scale that includes meaning but assesses predominantly spirituality. These studies had to be excluded seeing as they considered meaning to either be a synonym or a component of spirituality (e.g., Bi et al., 2021; Park & Cho, 2017). The included studies applied different instruments to assess MiL, which can be a threat to the validity of the results obtained by the meta-analysis. Three out of five studies used the Meaning in Life Questionnaire (MILQ) to assess MiL. Additionally, these are also the most recent articles, which points to a tendency for

the use of this instrument. Therefore, in the future the use of the MILQ would benefit the research of MiL.

Meaning-making is a complex process that involves a variety of components. But unlike PTG, there is no validated instrument that measures the entirety of the process or its outcomes (meanings made). For that reason, there are fewer studies that assess this variable. The two studies that measured MM and PTG were not considered for meta-analysis, due to the lack of a valid instrument for the concept. Taking into consideration that both MM and PTG are processes, rather than outcomes, a longitudinal approach would be more fitting for future research. A longitudinal approach would allow researchers to assess the development of this processes, as well as the impact of MiL throughout them. Additionally, it should be considered the possibility of the development of an instrument to measure the cognitive processes that underlie MM.

Clinical Implications

Meaning is undoubtedly related to PTG in cancer patients. Both MiL and PTG have shown a positive impact in several psychological outcomes, such as anxiety, depression and life satisfaction. Cancer patients have a higher risk of developing psychological disorders, specifically those related with anxiety and depression (Caruso et al., 2017). As our findings have showed MiL can have a positive or negative role in the adjustment to the illness, facilitating or not PTG. All the included studies indicated that higher levels of MiL are associated to also higher levels of PTG. On the other hand, literature has shown that the absence of meaning can not only be distressful but lead to worse health outcomes. The ability to detect patients struggling with meaning can be the key to assist these patients' adjustment to cancer, by suggesting psychology support or specialized meaning-centered interventions. The existing distress protocols do not include existential problems, such as trouble in finding the meaning of cancer. Seeing as a lack of meaning can jeopardize the emotional well-being, it would be relevant to give these patients the opportunity to express such personal concerns when there are higher levels of distress. Regarding psychotherapeutic interventions centered on meaning for cancer patients, these would possibly benefit from considering the correlates and predictors of PTG. This would allow patients to more positively adjust to the illness, as well as enhance the likelihood of occurring PTG. Meaning-centered interventions are mostly applied to advance or terminal cancer patients (Breitbart, 2002; Guerrero-Torrelles et al., 2017; Kang et al., 2019; Mok et al., 2012). The struggles with meaning, however, can emerge in all cancer patients, even those that are not in advanced stage. Meaning-centered interventions in these patients could

facilitate a better adjustment to the illness, as well as to life after cancer. For that reason, further studies on the impact of meaning throughout the different stages of cancer, that also include an analysis to the illness and individual differences (e.g., type of cancer, age, gender), may benefit the application of these interventions in all the cancer patients that show an interest and need for support in the future. Additionally, considering the role of meaning in a cancer patient experience and their potential growth, it would be relevant to develop an intervention that, in addition to its focus on meaning, incorporated the processes of PTG in order to facilitate personal growth. This intervention could explore an individual's pre-existing MiL and make use of their personal resources to assist and guide the search for meaning in cancer, while taking into consideration the sociodemographic and psychosocial characteristics and cognitive processes described by the model of PTG. This way, the more existential concerns of the patient could be addressed while providing room for the development of growth.

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APPENDIX

APPENDIX A. PRISMA 2020 Checklist (Source: Page et al., 2021)

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	I
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	V
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	17
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	17
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	18-19, Appendix B
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	20
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	20, Appendix C
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	20
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	20
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	20-21
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	20-21
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	18-21
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	21
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	21
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	21

Section and Topic	Item #	Checklist item	Location where item is reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	23
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	21-23
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	22
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	-
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	22-23
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	-
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	23, 34, Figure 3
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Appendix D
Study characteristics	17	Cite each included study and present its characteristics.	23-24, Table 2 and 3
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	-
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	29-30, Table 3 and 4, Figure 4
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	35, Figure 5
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	35, Table 5
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	35
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	-
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	35-36
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	-
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	37-40

