UNIVERSITÀ CATTOLICA DEL SACRO CUORE

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Ciclo XXXV

S.S.D: M-PSI/03

INVESTIGATING DYNAMICS OF CHANGE OF PSYCHOLOGICAL PROCESSES WITHIN A COMPLEXITY FRAMEWORK: APPLICATION TO THE MEANING-MAKING PROCESS

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INTRODUCTION

Research in psychology is concerned with studying the functioning of phenomena that are generally defined as psychological processes. But what are psychological processes? Three are the fundamental characteristics of psychological processes that make them an extremely complex and articulated object of study: being systems of interacting elements; being governed by temporal dynamics; and being sensitive to contextual factors.

Psychological processes are systems of interacting elements

Early in the history of psychology research, psychological phenomena were defined as single undividable units, or factors, possessed by individuals in different quantities. This was the case for instance of intelligence, that, according to Spearman, consisted of one general factor, the *g-factor*, that could be measured to compare individuals. Over time, psychologists realized that psychological phenomena were much more complex than that, and mostly resembled living organisms, made of different elements in a mutual interaction (Allport, 1961; Bertalanffy, 1967). Starting from these insights, researchers started to formally define a psychological process as a "whole made of interacting components" (Bertalanffy, 1967, pp. 126), where each component plays a key role in shaping the system and is not replaceable or removable without altering the overall system functioning (Guastello & Liebovitch, 2009). Most of psychological theories were then reoriented toward a conceptualization of psychological processes as *systems of interacting elements.* Since then, the main task has been to investigate which are the cognitive, biological, and environmental factors that generates complex psychological phenomena such as personality, psychopathology, identity and attitudes (Beck & Bredemeier; 2016; Berzonsky, 2011; Borsboom et al., 2019; Dalege et al., 2017).

Psychological processes are governed by temporal dynamics

Psychological processes are not static entities, immutable over time, instead, they are governed by internal mechanism that generates change in the psychological process. Most of times, the change in the configuration of the system occurs starting from the change in a single element which then generates a chain change in the whole system (Kunnen & Bosma, 2000). In this sense, psychological processes are dynamic systems *governed by temporal dynamics*. The internal dynamics of psychological processes are very rich and varied. Some of these take the form of long-term development trajectories, so that it is possible to identify different hierarchical steps of development of the living system (e.g., according to Erikson's (1968) theory of development, there are eight psychological stages that characterize individuals' development from infancy to older adulthood). Other dynamics take place at an instantaneous level and are mainly related to the relationship of the system with the external environment (e.g., perception-action processes), or the interaction between different systems (e.g., parent-child interactions). Some of these dynamics are difficult to predict because they do not change linearly, but alternate moments of equilibrium (such being set in a comfort zone) with moments of rupture and are typical of non-linear systems (Boker et al., 2016; Guastello & Liebovitch, 2002). The temporal nature of psychological process is recognized in contemporary theory and research, whose primary task is to describe the connections between elements of the system and the changes in the system's behaviors that are generated by such dynamics (Vallacher et al., 2002).

Psychological processes are sensitive to contextual factors

Dynamical systems are hardly ever self-contained, because they are immersed in a natural context. According to Bronfenbrenner´s (1979) ecological theory of human development, the natural context can shape the trajectory of development of living organisms. In this sense, external influences such as contextual (e.g., socio-cultural context;

high- vs low-stress job context) and situational (e.g., stressful/traumatic events) factors can directly interact with the system functioning by activating or deactivating some of its inner dynamics, thus producing a change in the natural course of the psychological process (Lewin, 1936; Vallacher et al., 2002). Additionally, interindividual differences can be observed in dynamics of change (Boker et al., 2016); indeed, the same psychological process can perform in wholly different ways for different individuals (e.g., young vs adult; general vs clinical population). Moreover, it is quite common for two or more systems inhabiting the same space to interact and influence each other. This is what happens when different psychological processes (e.g., identity and self-concept development) intertwine their respective development trajectories.

The methodological challenges in the study of psychological processes

Studying psychological processes within a complexity framework entail considering the three constitutive elements together. This generates *three main methodological challenges* that researchers must hierarchically consider. The first challenge is related to *how to theoretically conceptualize* the psychological process. In other words, it is it necessary to discern the basic constitutive elements of the system from the correlates before studying the mechanisms of change of the process dynamics (Kunnen & Bosma, 2000). The second challenge is *how to measure* the dynamics of the psychological process. We all know that psychological constructs are mostly abstract concepts that need to be operationalized in order to be measured. A good measurement tool must reflect the complexity of the psychological process without oversimplifying, with a balance between parsimoniousness and completeness. The assessment tools must be complete enough to identify all the elements of the system, with a high accuracy to detect even the smallest fluctuations in temporal dynamics, and sensitive to contextual factors. The last methodological challenge is *how to investigate* the dynamics of the psychological process. This challenge concerns the planning

of the research design and the use of sophisticated statistical techniques to analyze the data collected and "make the complexity speak". In order to face this challenge, it is necessary to have solved the first two; in fact, it is not possible to study a psychological process without having first defined what it is, and it is not possible to collect information data without having the appropriate measurement tools. Furthermore, as we have anticipated, the processes have different levels of functioning and can be determined by many factors. Therefore, it is necessary to decide which dynamics of the process we are interested in and to develop an ad hoc research design. In terms of complexity, all three process characteristics should be considered in planning the research design. However, the choice of the most appropriate research design and analysis technique is closely linked to the research questions of the researcher.

Application of the complexity framework to the meaning-making process

In the current thesis the complexity framework of psychological processes will be applied to the study of the meaning-making process, that is the process by which people construct the meaning of their own life. The reflection on the meaning-making process started with the seminal works of Victor Frankl (1963) who defined the need for meaning in life as the primary motivational force in a human life. During the last two decades the literature on the meaning-making process has flourished, and nowadays the meaning-making is recognized as a lifelong process that accompanies individuals across their development and the elaboration of significant life events (e.g. George & Park, 2017; King & Hicks, 2021; Martela & Steger, 2016; Park, 2017; Schnell, 2009; Steger et al., 2009). However, the dynamics that support the functioning of the meaning-making process are still obscure, in fact most of the studies conducted so far are cross-sectional and did not investigate how the meaning-making process develops and changes over time. Furthermore, some authors advanced theoretical and methodological issues, among which the lack of clarity in the

meaning-making process conceptualization (Newman et al., 2018, 2020; Park, 2010, 2017), and the inability to accurately measure the process due to the lack of reliable measurement tools (Park & George, 2013; Leontiev, 2013).

When I stumbled upon the meaning-making process, I immediately grasped the complexity of the process and its relevance in the fields of positive and developmental psychology. I have therefore decided to dedicate my doctorate and my doctoral thesis to the study of this process, in the attempt to answer some of the open questions regarding its functioning. Specifically, the thesis has three chapters, in each of which I dealt with a methodological challenge applied to the study of the meaning-making process. Table 0.1 presents a synthesis of the thesis structure.

Table 0.1

Structure of the doctoral thesis

Which methodological challenges did I address?	*In which chapter did I deal with each challenge?*	*How did I answer each challenge?*
Challenge N°1: How to theoretically conceptualize the meaning-making process?	Chapter 1	Study 1: Systematic review of the meaning-making literature
Challenge N°2: How to measure the meaning-making process?	Chapter 2	Study 2.1/2.2/2.3: Development and validation studies of a situational measure of meaning-making
Challenge N°3: How to investigate the dynamics of change of the meaning-making process?	Chapter 3	Study 3.1: Examining the complexity of the meaning-making process with Dynamic Structural Equation Modeling Study 3.2: Examining the complexity of the meaning-making process with Multilevel Network Analysis

In **chapter 1** I addressed the first challenge about how to theoretically conceptualize the meaning-making process, by conducting an extensive systematic review of the current evidence on the meaning-making process. The second challenge was how to measure the meaning-making process, and was addressed in **chapter 2**, in which I conducted a series of studies dedicated to the development and validation of a situational measure of meaning in life to be used to examine the meaning-making dynamics of change in the context of specific life events and experiences. Lastly, in **chapter 3** I dealt with the challenge of investigating the dynamics of change of the meaning-making process in the context of everyday life experience; to do so, I conducted two empirical studies with data collected with a daily diary methodology from emerging and young adults. In these two studies I demonstrate how different conceptualizations of the meaning-making process can be empirically studied through two cutting-edge data analysis approaches, specifically, the dynamic structural equation models (DSEM; Asparohuov et al., 2018) and the Multilevel Network Psychometric approach (Borsboom et al., 2021). A detailed description of the data analysis techniques that I applied was included in some methodological boxes.

In each of studies that I conducted, I tried to zoom in the process of meaning-making with the aim of breaking it down into its basic components and investigating its dynamics of change. In the conclusion of the thesis, I tried to recompose the process of meaning-making in light of the results obtained from the presented studies, and I derived some theoretical and methodological reflections about the challenges of studying psychological processes within a complexity framework.

CHAPTER 1.

Challenge N°1: How to theoretically conceptualize the meaning-making process?

Introduction

In this chapter I delt with the first methodological challenge regarding the study of the meaning-making process, that is "how to theoretically conceptualize the meaning-making process?". To do this, I conducted an extensive systematic review of the current evidence on the meaning-making process with the aim of summarizing the studies on two key points. First, I wanted to outline how the construct of meaning-making has been theoretically conceptualized and defined by both the theoretical and the empirical literature. Second, I pointed the attention on the empirical literature, with the aim of highlighting which measurement strategies has been adopted to investigate the meaning-making process. The ultimate goal of this chapter was to trace the strengths and weaknesses of both theoretical and empirical works and provide suggestions for future research on the meaning-making process.

State of the art of the meaning-making literature

As outlined by a recent contribute by King and Hicks (2021) published in the Annual Review of Psychology, the science of meaning in life is gaining increasing attention in the psychological panorama, to the extent that attempting to disclose what the meaning-making process is configures as one of the emerging topics for the next decade. There are two theoretical traditions from which the psychological reflection on the meaning-making process comes. The first one is the *developmental and life cycle* tradition, the second one is afferent to the *stress and trauma literature*. The *developmental and life cycle* tradition frames the meaning-making as a lifespan process that entails the construction of a solid system of meanings, which represents a set of core values and beliefs about the self (e.g., self-worth),

the others (e.g., humans are good) and the world (e.g., the world is a benevolent place) (Janoff-Bulman, 1989; Poulin & Silver, 2019). The construction of a solid system of meanings is a prerequisite to entering adult life as it provides the necessary skills to read and interpret the experiences and integrate them into a coherent and integrated vision of oneself, of the surrounding world, and of relationships with other people (Brassai et al., 2011; Mayseless & Karen, 2014; Steger et al., 2008). Therefore, during adolescence and emerging adulthood, the meaning-making process plays a prominent role in the development of a solid self and a structured identity (Arnett, 2007; Erikson, 1968; Negru-Subtirica et al., 2016; Steger et al., 2013).

On the other side, according to the *stress and trauma literature*, the meaning-making process is activated to recover from individual and collective impactful life experiences, such as illness (e.g., Guerrero-Torrelles et al., 2017), conflicts (e.g., Noviana et al., 2016), natural disasters (e.g. Lew et al., 2020), or bereavement (e.g., Brandstätter et al., 2014). The stress and trauma framework builds on the seminal work of Victor Frankl (1963), who, after he survived the Holocaust, theorized that having a strong sense of meaning in life is the primary motivational force for human beings, essential to surviving trauma and suffering. A notable development of this line of research has come with Park & Folkman's (1997) systematization of their meaning-making framework, which conceptualized meaning-making as the process through which people restore their global system of values and beliefs after it has been disrupted or violated by major traumatic experiences. This can be done in two ways, by assigning a new meaning to the event, or (more rarely) by reorientating the global beliefs and goals to accommodate the appraised event, thus leading toward a new configuration of self (Park, 2010; Park et al., 2012).

According to Park (2017) researchers are still fighting to figure out what meaning-making is, as proof of this, quite often empirical works attempt to measure meaning-making

without providing a conceptual definition (Park, 2010). Moreover, several terms are interchangeably used to refer to some sort of meaning-making processes, such as "sensemaking" or "meaning in life" (Park, 2010); the use of such inconsistent terminology contributes to generating confusion around the concept of meaning-making.

The ambivalence related to the definition of meaning-making is found also in the methodological approaches used to investigate the construct (measurement and research design). Regarding the measurement, researchers agree on the lack of reliable measurement tools able to grasp the conceptual breadth of meaning-making as a construct (Park, 2017; George & Park, 2013). Indeed, the meaning-making process has often been operationalized with single variables, thus reducing the conceptual richness of meaning-making to a simplistic presence vs absence of meaningfulness (Lontiev, 2013; Park, 2010). In equally frequent cases, measures of *meaning in life* have been used to investigate the *meaning-making* process (e.g., Costin & Vignoles, 2019; Steger et al., 2006). Although both concepts refer to the same theme, the two constructs cannot be superimposed, since meaning in life is what we call a psychological phenomenon ("the perception that one's life has meaning"), while meaning-making is the related psychological process ("how people construct the meaning of their life"). Additionally, most of the time researchers decide upon self-report measures to assess meaning-making (Park, 2010), even if they possess well-known drawbacks, for instance, their reliability is undermined by the subjective interpretations and implicit understanding ascribed by participants to the concept of *meaning* (Leonitev, 2013; King & Hicks, 2021).

Meaning-making is a psychological process, as such, its dynamics unfold over time (Torgesen, 1979; Vallacher et al., 2015). Consequently, some authors claimed the unsuitability of cross-sectional designs based on a single assessment; instead, they suggested the use of more process-oriented designs, such as multi-waves longitudinal studies or

intensive designs, to assess either the long-time changes in the meaning-making configurations or short-time fluctuations within everyday life experiences (Newman et al., 2018, 2020; Park, 2010). One more issue related to the research design is that most studies examined the activation of the meaning-making process in the context of past events or experiences, using *retrospective* data, however, this choice precludes direct examination of important aspects such as pre to post changes in the system of meanings (Park, 2010).

The literature presents several systematic reviews related to meaning in life, among which a meta-analysis of meaning in life and well-being (Li et al., 2021), a systematic review and meta-analysis on the associations between meaning in life and physical health (Czekierda et al., 2017), a review on meaning in life interventions implemented in patients with advanced disease (Guerrero-Torrelles et al., 2017), and a systematic review of existing meaning in life measures (Brandstätter et al., 2012). In front of the several cited systematic reviews about meaning in life, no systematic reviews are available for meaning-making. The only study that tried to review the literature is Park (2010), however, this commendable work focused in particular on the empirical research regarding meaning in the context of adjustment to stressful events; moreover, the author did not conduct a review systematically and more than 10 years passed since its publication, with many contributions, also thanks to Park's work, being published in the meanwhile.

Study 1. Methodological systematic review of the literature on meaning-making

As appears from the literature discussed so far, the meaning-making process has enjoyed considerable success over the past few decades within the psychological field, however, the development of the discipline is currently hampered by several theoretical and methodological gaps. A wide systematic mapping of the literature is needed to draw a common thread linking the voyage made by the scientific community to investigate the meaning-making process, and to dispose of the necessary evidence to understand which

theoretical and methodological choices are more suitable to better contribute to the development of this line of research.

In response to this gap, the present systematic review was conducted to map and summarize how the meaning-making process has been theoretically conceptualized and what methodological strategies have been adopted to investigate its dynamics. In planning this systematic review, I relied on the guidelines recently proposed by Siddaway and colleagues (2019). I followed *four steps* to build the rationale: *scoping*, i.e., become familiar with the literature, identify gaps, define the breadth of review's aims, and formulate specific research questions; *planning*, i.e., identify search terms and sources to consult and formulate inclusion and exclusion criteria; *searching*, i.e., examination of published and unpublished literature; *screening*, i.e., selection of eligible work by adopting the double-blind procedure. The selected works have been critically synthesized by identifying theoretical misconceptions and methodological gaps. I finally discussed future directions to improve the research on the meaning-making process.

Scoping

The aim of this work consisted in critically synthesizing the existing literature on the meaning-making process in terms of (a) the theoretical conceptualization of the construct, (b) the research design and measurement strategies adopted. For each of these fronts I identified specific research questions that guided the conduction of this systematic review that are consultable in Table 1.1.

Table 1.1

Research questions guiding the conduction of the systematic review and information extracted from included records

Are of investigation	Research questions	Information extracted
(a) Theoretical conceptualization	*What theoretical traditions have been adopted to study the meaning-making process?*	Meaning-making was described within the stress and trauma and/or the developmental framework.
	Was a definition of meaning-making provided?	A clearly stated definition of meaning-making (e.g., the meaning-making process is/is defined/refers to…) if provided. The definition might come from the literature (in this case the reference is needed) or be provided by the authors.
	Was meaning-making conceptualized as an individual, dyadic, or group process?	Meaning-making was considered from a theoretical point of view as an individual process or a dyadic/group process of co-construction of meanings.
	Was the meaning-making process investigated concerning a specific life experience?	The meaning-making process was framed in the context of a traumatic or stressful event (e.g., bereavement; deployment), a normative event (e.g., birth), a normative transition (e.g., becoming a parent; career employment), a non-normative transition (e.g., chronic illness), or it was not referred to any specific events or transitions.
(b) Research designs and measurement strategies	*What research approach has been adopted to investigate the meaning-making process?*	Records were categorized as quantitative, qualitative, or mixed.
	What research design or methodological approach has been used?	Qualitative and quantitative studies were synthetized separately reporting the research design (e.g. cross-sectional) or the approach (e.g. grounded theory) adopted.

(*table continues*)

Table 1.1 (*continued*)

Are of investigation	Research questions	Information extracted
	What was the timeframe of data collection?	The meaning-making process was investigated with different perspectives: *retrospective* (focus on the past: e.g., how did you reconstruct your meaning after a trauma?), *prospective on past* (focus on the present meaning-making activation regarding a past event (e.g., What meaning do you give now to your past trauma?), *prospective on the present* (focus on the present meaning-making activation about a present condition/event; e.g. Are you in search of meaning?), *prospective on future* (focus on the present meaning-making activation concerning a future perspective; e.g. Do you think you will have a significant life in the next two years?).
(b) Research designs and measurement strategies	*How was the meaning-making operationalized?*	For qualitative studies information were extracted about: the instrument used (e.g., observation, narratives, etc..); the operationalization of meaning-making as a global evaluation (e.g., my life is meaningful) or as a situational evaluation referred to a specific time (e.g., today I feel that my life has value) or event (e.g., I find meaning in my illness); the unit of analysis (individual, dyad, group); and the level of coding (e.g., top-down vs bottom-up). Quantitative studies were synthesized based on the characteristics of the measure adopted, as the typology (e.g., self-report) and dimensionality (mono vs multi-dimensional); the operationalization of meaning-making as a global vs situational evaluation; and the unit of analysis (individual, dyad, group).
	What were the characteristics of the populations investigated?	Several information was extracted from each empirical work: sample size; population life-stage (adolescence, under 18; emerging adulthood, 18-29; young adulthood, 30-35; adulthood, 35-64; late adulthood, over 65; Arnett, 2014; Erikson, 1968); general vs clinical (e.g., people with a diagnosis and/or under treatment/therapy) population.

Planning

To make sure that other systematic reviews on meaning-making process were not yet available and that there weren't any in progress (as suggested by Siddaway et al., 2019), I conducted a systematic research on Scopus and PsycInfo, launching the following search query: (TITLE ("meaning-making" OR "meaning making") AND TITLE ("review")[1]. In addition, I checked some of the main pre-registration platforms (OSF, Prospero). None of the works identified by the double search corresponded for purposes and objectives to our systematic review, therefore, I proceeded in planning.

Inclusion and exclusion criteria

The following inclusion and exclusion criteria were formulated to identify all the eligible studies for our systematic review aims:

Criterium 1. The meaning-making process must be intended as the *psychological process of giving meaning to life existence*: records in which the meaning-making process refers to other topics (e.g., linguistic) were excluded.

Criterium 2. The temporal dimension of the meaning-making process must be included in the rationale (aims/research questions): records exploring just the presence/absence of the attribution of meaning to life or life experiences were excluded.

Criterium 3. Since our interest concerns a systematization of the theoretical conceptualization of the meaning-making process, both theoretical works and empirical works were included, provided the availability of the full text in the English language.

Criterium 4. Eligible journal articles must be peer-reviewed to guarantee a good scientific standard. This criterion was not required for other types of publications (e.g., books, chapters, dissertations) and the grey literature.

[1] The search has been run in September 2022 and led to the same result.

Searching

Published works

To find all available published works on the meaning-making process I searched the literature in two databases: Scopus and PsycINFO. These databases have been chosen because they cover all the relevant disciplines and fields which dealt with the meaning-making process, such as behavioral and social science, medical and health science, psychology, philosophy, and humanities. To obtain a balance between sensitivity (finding as many articles as possible that may be relevant) and specificity (making sure those articles are indeed relevant) I paid attention to different spellings and synonyms in formulating the search strings. Our search terms aimed to detect: *(a) the content of meaning-making*: using Boolean operators (AND, OR) and truncation symbols (*), I searched in the titles the keywords: ("meaning making" OR "meaning-making"); moreover, to ensure that the central theme of the studies was the meaning-making process, the presence of the terms "meaning making" OR "meaning-making" was also required in the keywords of the records; *(b) the temporal dimension of meaning-making*: I searched in titles, abstracts and keywords the following combination of keywords: (chang* OR process* OR dynamic*).

Moreover, to select only peer-reviewed journal articles, I conducted for each database a double search: the first query asked only for peer-reviewed journal articles; the second one searched for other types of publications (i.e., books, chapters, conference works, and dissertations). As Scopus doesn't allow to filter peer-reviewed records I manually checked that each journal article selected by the search string met this criterium.

For a detailed description of all the search strings employed see Table S1.1 available in the *Chapter 1* folder at the following link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Grey literature and unpublished works

Databases are not comprehensive, and a minority of potentially relevant work may be missed. Moreover, including unpublished works that meet inclusion criteria is considered best practice to control for publication bias (Siddaway et al., 2019). To uncover potentially eligible works from the grey literature I: (a) screened the last year's presentations at International Conferences on the topic (e.g., Meaning in life Conference (April 2019) hosted by the Human Flourishing Program at Harvard University; International Positive Psychology Association World Congress 2019); (b) screened the following databases specialize in different types of unpublished work: OpenGrey (http://www.opengrey.eu); OSF preprint (https://osf.io/preprints/discover) a platform which includes 33 partner repositories, including PsyArXiv; and WorldCat, a database for dissertations and theses; (c) contacted some the reference authors of the literature on this topic asking for unpublished or working materials[2].

Screening

As a preliminary step, I deleted the duplicate studies coming from the search on different databases by creating a single Reference Manager file on the Mendeley platform. I manually checked for any duplicates from the grey literature by deleting identical titles and author lists. The researchers involved in the screening process initially underwent a training phase. More precisely, four abstracts had been selected from the pool of records and independently screened by the two researchers. After the individual evaluation, the researchers shared the process that led to the evaluation of eligibility of each abstract (they reached a perfect agreement) and discussed any doubts relating to inclusion and exclusion criteria.

[2] The first author of the present work sent an e-mail the 15th July 2020 to seven reference authors asking for shareable material on the meaning-making process (link to the pre-registration was attached). Authors were kindly asked to reply before July 31, 2020.

The screening procedure followed a double phase due to a large number of records obtained from the search. As a preliminary requirement, the availability of full texts was checked. In the first round, the two researchers independently screened each abstract. Any discrepancy in the records selection was discussed until reaching agreement, and in cases where doubts remained, a third expert judge was consulted. The second round of screening envisaged the examination of full texts of the record selected in the first round and led to the final pool of included records. I documented in a PRISMA 2020 flow diagram (Figure 1.1), the selection flow and reasons for exclusion of records (Page et al., 2021).

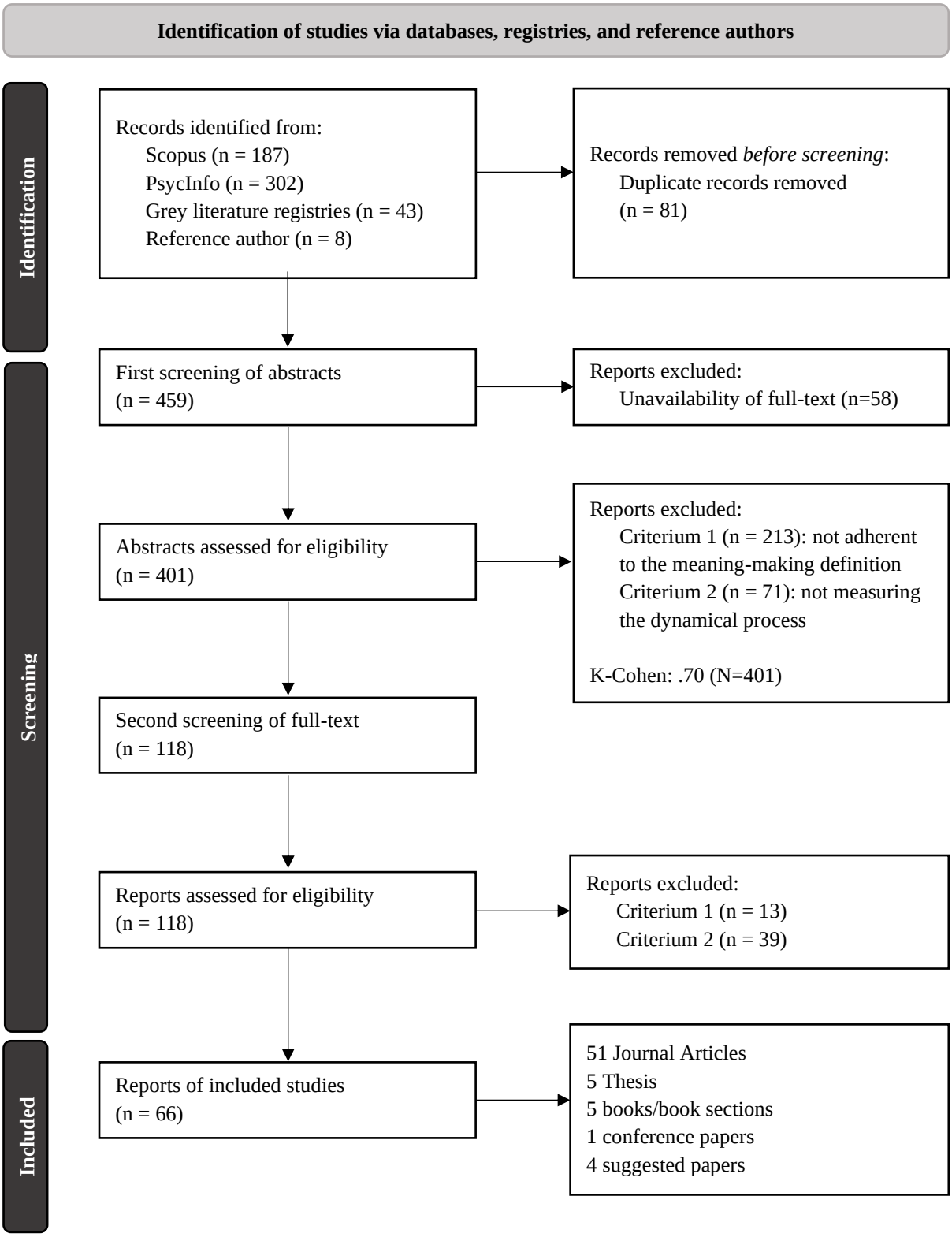
A total of 489 works were retrieved from the database searches (187 from Scopus, 302 from PsychInfo), 51 works were obtained from the grey literature search (43 from grey literature repositories, 8 from reference authors' suggestion)[3]. After the removal of the duplicates, 459 abstracts were independently screened by two researchers. 58 works were excluded due to the unavailability of the full text. Two reviewers independently assessed for eligibility a total of 401 works by screening the abstracts. As a measure of inter-rater agreement, I computed Cohen's kappa. Results indicate a substantial strength of agreement (k=.70) between the two reviewers (Landis & Koch, 1977). The disagreements were resolved by discussing every single case referring to inclusion and exclusion criteria until reaching consensus. The opinion of a third judge was requested for solving reviewers' disagreement on 10 works. 118 works moved to the second round of full-text screening, from which a final pool of 66 works[4] (51 Journal Articles, 5 Thesis, 5 books/book sections, 1 conference paper, 4 suggested papers) that met all the eligibility criteria was retrieved.