Section and Topic	Item #	Checklist item	Location where item is reported
	23b	Discuss any limitations of the evidence included in the review.	41-42
	23c	Discuss any limitations of the review processes used.	41-42
	23d	Discuss implications of the results for practice, policy, and future research.	42-43
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	18
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	18
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	-
Competing interests	26	Declare any competing interests of review authors.	-
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	-

APPENDIX B. Inclusion and Exclusion Criteria

	Inclusion Criteria	Concepts Definition	Exclusion Criteria
Population	Cancer adult patients No restriction on gender or type of cancer.	Adult: 18 years or older. According to the WHO(1) adolescence happens between the ages of 10 to 19 years old. In most European countries and states of America, the age of majority is 18 years (2).	Studies that don't differentiate between cancer patients and other chronic patients.
Variables	Meaning in Life (MiL) Meaning-Making (MM) Posttraumatic Growth (PTG) Other variables such as social support, QoL, life satisfaction will be evaluated as study outcomes and won't be used as keywords.	MiL: Individual's perception of life as significant, with sense and a purpose. MM: The process of reappraisal and search for meaning of an event. PTG: Positive psychological changes experienced as a result of a traumatic or challenging experience.	Studies that don't contain in the titles or abstract the the words meaning in life or meaning-making and posttraumatic growth, including the derivations of these concepts.
Primary Outcomes	Meaning in Life (MiL), Meaning-Making (MM), and Posttraumatic Growth.		

Secondary Outcomes	There will be accepted any secondary outcomes evaluated in the studies included for this review. It is expected to find the follow outcomes: sociodemographic, clinical (type of cancer, cancer site, time since diagnosis), health, quality of life, social support.		
Type of Study	Quantitative and Mixed Study Randomized Controlled Trial Observational Study Comparative Study Descriptive Study, as long as it is simultaneously empirical/correlational Correlational Study Longitudinal Study		Qualitative Study Descriptive study only Systematic Review Meta-analysis Theoretical Article Case Study Study Protocol
Type of Publication	Articles of empirical studies. Articles published on national and international peer-reviewed journals.		Comments Chapters of books Abstracts of articles (it won't be accepted articles where the only section available is the abstract) Bachelor's, Master's or Phd theses. Articles that, even though they were accepted or submited, are not yet published. Abstracts of oral or written communication of Congress or Conference.

Instruments	Instruments used to evaluate Meaning in Life, Meaning-Making and Posttraumatic Growth (Perceived Benefits Scale or Posttraumatic Growth Inventory).		
Language	English Portuguese (PT or BR) Articles with abstract in Portuguese and text in English, vice-versa. Articles with an English title or abstract even if the text is in a language not accepted.		Italian German French Chinese Corean
Time Restriction	Until present time		

Notes. (1)WHO - https://www.who.int/health-topics/adolescent-health#tab=tab_1

(2)https://fra.europa.eu/en/publication/2017/mapping-minimum-age-requirements/age-majority

https://www.law.cornell.edu/wex/adult

APPENDIX C. Combination of keywords used on search for articles

1	Cancer
2	Oncological Disease
3	Neoplasm
4	Tumour
5	Tumor
6	1 OR 2 OR 3 OR 4 OR 5
7	Posttraumatic Growth
8	Post-traumatic Growth
9	Benefit Finding
10	Positive Life Changes
11	Stress-Related Growth
12	Perceived Benefits
13	Existential Growth
14	7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13
15	Meaning*
16	Existential Meaning
17	Purpose
18	Meaning-Making
19	Meaning Making
20	Search* for Meaning
21	15 OR 16 OR 17 OR 18 OR 19 OR 20
22	6 AND 14 AND 21