[3] Most of International events had been delayed or cancelled for 2020 due to the COVID situation (e.g. 10th European Conference of Positive Psychology), and no materials were still available from previous international conferences (e.g. International Positive Psychology Association World Congress 2019), therefore no materials was retrieved from this source.

[4] One journal article was duplicated because made of two independent studies, therefore the final pool is made of 67 works (increase of one unit).

Figure 1.1

PRISMA 2020 flow diagram of the selection process



Data availability

I adhered to the PRISMA 2020 guidelines for systematic reviews (Page et al., 2021). This review project was preregistered. All data and research materials (including our coding scheme, the reasons for exclusion of records, the search string, and the reference of included records) together with the preregistered protocol and the PRISMA 2020 checklist are available in the *Chapter 1* folder at [https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2][5].

Results

Three researchers individually collected the information from reports filling specific sections of the given grid (Table 1.2-1.4), divided according to their level of expertise on the theoretical and methodological aspects. Then data collection and synthesis were confirmed by several plenary meetings where researchers discussed the results on all the records. Results are presented in three sections, one for each area of interest: (a) theoretical framework and conceptualization, and (b) research design and measurement strategies. Both the theoretical and the empirical works have been consulted to get a general view about the development of different theoretical frameworks, while only the empirical works have been examined to cover the methodological section. When the data sought in a report for a specific variable were missing or unclear, the specific information was categorized as NS (not specified) and reported in the specific table (see Tables 1.2-1.4).

[5] Some minor changes have been made with respect to the pre-registered protocol. In the preregistration a PRISMA 2009 checklist was included as the PRISMA 2020 Statement wasn't published yet. I included a PRISMA 2020 checklist in the supplementary materials available in the *Chapter 1* folder at [https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2]. Regarding scoping, information concerning meaning-based interventions were included in the research design section; some research questions were added for both theoretical conceptualization areas and research design and measurement strategies; it was decided not to deepen the topic of data analysis to give adequate space to discuss the methodological implications. Concerning searching, the OpenDOAR repository (http://v2.sherpa.ac.uk/opendoar/) didn't bring any pertinent results, therefore I decided to add the OSF preprint (https://osf.io/preprints/discover) as grey literature source. Finally, in the screening section, the inclusion criterium number two was reframed to better specified the concept of temporal dimension of the meaning-making process.

Theoretical conceptualization of meaning-making

Table 1.2 illustrates the varied theoretical traditions through which meaning-making has been investigated.

What theoretical traditions have been adopted to study the meaning-making process?

The most developed area resulted to be the *stress and trauma* theoretical framework, with a global 67% (N=45) of works investigating the meaning-making process within this framework. This trend was shared both by the theoretical works (N=25) in which the 64% (N=16) exploded the theoretical foundations of the meaning-making from a stress and trauma perspective and by the empirical works (N=41), with the 73% (N=30). Only 15% (N=10) of total works were built on the *developmental framework,* of which 6 were theoretical and 4 were empirical. A small group of works (N=8) integrated the two perspectives, of which 4 were theoretical and 4 empirical. Finally, in three empirical works (4%) a theoretical background wasn't clearly stated in the introduction.

Was a definition of meaning-making provided?

The 57% (N=38) of works reported a clear definition of meaning-making. Specifically, 65% (N=17) of theoretical works reported an accurate definition of meaning-making, while among the empirical works, only 51% (N=21) provided a definition of meaning-making in the rational. A lot of works converged in defining the meaning-making as the process by which people reduce the discrepancy between the situational appraisal of a stressful/traumatic event and the global system of meanings and worldviews (e.g., Ferrito et al., 2017; Gan et al., 2018; Park, 2010, 2017; Wojtkowiak et al., 2019). Other two common definitions of meaning-making were (a) the process of making sense, interpreting, and founding benefit from life experiences (Barak & Leichtentritt, 2015; Boynton & Vis, 2011; Lister, 2006; MacDermott, 2010), and (b) the process of creating and producing meaning in life (Allard, 2016; Butcher & Buckwalter, 2002; Fivush et al., 2017). Table 1.2 shows the

conceptual definitions of meaning-making adopted in both theoretical and empirical works. The fact that a lot of definitions converged on meaning-making as the process of reducing the discrepancy between global meaning and the appraisal of the event is probably due to their focus on the occurrence of specific stressful or traumatic life experiences.

Was meaning-making conceptualized as an individual, dyadic, or group process?

All the works except one considered the meaning-making as an *individual process*, however, 8 works (13%) acknowledged the meaning-making also as a *group or dyadic process* of co-construction of meanings among family members (e.g., Fivush et al., 2017; Mitchell, 2016), others (Märtsin, 2019), or parents (Ringer et al., 2020). These works were equally distributed among theoretical and empirical. Finally, one work (Patterson, 2005) focused on the family meaning-making process recognized as a pure *group process*.

Was the meaning-making process investigated concerning a specific life experience?

Most of the works (87%, N=58) investigated the meaning-making process referred to specific life experiences. Specifically, all the works based on the stress and trauma literature framed the meaning-making in the context of *traumatic events* (e.g. unexpected death, health trauma; Barak & Leichtentritt, 2015; Park & Blumberg, 2002), *stressful events* (e.g. university exam, organizational change; Milkavich, 2010; Van den Heuvel et al., 2013), *non-normative transitions* (e.g. cancer, neuro-disability, combat trauma experiences; Baker et al., 2018; Gan et al., 2018; Larner & Blow, 2011), or *generic stressful/traumatic experiences*. Among the developmental works, 50% (N=5) did not refer to any specific life experiences even if, in some cases, they focused on specific life stages such as adolescent development (e.g., Nagel, 2003). The other 50% of works referred to a *normative transition*, mostly related to career development (e.g., Chen, 2011; du Toit & Naudé, 2020), or a *stressful event* as the interpersonal group conflict (Botha, 2014). Among the seven works which combined the two theoretical perspectives, three of them (43%) didn't refer to any specific experience; the

others studied the meaning-making concerning *traumatic events* or *non-normative transitions* (e.g., holocaust, veterans' moral injuries, mental illness; Adler et al., 2013; Armour, 2010; Kopacz et al., 2019;), and one study focused on impactful events (positive/negative) in the life of at-risk youths (Michael et al., 2018).

Table 1.2

O*verview of studies investigating the meaning-making process within different theoretical frameworks*

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Abes et al., 2007	T	D	/	TN	I
Adler et al., 2013	QL	D;T	/	TNN	I
Allard, 2016	QL	T	The process of translocal meaning making describes how respondents actively and individually engage in producing meaning out of the socially located information that they are provided or encounter throughout the migration and settlement process (pp.1-2).	TNN	I;G
Armour, 2010	QL	T;D	Meaning making is an effort to revise the assumptive base prior to the trauma or create new beliefs to achieve a closer match to the recently experienced reality (p.441). Meaning making was defined as the forming and reforming of intentionality and significance (Carlson, 1988, in Armour, 2010, p.444).	TE	I
Baker et al., 2018	QL	T	/	TNN	I
Barak & Leichtentritt, 2015	QL	T	Meaning making can be defined as a process of adaptation to bereavement through sense making and benefit finding in the loss (Holland et al., 2006, in Barak & Leichtentritt, 2015, p.360).	TE	I
Bianco et al., 2017	QL	T	/	TE	I
Boals, 2012	QT	T	Meaning making involves "coming to see or understand the situation in a different way and reviewing and reforming one's beliefs and goals in order to regain consistency among them" (Park & Ai, 2006, p. 393, in Boals, 2012, p.395). Meaning making was defined as changes in situational appraisals of the stressful event or global beliefs and worldviews (p.395).	SE;TE	I
Böhmer et al., n.d.	QT	T	/	TNN	I
Botha, 2014	QL	D	Meaning-making can therefore be described as an active, self-regulated activity in which meaning often becomes a goal in itself (p.14).	SE	I

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Boynton & Vis, 2011	T	D;T	Meaning making is part of spirituality, and both are developed and expressed through interactions, relationships, and connections with the self, others, and often a higher power (Sheridan, 2004; Vis & Boyton, 2008, in Boynton & Vis, 2011, p.138). O'Connor (2002, 2003, in Boynton & Vis, 2011, p.143) describes meaning-making as an individual creating or discovering significance in events with cognitive and emotional components.	TE	I;G
Brinn & Auerbach, 2015	QL	T	/	TE;TNN	I
Butcher & Buckwalter, 2002	QL	T	Meaning-making is an activity in which each person is engaged in a process of shaping an identity and shaping a coherent, meaningful life (Carlsen, 1996, in Butcher & Buckwalter, 2002, p.126).	TNN	I
Campo et al., 2017	QT	T	/	TNN	I
Chen, 2011	T	D	If career meaning making is about searching and finding a truth to facilitate and enhance one‘s vocational wellbeing, then this truth-finding mission can only be accomplished through people‘s subjective experiencing in its very context (p.43).	TN	I
Coleman et al., 2020	QL	T	/	TNN	I
Courtenay et al., 1998	QL	T	/	TNN	I
Courtois, 2017	T	T	/	TE	I
du Toit & Naudé, 2020	QL	D	/	TN	I
Easter-Rose, 2017	QL	D	/	TN	I
Ferrito et al., 2017	T	T	Meaning-making has been conceptualized as a process and an outcome (Park, 2010, in Ferrito et al., 2017, p.1), entailing “[the] coming to see or understand [a] situation in a different way and reviewing and reforming one's beliefs and goals in order to regain consistency” (Park & Ai, 2006, p.393, in Ferrito et al., 2017, p.1).	TE	I

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Fivush et al., 2017	T	D	Narrative meaning-making refers to how individuals make human sense of experiences in ways that help them understand themselves, others, and their worlds (Grysman & Mansfield, 2017, in Fivush et al., 2017, pp.128-129).	NS	I;G
Gan et al., 2018	QT	T	Meaning making refers to the process of integrating the appraised meaning of a traumatic event into one's global belief system to reduce cognitive discrepancy (abstract, p.594).	TNN	I
Hall et al., 2018	T	T	Meaning-making is an important way in which religion and spirituality contribute to adjustment in the context of encountering difficult life events. (abstract, p.77)	TE;SE;TNN	I
Holland et al., 2015	QT	T	Meaning making (i.e., "the restoration of meaning in the context of highly stressful situations;" Park, 2010, p. 257, in Holland et al., 2015, p120.).	SE;TNN	I
Im, 2018	QL	T	Meaning-making is a "process of working to restore global life meaning when it has been disrupted or violated, typically by some unpleasant or terrible life event" (Park, 2005, p.710, in Im, 2018, p.15)	TE;TNN	I
Kjorven Haug et al., 2014	QL	T	/	TNN	I
Kopacz et al., 2019	T	D;T	Meaning-making is defined as "retaining, reaffirming, revising, or replacing elements of [one's] orienting system to develop more nuanced, complex and useful systems" (Gillies et al., 2014, p. 208, in Kopacz et al., 2019, p.77)	TE	I
Krueger, 2006	T	T	Meaning making is not a "cognitive coping strategy" but a complex re-orientation to the world (Neimeyer, 2001, p. 172, in Krueger, 2006, p.168).	TE	I
Kunnen & Bosma, 2000	T	D	Meaning making refers to the way in which people actively organize their own experience (p.59).	NS	I
Lachnit et al., 2020	QT	T	To reduce distress and facilitate adjustment, individuals attempt to resolve the discrepancy (between situational and global meaning), termed meaning making (Park, 2010; Park & Folkman, 1997, in Lachnit et al., 2020, p.1015).	SE	I
Larner & Blow, 2011	T	T	/	TE;TNN	I
Lee, 2008	T	T	/	TNN	I

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Leung, 2010	QL	T	/	TNN	I
Lister, 2006	QL	T	Meaning-making was defined as a parent's experience of having grown, found benefit or a purpose in life as a result of their children death (abstract, p.3).	TE	I
MacDermott, 2010	T	T	Meaning making is the act of purposefully engaging in cognitive processing about a traumatic event in order to understand its significance (Joseph & Linley, 2005, in MacDermott, 2010, p.200). Meaning making is usually conceptualized as the process by which an individual's global meaning and appraised meaning of a trauma arc made to agree (Park & Folkman, 1997, in MacDermott, 2010, p.202).	TE	I
Marotta-Walters, 2015	T	T	Meaning making is a psychotherapeutic healing factor that promotes adaptation following exposure to trauma, as well as a process that is closely related to psychospirituality (abstract, p.64). Meaning making is defined as a cognitive and affective change in the way an individual perceives a painful experience and it can occur at any stage of healing (p.64).	TE	I
Martino, Picione et al., 2019	QL	T	/	TNN	I
Martino, Lemmo et al., 2019	QL	T	/	TE	I
Märtsin, 2019	T	D	/	NS	I;G
Michael et al., 2018	QL	T;D	The complicated process of understanding the self within one's environment can be expressed as 'meaning making:' the way people actively realize and interpret their experiences in life (p.440).	TE;SE;NE	I
Milkavich, 2010	QT	T	/	SE	I
Mitchell, 2016	T	T	/	TNN	I;G
Nagel, 2003	QL	D	/	NS	I
Newman & Nezlek, 2019	QT	NC	/	NS	I

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Newman et al., 2018	QT	NC	/	NS	I
Park, 2010	T	T	Meaning making (i.e., the restoration of meaning in the context of highly stressful situations, p.257). The meaning-making model posits that recovering from a stressful event involves reducing the discrepancy between its appraised meaning and global beliefs and goals (Joseph & Linley, 2005, in Park, 2010, p.259). Meaning making refers to the processes in which people engage to reduce this discrepancy.	TE;SE;TNN	I
Park, 2017	T	T;D	Processes of meaning making (creating or recreating harmony among global and situational meaning) are considered to be primarily cognitive (p.17).	NS	I
Park, 2013	T	T	The meaning making model posits that recovering from traumatic events involves reducing the discrepancy between the appraised meaning of the trauma and one's global meaning (Park, 2010, in Park, 2013, p.64). Meaning making refers to the processes through which people reduce this discrepancy (p.64).	TE;SE;TNN	I
Park & Ai, 2006	T	T	Meaning making refers to working to restore global life meaning when it has been disrupted or violated, typically by a major traumatic life event (pp.392-393).	TE;SE;TNN	I
Park & Blumberg, 2002	QT - study 1	T	Mechanism of meaning-making defined as changing situational meaning (appraisals of the traumatic experience) and global meaning (world views, personality, and coping styles) in order to reduce the discrepancy between global and situational meaning (abstract, p.597).	TE	I
Park & Blumberg, 2002	QT - study 2	T	Mechanism of meaning-making is defined as changing situational meaning (appraisals of the traumatic experience) and global meaning (world views, personality, and coping styles) in order to reduce the discrepancy between global and situational meaning (abstract, p.597).	TE	I
Park et al., 2008	QT	T	We conceptualize meaning making as a coping process that, when successful, reduces discrepancies between appraised and global meanings (p.865).	TNN	I
Park & Esposito, 2011	QT	T	Meaning making refers to the processes through which people engage to reduce discrepancies between the meaning they assign to a specific situation and some aspect of their global meaning (Park & Folkman, 1997, in Park & Esposito, 2011, abstract p.153)	TE;SE;TNN	I

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Park & George, 2013	T	T	Meaning making following stressful events entails attempts to fit individuals' appraisals of events together with their global meaning in order to reduce the discrepancy between them (Horowitz, 1997; Park & Folkman, 1997, in Park & George, 2013, p.485).	TE;SE;TNN	I
Patterson, 2005	T	T	Meaning-making is a dynamic process that emerges over time as families search for meaning in a life that has been seriously disrupted, sometimes shattered, by the diagnosis/onset of a chronic health condition, with its added demands, multiple losses, changed routines, roles, and expectations (p.538).	TNN	G
Pelletier & Drozda-Senkowska, 2019	QT	T	Meaning-making refers to "the ways what we make sense of ourselves and our environment, the feelings that are aroused when these understandings are constructed or violated, and the common ways in which we respond to these violations." (Proulx et al., 2013, pp. 4-5, in Pelletier & Drozda-Senkowska, 2019, p.791).	TE	I;G
Ringer et al., 2020	QL	T	/	TNN	I;D
Sacco et al., 2019	T	T	Meaning-making refers to coping processes that align situational meaning (e.g., receiving a HF diagnosis, hospitalization, decreasing physical functionality) and global meaning (e.g., the desire for a full, healthy life, a sense of purpose, religious/spiritual beliefs) (Park, 2010, in Sacco et al., 2019, p.558).	TE	I
Schnell & Pali, 2013	QT	D;T	/	NS	I
Singer, 2004	T	D	/	NS	I
Spitzenstätter & Schnell, 2020	QT	T	/	TE;NE	I
Taves et al., 2018	T	D;T	/	NS	I
Ulfseth et al., 2015	QL	NC	Meaning-making is described as a process of attaching significance to experiences through cultural participation (Bruner, 1990, in Ulfseth et al., 2015, p.424).	TNN	I;G

(*table continues*)

Table 1.2 (*continued*)

Study	Typology of contribution[a]	Theoretical tradition[b]	Meaning-making definition	Experience typology[c]	Level of the process[d]
Van den Heuvel et al., 2013	QT	T	Meaning-making refers to reflective actions that individuals may undertake to create meaning which are suggested to increase the willingness to adapt to change (Van den Heuvel et al., 2009, in Van den Heuvel et al., 2013, p.13). Meaning-making is concerned with the extent to which individuals are effective in integrating challenging/ambiguous events into a framework of personal meaning using value-based reflection (Park, 2010; Van den Heuvel et al., 2009, in Van den Heuvel et al., 2013, p.14).	ES	I
Wojtkowiak et al., 2019	QL	T	Meaning making refers to the processes by which people engage to reduce this discrepancy (Park, 2010, p. 259, in Wojtkowiak et al., 2019, p.123)	TE	I
Wortmann & Park, 2009	T	T	/	TE;NE	I

Note. NS = not specified.

[a] T = theoretical, QL = qualitative.

[b] D = developmental, T = stress and trauma.

[c] SE = stressful event, TE = traumatic event, NE = normative event, TN = normative transition, TNN = non normative transition.

[d] I = individual, D = dyad, G = group.

Research design and measurement strategies

What research approach has been adopted to investigate the meaning-making process?

Among the 41 empirical works included in this review, 23 (56%) adopted a qualitative approach, 17 (41%) were quantitative studies, and one study used a mixed-method design. Table 1.3 and Table 1.4 illustrate the research designs and measurement strategies adopted by qualitative and quantitative works.

What research design or methodological approach has been used?

Qualitative studies (N=24)[6] adopted a wide array of methodological approaches to investigate the meaning-making process. Four (17%) were based on the grounded theory framework (e.g., Coleman et al., 2020), four (17%) on the narrative approach (e.g., Martino, Picione et al., 2019), three (12%) adopted a thematic analysis (e.g., Michael et al., 2018), two (8%) made use of interpretative phenomenological analysis (e.g., Baker et al., 2018), and two (8%) were based on the hermeneutic approach (e.g., Barak & Leichtentritt, 2015). Three studies (12%) were a combination of different frameworks mixing the narrative approach with grounded theory (Im, 2018), ethnography and hermeneutic (Ulfseth et al., 2015). Five works (21%) introduced specific methodologies not attributable to classic frameworks, for example, the autobiographical timeline interview (Leung, 2010) and the interactive qualitative analysis adopted by Botha (2014). Finally, in one study the methodological design wasn't specified. Two qualitative studies developed meaning-based interventions for promoting a healthy way to grow during adolescence by participating in a leadership development program (Nagel, 2003), and to facilitate the identity reconstruction process in patients with neurodisability by participating in a f*ocused therapeutic songwriting program* (Baker et al., 2018).

[6] The mixed-method work has been synthetized both as a qualitative and quantitative study.

Among the quantitative studies (N=18)[6], 61% (N=11) employed longitudinal designs, based on two (N=5; e.g. Gan et al., 2018), three (N=5; e.g. Milkavich, 2010) or four (N=1; Lachnit et al., 2020) waves; the 28% (N=5) adopted an experimental design, two of which were randomized control trials (Böhmer et al., n.d.; Spitzenstätter & Schnell, 2020); finally, only two studies (11%) were based on intensive longitudinal designs (Newman & Nezlek, 2019; Newman et al., 2018), and specifically on a two weeks daily diary study.

What was the timeframe of data collection?

Among qualitative studies, 46% (N=11) adopted more than one perspective to observe the meaning-making. The most common perspective to investigate meaning-making was *retrospection*, adopted in 75% (N=18) of works, followed by *prospective on the present* (50%, N=12), *prospective on past* (25%, N=6), *prospective on future* (22%, N=4). For example, Leung (2010) adopted a multi-perspective to explore participants' sense-making of the cancer experience from the diagnosis to present (*retrospective, prospective on past, prospective on the present*). Easter-Rose (2017) asked a group of African-American adolescents to draw and then describe a picture about their life today (*prospective on the present*) and about their life in the future (*prospective on the future*).

Even among quantitative studies, the multi-perspective was the most popular, adopted by 55% (N=10) of works. Specifically, a *prospective on the present* was endorsed by 67% (N=12) of studies, *retrospection* was adopted by 50% (N=9), *prospection on the past* by the (N=6), and *prospection on the future* only by one study. For example, van den Heuvel et al., (2013) examined employees' meaning-making activation at the moment of data collection (*prospective on the present*) by asking participants their actual perception of life meaningfulness. Lachnit et al. (2020) examined the meaning-making coping strategies activated by participants to cope with a stressful event that occurred in the past (*retrospective;* e.g., I looked for something good in what was happening), and the level of the

perceived discrepancy at present (*prospective on past; e.g.* How distressful is the stressful event or situation to you now?). Finally, Spitzenstätter & Schnell (2020) examined changes in participants' meaningfulness after an intervention on their mortality awareness (*prospective on future*).

How was the meaning-making operationalized?

Among the qualitative studies, 33% (N=8) opted for a multi-method approach, combining more than one instrument. The preferred instrument to investigate meaning-making was the interview, adopted by 77% (N=20) of studies. Most researchers conducted semi-structured or in-depth interviews to explore the role of meaning-making in a variety of life experiences, for example, immigration (Allard, 2016) or near-death experiences (Bianco et al., 2017). Two studies used *focus groups*, for example, Botha (2014) investigated emerging adults' feelings when they experience a loss of meaning consequently to an interpersonal conflict. Four works collected *narrative materials*, obtained for example from asking postgraduate students to write about the challenges and emotions faced during the honors year after their bachelor's degree (du Toit & Naudé, 2020). Four studies used *artifacts* to collect evidence about the meaning-making activation; for example Baker et al. (2018) opted for songwriting, and their patients with disability composed a song about their past self, their present self, and their imagined future self; Ester-Rose (2017) asked participants to draw a picture about their life today and in the future; Leung (2010) used worksheet in a horizontal timeline to help breast cancer women in the construction of their life narrative. Finally, *observation* was used in Uflseth et al. (2015), where researchers activated small talks with mental illness to describe how meaning-making can be activated in daily situations. In the 71% (N=17) of works, the meaning-making features have been extracted from the analysis of narrative materials obtained from participants' descriptions of their life stories or experience under investigation. In the remaining 29% of works (N=7), the meaning-making has been

investigated by direct questions (e.g., What *new meanings in your life*, if any, have emerged from this experience? In Leung, 2010); in all that cases, the meaning-making process has been operationalized as a *situational process*, related to a specific event or life experience (e.g., combat experience in Brinn & Auerbach, 2015) or bound to a definite time (e.g., present experience of meaningfulness associated with a song in Baker et al., 2018). The qualitative materials obtained from all these approaches and instruments was coded in the 87% of cases (N=21) with a *bottom-up perspective*, by grouping patterns of coding and inferring meaning-making features from successive readings; however, three works adopted a *top-down* perspective by applying pre-existent coding systems to identify specific meaning-making features in narratives (e.g., Martino, Lemmo et al. 2019). Finally, the unit of analysis was the *individual* in all works except for Ulfseth et al. (2015) which focused on the observation of a *group* of patients with mental illness.

Most quantitative studies assessed the meaning-making or some specific features of it by using several self-report measures in conjunction. For example, Park and Blumberg (2002) assessed the global and situational meaning with nine different self-report measures. Three works combined self-report measures with an interview (e.g., Armour, 2010) or a narrative product (Boals, 2012). The 89% (N=16) of works employed specific meaning-making measures, for example, the meaning-making scale (Van den Heuvel et al., 2009) or the Perceived Personal Meaning Scale (Wong, 1998). However, measurements of other constructs have frequently been used to assess meaning-making, for example, the Brief COPE (Carver, 1997) or the Stress Appraisal Measure (SAM; Peacock & Wong, 1990). Among the 14 different meaning-making measures adopted across the studies, 78% (N=11) were validated measures; the two most used were the Meaning in Life Questionnaire (MLQ; Steger et al., 2006) and the Sources of Meaning and Meaning in Life Questionnaire (SoMe; Schnell & Becker, 2007) that were included in the 33% (N=6) of works. Most meaning-

making measures operationalized the construct as mono-dimensional, with some exceptions: four studies adopted measures that can be considered multi-dimensional regarding the *process*, for example, the MLQ (Steger et al., 2006) is made of two dimensions, the *search* for meaning and the *presence* of meaning in life; similarly, Campo et al. (2017) used face validated items (Wu et al., 2008) about "*searching for* and *having found* a reason/benefit of the illness"; the ISLES (Holland et al., 2010) assesses two processual dimensions of meaning-making, making sense of the world (comprehensibility), and disruption of worldviews (footing in the world). Two examples of a multidimensional measure regarding the *content* of meaning-making refer to Boals' (2012) study in which narratives were coded based on five components of meaning-making, and Park et al. (2016) Global Meaning Violations Scale by which the disruption of global beliefs and goals is reassessed. Six studies (37%) operationalized the meaning-making as a *global evaluation* of life meaning (e.g., Milkavich, 2010; Spitzenstätter & Schnell, 2020); seven works (44%) operationalized the meaning-making as a *situational evaluation* of specific life *events* (e.g., Boals, 2012), and one study was based on a *situational evaluation* bound to a specific *time* (Newman & Nezlek, 2019). Finally, two studies operationalized meaning-making both as a *global* and a *situational process* (Newman et al., 2018; Park & Esposito, 2011). The unit of analysis for each of the quantitative works was *individual.*

What were the characteristics of the populations investigated?