APPENDIX D. Excluded articles based on full text analysis

Reference	Reason for exclusion
Aderhold, C., Morawa, E., Paslakis, G., & Erim, Y. (2019)	Meaning is not a variable
Andrykowski, M. A., Aarts, M. J., van de Poll-Franse, L. V., Mols, F., Slooter, G. D., & Thong, M. S. (2013)	Meaning and PTG are not variables
Bi, W., Wang, H., Yang, G., & Zhu, C. (2021)	Instrument measures spirituality
Cafaro, V., Iani, L., Costantini, M., & Di Leo, S. (2019)	Study Protocol
Campo, R. A., Wu, L. M., Austin, J., Valdimarsdottir, H., & Rini, C. (2017).	PTG is not a variable
Carlson, L. E., Tamagawa, R., Stephen, J., Drysdale, E., Zhong, L., & Speca, M. (2016)	Intervention Efficacy
Caruso, R., Nanni, M. G., Rodin, G., Hales, S., Malfitano, C., De Padova, S., Bertelli, T., Murri, M. B., Bovero, A., Miniotti, M., Leombruni, P., Zerbinati, L., Sabato, S., & Grassi, L. (2020)	Study Protocol
Davis, L. Z., Cuneo, M., Thaker, P. H., Goodheart, M. J., Bender, D., & Lutgendorf, S. K. (2018)	PTG is not a variable
Faustova A. G. (2020)	Meaning construct (purpose)
Gan, Y., Zheng, L., Wang, Y., & Li, W. (2018)	Instrument not validated
Hamama-Raz, Y., Pat-Horenczyk, R., Roziner, I., Perry, S., & Stemmer, S. M. (2019)	Meaning is not a variable
Holtmaat, K., van der Spek, N., Lissenberg-Witte, B., Breitbart, W., Cuijpers, P., & Verdonck-de Leeuw, I. (2019)	Intervention Efficacy
Holtmaat, K., van der Spek, N., Lissenberg-Witte, B. I., Cuijpers, P., & Verdonck-de Leeuw, I. M. (2019)	Instrument Analysis
Jang, S. H., Lee, H. R., Yeu, H. N., & Choi, S. O.	Language
Kállay, É., & Băban, A. (2008)	Intervention Efficacy
Kim, Y., & Hwang, B. (2021)	Language
Kissane, D. W., Lethborg, C., Brooker, J., Hempton, C., Burney, S., Michael, N., Staples, M., Osicka, T., Sulistio, M., Shapiro, J., & Hiscock, H. (2019).	Intervention Efficacy
Labelle, L. E., Lawlor-Savage, L., Campbell, T. S., Faris, P., & Carlson, L. E. (2015)	Intervention Efficacy
Li, W. J., Miao, M., Gan, Y. Q., Zhang, Z. J., & Cheng, G. (2016)	Meaning construct (meaning discrepancy)
Li, Y. C., Yeh, P. C., Chen, H. W., Chang, Y. F., Pi, S. H., & Fang, C. K. (2015)	Instrument not validated

Lo, C., Hales, S., Rydall, A., Panday, T., Chiu, A., Malfitano, C., Jung, J., Li, M., Nissim, R., Zimmermann, C., & Rodin, G. (2015)	Study Protocol
Moreno, P. I., Dooley, L. N., & Bower, J. E. (2018)	Meaning construct (eudaimonic wellbeing)
Morris, B. A., & Shakespeare-Finch, J. (2011)	Meaning is not a variable
Park, C. L., & Cho, D. (2017)	Sample (adolescents)
Ponto, J. A., Ellington, L., Mellon, S., & Beck, S. L. (2010)	Meaning construct (meaning of illness)
Raheme, S., & Reza, D. G. (2018)	Language
Rinaldis, M., Pakenham, K. I., & Lynch, B. M. (2012)	Meaning is not a variable
Scheffold, K., Philipp, R., Engelmann, D., Schulz-Kindermann, F., Rosenberger, C., Oechsle, K., Härter, M., Wegscheider, K., Lordick, F., Lo, C., Hales, S., Rodin, G., & Mehnert, A. (2015)	Study Protocol
Taha, S. A., Matheson, K., & Anisman, H. (2012)	Meaning and PTG are not variables
Thombre, A., Sherman, A. C., & Simonton, S. (2010)	Instrument not validated
Tonsing, K. N., & Ow, R. (2018)	Meaning and PTG are not variables
Trzebiński, J., & Zięba, M. (2013)	Meaning is not a variable
van der Spek, N., Vos, J., van Uden-Kraan, C. F., Breitbart, W., Cuijpers, P., Holtmaat, K., Witte, B. I., Tollenaar, R., & Verdonck-de Leeuw, I. M. (2017)	Intervention Efficacy
Wang, Y., Gan, Y., Miao, M., Ke, Q., Li, W., Zhang, Z., & Cheng, G. (2016)	Instrument not validated
Zebrack, B. J., & Chesler, M. A. (2002)	Meaning and PTG are not variables