Among the qualitative studies, the sample size ranged from 1 to 133 with a mean of 28.2 (SD=34.2). Seven studies (29%) investigated the meaning-making in a population of adolescents (aged under 18) or emerging adults (aged from 18 to 29); seven studies (21%) chose emerging adults, young adults (aged from 30 to 35) and/or adults (aged from 35 to 64) as their target; seven studies (29%) focused only on the life stages of adulthood or late adulthood (aged over 65); one study covered the longest lifespan period from emerging

adulthood to late adulthood. The 50% (N=12) of qualitative works considered the *general population* as the target, while the other half addressed research questions about the *clinical population* (i.e., individuals with a diagnosed physical or psychological illness).

Conversely, the quantitative literature focused especially on the general population, as only 28% (N=5) considered a clinical sample, with an average sample size of 155.5 (SD=92; range 42-368). Seven studies (39%) focused on emerging adults, four (22%) studies focused on young adults or adults, one (5%) study considered late adulthood, while six studies (33%) included samples with a wide age range, covering almost all the life span from adolescence to late adulthood.

Table 1.3

Summary of research designs and measurement strategies adopted by qualitative studies investigating the meaning-making process

Study	Study design		Operationalization of meaning-making					Sample		
	Methodological approach[a]	Timeframe of data collection[b]	Instrument[c]	Specific meaning-making questions	Global vs Situational[d]	Unit of analysis[e]	Coding[f]	N	Life stage[g]	Population[h]
Adler et al., 2013	N	PPR	N;S	no	/	I	T	54	ADO	C
Allard, 2016	NS	R	I	no	/	I	B	14	ADO;EA	G
Armour, 2010	TA	R;PPR	I;S	yes	SE	I	B	133	A	G
Baker et al., 2018	I	R;PPA;PPF	I;A	yes	SE;ST	I	B	15	A	C
Barak & Leichtentritt, 2015	ER	R;PPA	I	no	/	I	B	10	A	G
Bianco et al., 2017	I	R	I	no	/	I	B	6	A;LA	C
Botha, 2014	Other	PPR	FG	yes	SE	I	B	127	ADO	G
Brinn & Auerbach, 2015	Other	R	I	yes	SE	I	B	12	ADO;EA	G
Butcher & Buckwalter, 2002	ER	PPR	I	no	/	I	B	1	ADO;EA	C
Coleman et al., 2020	G	R	I	no	/	I	B	40	EA	C
Courtenay et al., 1998	G	R;PPA;PPR	I	yes	ST	I	B	18	EA	C
du Toit & Naudé, 2020	TA	R	I;N	no	/	I	B	4	LA	G
Easter-Rose, 2017	G	PPR;PPF	I;A;FG	no	/	I	B	21	EA;YA;A	G
Im, 2018	N;G	R;PPF	I	yes	NS	I	B	30	EA;A	G
Kjorven Haug et al., 2014	Other	R;PPR	I	no	/	I	T	21	EA;YA;A	C
Leung, 2010	Other	R;PPA;PPR	I;A	yes	G;SE	I	B	26	EA;YA;A	C
Lister, 2006	N	R	I	no	/	I	B	16	EA;YA;A	G
Martino, Picione et al., 2019	N	PPR	I	no	/	I	B	29	EA;YA;A;LA	C

(*table continues*)

Table 1.3 (*continued*)

Study	Study design		Operationalization of meaning-making					Sample		
	Methodological approach[a]	Timeframe of data collection[b]	Instrument[c]	Specific meaning-making questions	Global vs Situational[d]	Unit of analysis[e]	Coding[f]	N	Life stage[g]	Population[h]
Martino, Lemmo et al., 2019	N	R	I	no	/	I	T	50	EA;YA;A	C
Michael et al., 2018	TA	R;PPA;PPR;PPF	I	no	/	I	B	14	EA;YA	C
Nagel, 2003	N;G	R;PPR	I;N;A	no	/	I	B	7	LA	G
Ringer et al., 2020	Other	R;PPA	I	no	/	I	B	12	LA	G
Ulfseth et al., 2015	E;ER;N	PPR	O;N;F	no	/	G	B	7	NS	C
Wojtkowiak et al., 2019	G	R	I	no	/	I	B	10	NS	G

Note. NS = not specified.

[a] N = narrative approach, TA = thematic analysis, I = IPA, G = grounded theory, ER = hermeneutic.

[b] R = retrospective, PPR = prospective on present, PPA = prospective on past, PPF = prospective on future.

[c] I = interview, N = narrative, A = artefacts, O = observation, FG = focus group, F = field notes, S = self-report.

[d] G = global evaluation, SE = situational evaluation related to events, ST = situational evaluation related to time.

[e] I = individual, D = dyad, G = group.

[f] T = top-down, B = bottom-up.

[g] ADO = adolescent, YA = young adult, A = adult, LA = late adult.

[h] G = general, C = clinical.

Table 1.4

Summary of research designs and measurement strategies adopted by quantitative studies investigating the meaning-making process

Study	Study design		Operationalization of meaning-making					Sample		
	Research design	Timeframe of data collection	Instrument	Meaning-making measure (*validated)	Measure dimensionality	Global vs situational	Unit of analysis	N	Life stage	Population
Armour, 2010	L (three waves)	R;PPR	S	Have you been able to make any sense of losing your loved one(s)?	MOC	SE	I	133	LA	G
Boals, 2012	E (pre-post-follow up)	PPR	S;N	Judges' Ratings of Meaning Making (Boals et al. 2011)	MUC;MOP	SE	I	88	EA	G
Böhmer et al., n.d.	E (RCT)	PPR	S	The Sources of Meaning and Meaning in Life questionnaire (SOME; Schnell & Becker, 2007)*	MOC;MOP	G	I	42	EA;YA;A;LA	C
Campo et al., 2017	L (two waves)	R;PPA	S;I	4 items adapted from (Wu et al., 2008)*	MOC;MUP	SE	I	254	A	C
Gan et al., 2018	L (two waves)	R;PPR	S	Chinese meaning-making scale (Wang et al., 2016). The Meaning-Focused Coping Questionnaire (MFCQ; Gan et al., 2013)*	MOC;MOP MOC;MOP	SE SE	I	146	EA;YA;A;LA	C
Holland et al., 2015	E (pre-post)	R;PPA	S	The Integration of Stressful Life Experiences Scale (ISLES; Holland et al., 2010)*	MUP	SE	I	51	A	C
Lachnit et al., 2020	L (four waves)	R;PPA	S	Global Meaning Violations Scale (GMVS; Park et al. 2016)*	MUC	SE	I	180	EA	G

(*table continues*)

Table 1.4 (*continued*)

Study	Study design			Operationalization of meaning-making				Sample		
	Research design[a]	Timeframe of data collection[b]	Instrument[c]	Meaning-making measure (*validated)	Measure dimensionality[d]	Global vs situational[e]	Unit of analysis[f]	N	Life stage[g]	Population[h]
Milkavich, 2010	L (three waves)	PPR	S	Meaning in Life Questionnaire (MLQ; Steger et al., 2006)*	MOC;MUP	G	I	106	EA;YA;A	G
Newman & Nezlek, 2019	I (daily diary)	PPR	S	Meaning in Life Questionnaire daily adaptation (Steger et al., 2006)*	MOC;MUP	ST	I	130	EA	G
Newman et al., 2018	I (daily diary)	PPR	S	Meaning in Life Questionnaire + MLQ daily adaptation (Steger et al., 2006)*	MOC;MUP	G;ST	I	254	EA	G
Park & Blumberg, 2002	L (two waves)	R;PPA	S	no	/	/	I	44	EA	G
Park & Blumberg, 2002	E (pre-post-follow up)	R;PPA	S	no	/	/	I	85	EA	G
Park et al., 2008	L (two waves)	R;PPR	S	Perceived Personal Meaning Scale (Wong, 1998)*	MOC;MOP	G	I	250	A	C
Park & Esposito, 2011	L (two waves)	R;PPA;PPR	S	The existential Well-Being Scale (Paloutzian & Ellison, 1991)* Meaning Assessment Scale (MAS) (Park et al., in press)	MOC MUP	G SE	I	283	EA	G
Pelletier & Drozda-Senkowska, 2019	L (three waves)	R	S	Two items adapted from Updegraff et al. (2008)	MUP	SE	I	161	EA;YA;A;LA	G

(*table continues*)

Table 1.4 (*continued*)

Study	Study design			Operationalization of meaning-making				Sample		
	Research design[a]	Timeframe of data collection[b]	Instrument[c]	Meaning-making measure (*validated)	Measure dimensionality[d]	Global vs situational[e]	Unit of analysis[f]	N	Life stage[g]	Population[h]
Schnell & Pali, 2013	L (three waves)	PPR	S	The Sources of Meaning and Meaning in Life questionnaire (SOME; Schnell & Becker, 2007)*	MOC;MOP	G	I	126	ADO;EA;YA;A;LA	G
Spitzenstätter & Schnell, 2020	E (RCT)	PPR;PPF	S	The Sources of Meaning and Meaning in Life questionnaire (SOME; Schnell & Becker, 2007)*	MOC;MOP	G	I	98	EA;YA;A	G
Van den Heuvel et al., 2013	L (three waves)	PPR	S	The meaning-making scale (Van den Heuvel et al., 2009)*	MOC;MOP	G	I	368	YA;A	G

Note. NS = not specified.

[a] E = experimental, L = longitudinal, I = intensive.

[b] R = retrospective, PPR = prospective on present, PPA = prospective on past, PPF = prospective on future.

[c] S = self-report, I = interview, N = narrative.

[d] MOC = mono-dimensional content, MOP = mono-dimensional process, MUC = multi-dimensional content, MUP = multi-dimensional process.

[e] G = global evaluation, SE = situational evaluation related to events, ST = situational evaluation related to time.

[f] I = Individual, D = dyad G = group.

[g] ADO = adolescent, YA = young adult, A = adult, LA = late adult.

[h] G = general, C = clinical

General discussion

Theoretical conceptualization of the meaning-making process

This review makes clear that meaning-making is a complex, multi-level process, as emerges from both theoretical traditions. The stress and trauma framework is currently the most developed at the theoretical level and, consistently, the most investigated on an empirical level. About that, a great boost to the stress and trauma literature comes from Park & Folkman's (1997) theory of meaning-making, which has been further systematized in the next decade by Park and colleagues (Park, 2010; Park et al., 2013). Their foundational work likely conditioned the development of the meaning-making research, so that most empirical works revised in this review assumed Park's theoretical framework when investigating the meaning-making process in the context of specific life experiences. Perhaps the complexity of the meaning-making process is easier to investigate if the process is circumscribed to specific concrete experiences because it is easier to formulate specific research questions and structure effective designs when the object of investigation is defined by specific boundaries. Conversely, the developmental literature on meaning-making seems to be underdeveloped, and a comprehensive theory of the meaning-making process within this perspective is missing. A future direction would be to integrate the two perspectives, as few works already tried to do. This would allow having an overall picture of how the meaning-making process works when unexpected events occur during a developmental transition.

Although more than 10 years have passed since Park pointed out the issue of the conceptual definition of meaning-making in her literature review (Park, 2010), difficulties remain in properly defining the construct of meaning-making. Many works included in this systematic review don't provide a definition of meaning-making, and the ones available appear to be inconsistent and sometimes even contradictory. For instance, some works define meaning-making as a purely cognitive process (e.g., Park, 2017; MacDermott, 2010), while

others assert that meaning-making is not a cognitive strategy (Krueger, 2006), instead it is based also on an emotional/affective component (Marotta-Walters, 2015; Boynton & Vis, 2011). Not even the works that refer to the same theoretical approach propose a shared definition. For example, among the stress and trauma literature, I found a bunch of works adopting Park's definition of meaning-making as the process of reducing the discrepancy between appraised and global meanings after a disruptive experience (e.g. Im, 2018; Gan et al., 2018); while others describe meaning-making as making sense or finding benefit after a traumatic experience (Lister, 2006; Pelletier & Drozda-Senkowska, 2019), or a cognitive and affective change in the way an individual perceives a painful experience (Marotta-Walters, 2015). On the other side, the developmental literature's struggle to find a shared definition of meaning-making appears even harder. Meaning-making has been defined as the process of forming and reforming significance (Armour, 2010); making sense of human experience to understand themselves, the other, and the world (Fivush, 2017); retaining, reaffirming, revising, or replacing elements of the orienting system (Kopacz et al., 2019); actively organize experiences (Kunnen & Bosma, 2000).

However, some universal features of the meaning-making process can be drawn from this comprehensive systematization of the literature. First, both traditions agree in defining the meaning-making process as associated with a *global system of meanings*, made of core values, beliefs, and goals about the self, the others, and the world (Janoff-Bulman, 1989; Poulin & Silver, 2019). What differentiates the two theoretical perspectives is that the developmental tradition focuses more on the *construction* of the *global system of meanings*, while the focal point of the stress and trauma approach is the *re-construction* of the system of meanings when disrupted by traumatic or stressful experiences. The second universal feature is that meaning-making is recognized as a *situational process*, that is anchored to specific events and life experiences. The integration of everyday life experiences into a coherent life

narrative is the first step for the construction of each own system of meanings, while the occurrence of significant life events can lead toward its disruption and reconstruction. The third and last feature of meaning-making is that it is a *temporal process*, in which past, present, and future integrate. *Past* experiences must be coherently integrated into a unified self-concept to generate the system of meanings; *present* (unexpected or expected) life experiences are the drivers of change in the process; *future* goals and life perspectives are the motivational sources that activate the meaning-making process. Based on these common features I hereby propose a new integrated conceptual definition of meaning-making:

Meaning-making is the process of construction and re-construction of a global system of meanings through the integration of past, present, and future situational experiences.

This definition aims to respond to the need for a conceptual definition that can be shared by both frameworks on meaning-making; however, further theoretical developments of the discipline could lead to further adjustments and updates of the definition. For instance, meaning-making has so far been considered as an individual process, underlining that people have to exercise personal agency in elaborating meanings out of their life experiences. However, few studies pointed out that the meaning-making process is a co-constructed work, especially within families and romantic couples (e.g., Mitchell, 2016; Fivush et al., 2018). In these systems, members are in a condition of interdependence and mutual influence (Lanz et al., 2015), by sharing most of their life experiences. Therefore, future studies should investigate the collective nature of meaning-making within dyads or groups.

Research design and measurement strategies

In general, the qualitative literature is rich, and the methodological approaches used are consistent. The fact that the qualitative literature presents such a wide variety of methodological approaches, e.g., grounded theory, narrative approach, IPA, underlines that meaning-making is a multifaceted object of study that can be observed from different angles.

From a measurement perspective, most qualitative works do not explicitly investigate meaning-making, instead, they adopt unstructured interviews and narratives in which people can tell their stories without directly referring to the theme of meaning-making. It is up to the researchers to bring out how people construct life meanings over time, through a work of systematization and interpretation of data that should be guided by a clear theoretical framework. It is important to point out that, although this approach responds to the qualitative aim to go in-depth and obtain rich materials about the process under observation, without a clear theoretical conceptualization of meaning-making the risk of over-interpret or confusing meaning-making with other processes increases.

On the other side, the quantitative literature on meaning-making is scarce and presents several methodological issues. Compared to the past decade researchers seem to be more aware that research designs that include time are needed to grasp the meaning-making dynamics that unfold over time. However, most longitudinal studies measured two or three time periods, covering only few months. Therefore, long-span longitudinal studies with more waves are needed to uncover the changes in meaning-making configurations along with normative life transitions (e.g., transition to adulthood in Zambelli & Tagliabue, 2022). Additionally, only two intensive studies (daily diary) are present, conducted by the same team of researchers (Newman et al., 2018; Newman & Nezleck, 2019). These studies were able to clarify some inconsistencies by showing that at the within level (state), the daily search for meaning in life was positively related to well-being, while at the between level (trait), the search for meaning in life was negatively related to well-being; thus, suggesting that situational dynamics differ from changes at the global level. Although researchers might be discouraged from using intensive designs due to their onerousness, those designs are the only ones able to reveal the daily fluctuations that characterize the meaning-making process at a situational level; therefore, this line of research should be pursued, for instance by using

more parsimonious designs such as short-ILD (e.g., daily diary studies with T<30; Schultzberg & Muthén, 2018). Additionally, only two randomized control trials (RCT) have been conducted (Böhmer et al., n.d.; Spitzenstätter & Schnell, 2020). RCTs they are the only accessible way to examine strong causal mechanisms which undergo the meaning-making process, for instance when attempting to verify the efficacy of meaning-based interventions on the recovery from trauma.

The difficulties around the operational definition of meaning-making reflect in the absence of valid and reliable measures developed to assess meaning-making. This systematic review unveiled the common practice of using measures of other constructs (e.g., coping, post-traumatic growth, meaning in life) to assess meaning-making. Moreover, when meaning-making is considered as a multi-dimensional measure regarding the process, it is assessed as mono-dimensional regarding the content (e.g., Meaning in Life Questionnaire; Steger et al., 2006), and vice versa: multi-dimensional regarding the content, but mono-dimensional regarding the process (e.g., Judges' Ratings of Meaning Making; Boals et al. 2011). What is missing is an integrated measure able to capture the conceptual breadth of meaning-making, a measure that considers meaning-making both in its process and content complexity. However, developing a single measure capable of capturing the whole meaning-making process may not be feasible. One solution could be to develop instruments able to accurately and reliably capture different features of the meaning-making process. Some attempts have already been made, for example, Park's Global Meaning Violations Scale, a new measure developed to evaluate the discrepancy between global beliefs and appraisal (GMVS; Park et al. 2016). Moreover, future works should drive their efforts for the development of different typologies of measures beyond self-report, for instance, implicit measures. In that sense, it is interesting the use of artifacts and observations as instruments used in qualitative studies to collect product and process-oriented aspects of meaning-

making. These kinds of implicit measures are a promising way to overcome the problem of the lack of accuracy of self-report tools, due to the inability of participants to accurately identify and report about their system of meanings, as already suggested by Park (2010) and Leontiev (2013).

One issue shared by the qualitative and quantitative literature is related to the time perspective adopted to investigate meaning-making. Specifically, *retrospection* (focus on past experiences) and *prospection on the present* (focus on present experiences) are the most common adopted perspectives, while the *perspective on the future* (focus on future experiences) is currently under-studied. However, to have an overall view of the meaning-making process these three temporal perspectives should be integrated, because as I said, even if a stressful event occurred in the past, it certainly has an impact on the present, and can determine a person's future goals and life expectations. In our opinion, this could be addressed in three ways: using a measure (currently non-existent) capable of capturing all the three temporal levels; combining measures with different time perspectives; and using repeated measures research designs (e.g. longitudinal, intensive), or designs that combine different time-frames, such as measurement burst designs (Walls et al., 2011).

One last consideration to dwell on is the population target. Empirical research investigated the meaning-making process across the entire life cycle from adolescence to the elderly, both in the general and clinical population, thus proving that the meaning-making topic is of attracting interest for all areas of psychology. Therefore, the ground is fertile for breading studies also on pre-adolescence, an understudied population which might give insights into the meaning-making process dynamics, and clarify some theoretical unanswered questions, for instance, the abovementioned theme of the co-construction of meaning-making within the family previously discussed.

Conclusion remarks and methodological recommendations

The concluding act of this systematic review is to update the theoretical and methodological issues that are currently interfering with the development of the discipline and outline available strategies to solve them.

First it is necessary to acknowledge that the lack of clarity in the meaning-making process conceptualization is still an issue (Park, 2010, 2017; Newman et al., 2018). This problem has been partially solved thanks to Park's systematization of the meaning-making process in the context of stressful and traumatic experiences. However, this systematic review brings to light the developmental literature on meaning-making, which owns established theoretical roots, but which appears to be misaligned concerning the theoretical conceptualization of meaning-making. A thorough endeavor should be dedicated to the integration of the developmental and stress and trauma perspective within a comprehensive theoretical conceptualization of meaning-making. A good starting point could be the adoption of a shared conceptual definition of meaning-making, such as the one I propose, to create a shared terminology that reflects the complexity of the meaning-making process and includes the plurality of gazes through which the meaning-making process can be observed.

Definition complexity reflects measurement complexity; this systematic review brought out the limitations of measurement strategies adopted by quantitative works; however, I believe that some suggestions for future research can be drawn. At an empirical level the literature is moving from a qualitative to a quantitative approach, on which, however, I see many methodological difficulties that probably explain the relative lack of studies. Beyond the deficiency of reliable meaning-making measures and the shortage of studies using process-oriented research designs that I already discussed, I want to advance one last methodological recommendation that is valid for all empirical research. The quality of the research and the ability to obtain meaningful results is directly dependent on the

researcher's ability to coherently combine the research design with measurement strategies to answer well-defined research questions. For instance, if the interest is understanding how living with cancer impacts on patients' system of beliefs about themselves, a measure able to detect changes in the global system of meaning should be included (e.g., GMVS, Park et al. 2016), and the adoption of a longitudinal design would allow mapping the changes in meaning-making configurations across the illness. Instead, if the aim is to examine how everyday activities contribute to shifting the activation of meaning-making dynamics, a situational measure sensible enough to detect daily fluctuations, combined with an intensive design such as a daily diary study, should be chosen. Experimental designs would be the best choice when attempting to verify the efficacy of meaning-based interventions on the recovery from trauma, combined with global measures of meaning to prove a shift in the system of meanings configuration due to the intervention, and situational measures might shed light on which meaning-making dynamics the intervention is working on.

One last consideration is dedicated to the processual nature of meaning-making that could be valorized in the implementation of meaning-based interventions, which are very few to date, even if results are promising. Solving the theoretical and methodological questions discussed here is the first step to better understanding which dynamics govern the meaning-making process. A finer comprehension of the meaning-making process constitutes a prerequisite for the implementation of effective interventions based on the intentional activation of specific dynamics, to help people to activate and manage their meaning-making process to improve their ability to recover from trauma and/or to deal with the multiple transitional challenges.

This systematic review has also some limitations. First, the adopted search string, which retrieved only the records including the term meaning-making (or meaning making) in the title and the keywords. On the one hand, this search string made it possible to assemble

only the records which had the process of meaning-making as the target of inquiry, giving birth to the first systematic review of the literature on the meaning-making process. On the other hand, I might have missed the works that investigated the meaning-making process without addressing it as such. As the ambiguity in the conceptual definition of meaning-making emerged as one of the major issues undermining the construct validity of the meaning-making literature, it would be interesting to have a quantitative and qualitative description of this "hidden" meaning-making literature.

A second limitation is that this systematic review doesn't consider some relevant topics like data analysis and results. Although this choice was considered necessary to properly analyze and discuss the theoretical and methodological issues, the study of these topics could unveil other unresolved issues that take part in the explanation of contradictory results present in the literature. For instance, some authors advanced a main concern regarding the use of simplistic analysis approaches that deny the complexity and conceptual breadth of the meaning-making as a construct (Leonitev, 2013; Martela & Steger, 2016), suggesting that the meaning-making is a multilevel process (Newman et al., 2020; Park, 2010). Further systematic reviews and meta-analyses should be conducted to summarize and critically analyze the available evidence around these topics.

CHAPTER 2.

Challenge N°2: How to measure the meaning-making process?

Introduction

From the systematic review presented in Chapter 1 several methodological limitations in the meaning-making research emerged. These limitations mainly concern the quantitative literature which appears limited and inconsistent. From the analysis conducted, it emerges the lack of valid and reliable meaning-making self-report measures to assess the meaning-making features and its temporal dynamics. These limitations bring us toward the second methodological challenge in the study of meaning-making, related to the measurement of the meaning-making process within the quantitative framework.

Addressing this challenge is the aim of this second Chapter. The Chapter initially provides a review of the most recent theoretical advancements in the meaning literature and an inspection of the qualities and limitations of available measures of meaning in life. From this preliminary examination, several measurement gaps related to the operationalization of the construct have been pointed out. On those bases, a new self-report measure of meaning in life has been developed, dedicated to the assessment of the meaning-making dynamics in the context of specific life events and experiences. The psychometric properties of the new scale have been tested with two empirical studies.

Meaning in life as a processual construct: presence and search for meaning

Starting from the awareness about the beneficial effects of living a meaningful life (Frankl, 1963; Irving et al., 2017; Roepke et al., 2014; Shoshani & Russo-Netzer, 2017; Steger et al., 2009; Li et al., 2019), for a long-time researchers questioned themselves about the origins of meaning in life, in other words, how meaning in life is created? How can be

enhanced? All these questions lead to the investigation of the dynamics of the meaning-making process.

One of the first reflection about how to measure the meaning-making process came from Steger and colleagues (2006), who argued that meaning in life is not just a matter of presence or absence of meaningfulness, but the process-oriented nature of meaning in life can be expressed by the combination of two constitutive features: the perception of a life fulfilled with meaning (i.e., *presence of meaning*) and the active efforts to establish some understanding of purpose and meaning in life (i.e., *search for meaning*). The empirical findings produced in the last 15 years based on this theoretical framework have shown that, in the adult population, the two dimensions of presence and search for meaning are cross-sectionally negatively associated (Li et al., 2021 for a meta-analysis). Moreover, if presence of meaning is unequivocally an indicator of well-being in all stages of life, prominent levels of search for meaning are quite often positively associated with lower well-being or negative psychological functioning in the adult population (Li et al., 2021). These results sustain the *presence-to-search model*, according to which, when people perceive a lack of meaning in life, and consequently low well-being, they are pushed towards a greater search for meaning (Heine et al., 2006).

In contrast, when perceptions of meaning in life are reported not by adults but by emerging and young adults, presence and search for meaning are often positively associated, and the search for meaning itself does not show negative associations with well-being constructs (Krok, 2018; Steger et al., 2011). These results underline a normative function of the search for meaning during emerging and young adulthood that mirrors the process of identity exploration typical of these phases of life (Mayseless & Keren, 2014; Negru-Subtirica et al., 2016). The bunch of empirical evidence collected by administering the MLQ measure made scholars concluding that presence and search for meaning are two separate but

interdependent dimensions of meaning in life, therefore, they should be studied in conjunction to grasp the full complexity of the meaning-making process (Steger et al., 2009).

Meaning in life as a multidimensional construct: the tripartite view of comprehension/coherence, purpose and significance/mattering

A decade after Steger opened the reflection on the process of meaning in life creation, a theoretical reflection about how to conceptually define and measure the construct of meaning in life raised. The starting point was the need to establish the theoretical independence of meaning in life from other related constructs such as well-being, life satisfaction and coping, discriminating what constitutes meaning in life as a construct from what is just a correlate (Leontiev, 2013; Park, 2010). In recent years, a scholar consensus has emerged in defining meaning in life as a multidimensional construct founded on the perception of life that is comprehensible and coherent (i.e., *coherence* or *comprehension* dimension), oriented by purposes (i.e., *purpose* dimension), and endowed with value (i.e., *significant* or *mattering* dimension) (Costin & Vignoles, 2020; George & Park, 2017; Heintzelman & King, 2014; King et al., 2006; Martela & Steger, 2016).

Comprehension/coherence can be defined as the extent to which individuals perceive a sense of coherence and comprehensibility regarding one's life (Baumeister, 1991; George & Park, 2016; Reker & Wong, 1988). Individuals with high coherence are able to understand the experiences and inscribe them into a clear and coherent life story, thus perceiving that their life finally make sense (Heine et al., 2006; King et al., 2006; Vignoles et al., 2006). *Purpose* refers to the degree to which individuals live their lives as directed and motivated by intrinsically valued goals (Battista & Almond, 1973; George & Park, 2016; Klinger, 1998; McKnight & Kashdan, 2009). Individuals with high purpose dimension scores perceive a purposeful living, they have a clear sense of their aspirations and are extremely committed to reach these ends (George & Park, 2016). Finally, *significance/mattering* dimension represents

the extent to which individuals feel their existence as inherently meaningful, valuable, and worth living (George & Park, 2014, 2016; King et al., 2006). Martela and Steger (2022) operated a distinction between significance and mattering, stating that the former (significance) is about a sense of life that is inherently valuable, while mattering is more about the value of one's life to the world.

A brief panorama of available meaning in life measures and their limitations

Currently, we dispose of few self-report measures of meaning in life that were built under the aforementioned theoretical basis (see Table 2.1). First, the meaning in life questionnaire (MLQ) developed by Steger at al. (2006). This 10-item measure is the only available self-report measure to assess meaning in life with a processual perspective, by operationalizing the construct as made of a presence of meaning dimension, and a search for meaning dimension. The MLQ has been translated and validated in more than 20 countries and its bi-factorial structure showed strong stability and validity evidence (see Table 2.1). The major drawback of the MLQ is that it does not grasp the multidimensionality of the construct as made of comprehension/coherence, purpose and significance/mattering.

To serve this purpose, three self-report measures of *presence* of meaning in life has been recently developed, chronologically the Multidimensional Existential Meaning Scale (MEMS; George & Park, 2017), the multidimensional MIL scale (Costin & Vignoles, 2020) and the three dimensional meaning in life scale (3DM; Martela & Steger, 2022). All the three measures showed good psychometric properties and yielded support for a distinction among the three dimensions of MIL, providing also evidence of discriminant validity with other theory-related constructs (see Table 2.1).

I see two major shortcomings in the self-report measures of meaning in life that I examined. The first limitation is that we miss an integrated measure of meaning in life in which the tripartite view of meaning in life is acknowledge both as constituting the subjective

perception of life meaning, and as the target of individuals' exploration when searching for something that makes their life meaningful. This gap will be addressed as one of the aims of the present contribution.

The second measurement issue is related to the fact that all the four MIL instruments are measures of global meaningfulness of life, in the sense that their intention is to grasp an overall estimation of how much people perceive their whole life as meaningful and/or how much they think to be in search of meaning. Coherently, the instructions given to participants do not refer to any specific situation or timeframe (see Table 2.1), with the only exception of the Multidimensional MIL scale (Costin & Vignoles, 2020) that asks participants to refer to their "*current feelings*", that is an indication of focusing specifically on their perception and emotions experienced in the present moment of data collection. Items are always formulated with the present verbal tense (e.g., from the MLQ: "I am always searching for something that makes my life feel significant"; from the Multidimensional MIL "I can make sense of the things that happen in my life"). The 3DM measure (Martela & Steger, 2022) follows the same plot but one item from the significance dimension reports a situational reference related to everyday life ("*Every day* I experience the sense that life is worth living"). Additionally, the MEMS (George & Park, 2017) includes one items from the mattering dimension with a future-oriented orientation "*Even a thousand years from now*, it would still matter whether I existed or not", and one item that specifically asks participants to globally evaluate the comprehensibility of their life "*looking at my life as a whole*, things seem clear to me". Despite those measures possess good psychometric properties as shown in their validation works (Table 2.1), some authors have expressed criticality in the use of global measures when the goal is to study meaning in life in the context of specific situational experiences. For instance, empirical studies found that global evaluations of life meaning are unsuitable to measure daily micro-dynamics assessed with intensive longitudinal designs, as they are not

sensitive to short-time fluctuations (Newman et al., 2018, 2020). When people are asked to report their global perception of meaningfulness, they make an average estimate of life value which is affected by their past peak experiences, by the current situation (e.g., one present mood), and by a comparison between their expectations for the future and reality, thus making impossible to distinguish the role of the different temporal dynamics and experienced events (Newman et al., 2020). Moreover, global measures of meaning in life do not provide indications to participants about what experiences they should consider when evaluating their perception of life meaningfulness, thus making even more difficult for participants to provide a reliable self-report evaluation of their "meaning in life" that is a concept inherently ambiguous (Leontiev, 2013; Park, 2017). Hence, when the goal is to detect the meaning in life in relation to specific moments and events, it would be important to operationalize meaning in life as a situational construct by equipping the instructions and/or items with an anchor to specific situational experiences.

Table 2.1

Self-report measures of meaning in life assessing the three content-dimensions and the two process-dimensions of the construct

Instrument	Validation paper	Number of items	Scale of measurement	Instructions	Dimensions	Reliability	Validity evidence
MEMS - Multidimensional Existential Meaning Scale	George & Park, 2017	15 items	Likert scale 1-7	Please read the following items carefully. Using the response scale listed next to each item indicate the extent to which you agree or disagree with that statement.	Comprehension Purpose Mattering	from study1[a] .90 .89 .84	Content validation (by experts) Convergent validity Criterion validity
Multidimensional MIL scale	Costin & Vignoles, 2019	16 items	Likert scale 1-7	Please indicate your current feelings by selecting how much you agree or disagree with the following statements.	MIL judgement Coherence Purpose Mattering	from study1[b] .89 .77 .85 .92	Structural stability (across time and samples) Generalizability (multigroup invariance)
3DM - Three dimensional meaning in life scale	Martela & Steger, 2022	11 items	Likert scale 1-7	Please read each of the following items carefully, thinking about how it relates to your life, and then indicate how true it is for you.	Coherence Purpose Significance	from study4[a] .84 .85 .71	Structural stability (across samples) Convergent validity Divergent validity Criterion validity
MLQ - Meaning in Life Questionnaire	Steger et al., 2006	10 items	Likert scale 1-5	Please take a moment to think about what makes your life feel important to you. Please respond to the following statements as truthfully and accurately as you can, and also please remember that these are very subjective questions and that there are no right or wrong answers.	Presence Search	from study1b[a] .86 .87	Structural stability (across samples) Convergent validity Divergent validity

Note.

[a] reliability calculated with Cronbach's Alpha

[b] reliability calculated with Raykov's (1997) formula for latent factors

Up to now, only few sporadic attempts have been made to develop self-report measures related to the meaning in life topic that include an anchor to specific situational experiences. For instance, Armour (2010) asked participants to answer the question "Have you been able to make any sense of losing your loved one(s)?"; Park et al. (2016) assessed how much a specific stressful or traumatic experience violated personal values and the ability to accomplish life-goals with the Global Meaning Violations Scale (GMVS); and The Meaning-Focused Coping Questionnaire (MFCQ; Gan et al., 2013) assesses the extent to which participants possess specific meaning-focus skills in the context of bad experiences (e.g. "I wondered whether there is some special meaning in the occurrence of this event"). In a couple of daily diary studies, Newman and colleagues (Newman et al., 2018; Newman & Nezlek, 2019) tried to integrate temporality into the measurement of meaning in life by adapting the MLQ for the measurement of daily perceptions by asking participants to refer to the events of the previous 24 hours to make their assessment of meaning in life (e.g. "How meaningful did you feel your life was *today*?").

Meaning in life as a situational construct: event-specific and temporal oriented

The experience of life meaningfulness and the process of meaning-making grounds in specific timeframes and contexts as recently discussed by King and Kicks (2022). Therefore, when taking into consideration meaning in life as a situational construct, we must consider that it possesses two properties: it is *event-specific* and *temporal oriented*.

Meaning in life is event-specific because it can be disrupted or enhanced by some major experiences. These major events can be categorized in *traumatic events* (e.g., death; Barak & Leichtentritt, 2015); *stressful events* (e.g., dealing with an organizational change; Van den Heuvel et al., 2013); *normative transitions* (e.g., graduating from college, Wilt et al., 2016; becoming a parent, Albertova & Bolekova, 2022); or *non-normative transitions* (e.g., cancer, combat trauma experiences; Baker, 2000; Larner & Blow, 2011). The occurrence of

these events can be expected or unexpected, but in any case, it generates a shift in one's system of meanings that can be perceived by individuals either as a crisis of meaning (i.e., feeling the life as fragmented, empty, and worthless; Schnell, 2009), or as an enhancement of life-fulfillment.

Not just major events, but also mundane activities are important to foster a sense of life meaningfulness, even if most of the time people are unaware of this implicit process, exactly as we are mostly unconscious of our identity development (Schachter, 2018). In fact, as human beings we build the meaning of our life day after day, by interpreting the naturally occurring everyday life-experiences and integrating them in our identity (Brassai et al., 2011; Frankl, 1963; Park & Baumeister, 2017; Steger et al., 2008). For instance, daily routines and leisure activities, such as have a cup of coffee every morning, has been found to play a leading role in making one's life meaningful (Bailey & Fernando, 2012; Heintzelman & King, 2019).

The second situational property of meaning in life is that it is *temporal-oriented*. As stated by Fivush et al. (2017) "meaning-making emerges differentially across days, weeks, months, and years after an experience, and this event processing takes place within ongoing developmental change" (pp. 127). In other words, the perception of life meaningfulness experienced before something unexpected happens is different from that perceived concurrently with the event, and change along with the evolving situation, and beyond, because even when an event is concluded (e.g., recovery from an illness) the overall assessment of one's life could still change until finding a new stable configuration. For instance, Updegraff et al. (2008) found American citizens survived to the 9/11 Terrorist Attacks to be actively engaged in the search for meaning even after 2 months, 1 and 2 years after the event. Being able to distinguish the change in meaning and its dynamics before, during and after an experience is of utmost importance because it allows researchers and

practitioners to have information on how to intervene on a traumatized individual promoting a functional activation of the meaning-making process (Hill et al., 2017, 2019; Mascaro & Rosen, 2008). The temporality of the process can emerge also in short time-frames, as the ways individuals elaborate and give meaning to specific experiences over time change and undulate at a daily level (Fivush et al., 2017; Frankl, 1963; Heintzelman et al., 2013; Steger & Kashdan, 2013). For example, Eakman (2014) conducted an 11-months study and discovered that the perception of meaning in life changed according to the meaningful activities (day-to-day activities that are motivated by personal values) participants were involved into.

From the literature presented so far, it emerges that the psychometric literature on meaning in life is missing an integrated measure of meaning in life that is capable of detecting the multi-dimensionality of the construct within a situational framework, where for *situational* I intend both the reference to specific life events or transition of interest (e.g. cancer diagnosis, COVID-19 pandemic, getting a new job), and a specific time-frame (e.g. day by day, the last month), in order to be able to measure the meaning-making dynamics we intend to measure, that is precisely what scholars refers to as construct validity of a measure (Zumbo, 2005).

Aims

This project intends to lead to an advancement in the measurement of the meaning in life construct within the quantitative approach, by proposing a new measure of situational meaning in life. The aims of the present work are two-fold:

Aim 1. To develop a new self-report measure of meaning in life capable of (a) capturing the complexity of the construct by integrating the tripartite view of MIL (coherence/comprehension, purpose, and mattering/significance) within the two process-oriented dimensions of presence and search for meaning in life, and (b) detecting the

situational features of meaning in life in the context of event-specific and time-oriented experiences. The new measure is called SMILE (*Situational Meaning In Life Evaluation*).

Aim 2. To collect empirical evidence of the validity of the SMILE (structural generalizability, reliability, convergent and criterion validity).

Three studies have been designed to properly answer the aims. The first study presented the process of development of the SMILE (Aim 1); the second study tested the psychometric properties of the SMILE (Aim 2) by collecting evidence of structural validity, reliability evidence, generalizability evidence, and criterion-related validity on a representative sample of 3033 Italian participants; the third study examined the replicability of the validity evidence collected in study 2 (Aim 2) on a sample of 318 emerging adults, and additionally examined convergent, divergent and incremental validity (with SEM models).

Study 2.1 Development of the SMILE measure

The purpose of the first study was to create the item pool for the construction of a situational measure of meaning in life that must have the following properties: (a) to assess the process-dimensions of presence and search for meaning in life; (b) to include the multidimensionality of the construct as made of comprehension/coherence, purpose and significance/mattering in both the presence and search form; (c) to equip each item with an event-specific and temporal-oriented anchor that can be adapted to different context and situations; (d) the measure must not exceed in length as it will be used especially for longitudinal and intensive longitudinal design.

Development of the SMILE measure

With the aim to formulate a theoretically grounded and face valid item pool, I based on the most recent and relevant definitions of meaning in life and I examined the available global measures of meaning in life. The process of item selection followed a recursive process of ideation and discussion by the authors until reaching consensus about the clarity

and consistency of the items with the theoretical definitions of meaning in life. The adaptability of the scale to different typologies of situational events and the applicability to longitudinal and intensive designs was considered as a prerogative of the measure.

For the *comprehension/coherence* dimension I took as a reference the MLQ's item "I understand my life's meaning" and two items from MEMS' comprehension dimension "I understand my life" and "I can make sense of the things that happen in my life". According to the literature, the *coherence/comprehension* dimension refers to the people's past experiences, as it is grounded in the ability of people to understand the meaning of an occurred event or experience, and then being able to integrate it into a coherent life narrative (Reker & Wong, 2012; Martela & Steger, 2016). Therefore, I developed one item that assesses the ability of people to understand the meaning of events that happen in life (*presence of comprehension*), and I equipped the item with a reference to a specific event or situation and a temporal anchor to the past "If I look back at my life". This item has been formulated also in the search for meaning version (*search for comprehension*) to grasp the attempt of people to find out a meaning of the event.

For the *significance/mattering* dimension I referred especially to the 3DM's items "My life is full of value" and "Every day I experience the sense that life is worth living", and the MLQ's item "I have a good sense of what makes my life meaningful". The subjective perception of living a valuable life is strictly connected with present feelings (Martela & Steger, 2016), in fact this is the affective component of meaning in life, as it relates with emotions as happiness and fulfillment (Reker & Wong, 2012). Therefore, I developed one item to assess how much people perceive their life as valuable in the present ("Today") in the context of a specific event or situation (*presence of significance*). In the search for meaning version this item assesses the attempt to find out what values life in the context of a specific event or situation (*search for significance*).

Finally, the *purpose* dimension of meaning in life is distinctively future-oriented, as it is concerned to the strive to reach valuable lifegoals for one's future and give a sense of life directionality (Martela & Steger, 2016). I referred to 3MD's item "I have a set of core goals that give my life a sense of direction" and the Multidimensional MIL scale's "I have certain life goals that compel me to keep going" to formulate the *presence of purpose* and the *search for purpose* items grasping respectively the perception of having or being in search for life goals that push to move forward during a specific event or situation, with a temporal anchor to the future ("If I think about my future").

The definitive version of the Situational Meaning in Life Evaluation scale is composed by six items that belong to two different process-dimensions, *presence of meaning* and *search for meaning*. Each process-dimension is provided by three items, covering the three content-dimension of meaning in life of *comprehension*, *significance* and *purpose*. Each item is provided with the reference to the specific situation or event that people are processing while making meaning of their life. Each item incorporated the temporal features specific of the content dimension considered (past for coherence, presence for mattering, future for purpose). The instructions given to participants are "Looking back on what has happened, and what you have been thinking and doing since the occurrence of the [event/situation], we ask you to evaluate how much do you agree with the following statements". Use the following scale to answer considering that 1 corresponds to "strongly disagree" and 7 corresponds to "strongly agree".

The SMILE scale has been developed to be used also in intensive longitudinal designs, for example daily diary studies. Therefore, I developed a daily version of the SMILE in which the items and the instructions were adapted to comply with the aim of investigating the perception of presence and search for meaning in life in a daily context (e.g., by adopting the "today" temporal reference for each item). The SMILE_daily will be described in Chapter

3, in the context of its application to daily dairy studies. In the Appendix the SMILE scale is reported both in the cross-sectional version (A.1) and in the daily version (A.2).

Study 2.2 Validation of the SMILE measure on a representative sample

The aim of the second study was to administer the SMILE scale and test the psychometric properties on a national representative sample. Given that the scale was built on a pre-determined theoretical bases, the factorial structure of the SMILE was evaluated by testing few alternative models with Confirmatory Factor Analysis. Specifically, I sequentially tested a mono-factorial structure (general meaning in life factor), a two-factor structure (presence and search for meaning), a two-factor structure with correlated residuals of items belonging to the same content-dimension of meaning (e.g. presence-coherence with search-coherence), and a bi-factor structure in which two factorial structures (structure1: presence-search for meaning; structure 2: comprehension-purpose-significance) were contemporaneously estimated. Once the best factorial structure was established, the generalizability was examined across gender and age by testing measurement invariance. Internal consistency was then examined with McDonald's omega (Ω), that has been demonstrated to overperform the Cronbach's alpha coefficient (Dunn et al., 2014). Finally, I collected evidence of concurrent criterion validity with measures of well-being (i.e., positivity and mental health) and future anxiety, by using SEM models as suggested by the contemporary view of validity (Hubley & Zumbo, 2011).

Participants and procedures

Data came from the third wave of a broader longitudinal research project titled "The Family at the time of COVID-19" conducted by Università Cattolica del Sacro Cuore of Milan (IT). The study was approved by the Ethics Committee of the university in accordance with APA ethical guidelines for human research (http://www.apa.org/ethics/code/). Data was gathered by Human Highway (https://www.humanhighway.it/) through Op*Line*, an online

representative panel of the Italian population. Participants completed an anonymous online survey in May 2021, during a COVID-19 scenario in which several restrictions were raised in different regions of Italy according to spread rates of the virus.

The sample initially consisted of 3048 participants, but 13 participants were excluded because they were underaged (less than 18 years) or didn't report their age. The final sample included 3035 participants (51.6% female) belonging to different life phases: 21.9% were emerging and young adults (18-35 years), 64.2% adults (36-64 years), and 14% late adults (65-91 years)[7], with a mean age of 48.3 years (SD=14.03).

Measures

Situational meaning in life. In this study a practical example of how the SMILE measure can be easily adapted to investigate meaning in life in the context of a stressful event is presented. The purpose of this study was to investigate the perception of meaning in life in the Italian population who had been experiencing a collective stressful event such as the COVID-19 pandemic. Therefore, the generic situational anchor [event/situation] has been substituted with "the pandemic" in each of the six items of original version (e.g., "Today I can say that my life has value during the pandemic"). The temporal references were maintained in the original form, except for the past reference of the coherence items that was changed into "If I look back at the past year" because the intention was to make participants reflect on the entirety of their pandemic experience that started in their country exactly one year before data collection. The items were rated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree).

[7] Participants were divided in three age-classes according to the most widespread age classification (e.g., Irving et al., 2006; Navarro-Pérez et al., 2022; Paccagnella et al., 2008).

Positivity. As measure of well-being, I selected the *Positivity scale* (Caprara et al., 2012; Ω = .89) which is made of 8 items (e.g. *"I have great faith in the future"*; *"I am satisfied with my life"*) assessed on a 5-point Likert scale (1=strongly disagree; 5=strongly agree).

Mental Health. The Mental Health Continuum–Short Form (MHC–SF; Petrillo et al., 2015; Ω = .93) was administered. This scale is made of 14 items assessing how frequently participants experiences emotional (e.g., "happy"), social (e.g., "that people are basically good"), and psychological (e.g., "that you liked most part of your personality") well-being in the past month (rated on a Likert scale from 1=once or twice; 6=every day). The hierarchical structure of the scale allows the estimation of a global mental health factor.

Future anxiety. As measure of distress, I considered the Dark Future Scale (Zaleski et al., 2019; Ω = .90) made of five items (e.g., "*I fear that in the future my life will change for the worse*") rated on a 5-point Likert scale (1 = absolutely false; 5 = absolutely true).

Results

All the analysis has been conducted with SPSS (for outliers and descriptive statistics) and Mplus 8.4 (for CFA and SEM models). As a preliminary step I examined the outliers' distribution in our multivariate data using the Mahalanobis distance (Tabachnick & Fidell, 2013). 204 cases were identified as multivariate outliers (chi-square distribution significant for $p < .001$) and were therefore excluded from subsequent analysis[8], that were conducted on a final sample of N=2831. All the administered items were normally distributed showing kurtosis and skewness $\leq \left| 1.2 \right|$ (Muthén & Kaplan, 1985). Therefore, Maximum Likelihood was selected as the estimator in subsequent models. The factorial structure of the criterion variable measures (positivity, mental health, future anxiety) was tested in our sample with CFA.

[8] No significant differences were found comparing included cases with excluded cases on gender ($\chi 2(1)=.594$; p=.441) and age-classes ($\chi 2(2)=1.82$; p=.482).

Data availability. Descriptive statistics of the SMILE items, together with the SPSS and Mplus codes used to conduct the analysis are available in the *Chapter 2* folder at the following OSF link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

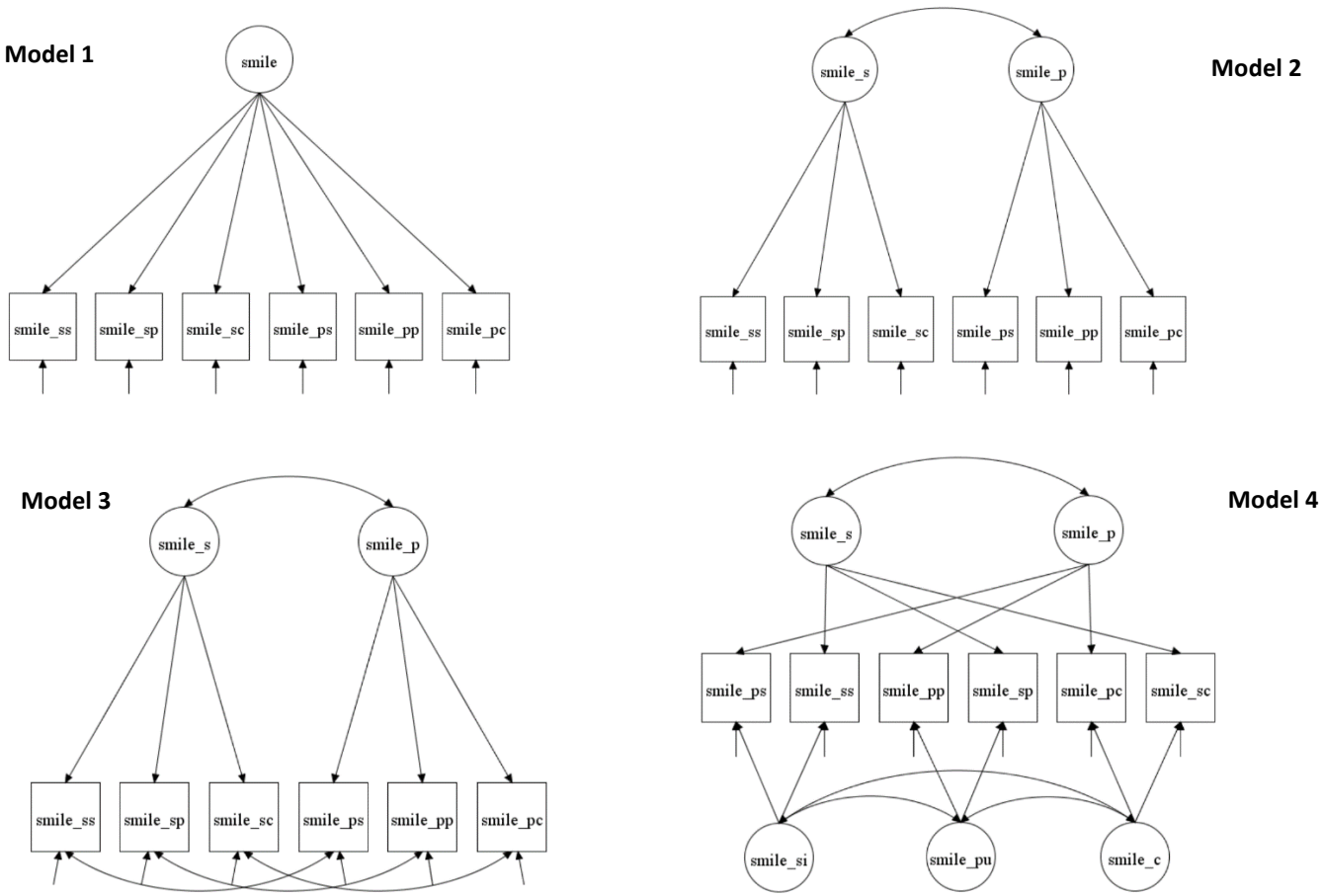
Examining the SMILE's factorial structure with CFA

Each of the theory-based factorial structures (see Figure 2.1) was tested with Confirmatory Factor Analysis, and the adaptability of the model to the data was examined through fit indices. The $\chi 2$ value was reported for each CFA model, however, considering that this index is not reliable for large sample sizes (Cheung & Rensvold, 2002), other fit indices had been examined in conjunction, among which the comparative fit index (CFI; acceptable fit for values $\geq .90$), the root mean square error of approximation (RMSEA; acceptable fit for values $\leq .08$), and the standardized root mean square residual (SRMR; acceptable fit for values $\leq .05$; Little, 2013).

Table 2.2 presents the model fit for each of the four theory-based structural models of SMILE tested. The two best fitting models were Model 3 (two-factor with correlated residuals) and Model 4 (bi-factor model), even if the latter one required fixing to 1 the first factor loading of the comprehension, significance, and purpose dimensions to obtain model convergence. Table 2.3, and Table 2.4 report the factorial structure of Model 3 and Model 4.

Figure 2.1

Theory-based factorial structure tested for the SMILE scale



Note. Model 1: one-factor structure; Model 2: two-factor structure with orthogonal residuals; Model 3: two-factor structure with correlated residuals; Model 4: bi-factor structure. Squares represent observed indicators, where the desinence _s represents search for meaning; _p represents presence of meaning; and the final letters refers to the content-dimension (s: significance; c: comprehension; p: purpose). Circles represent latent factors (smile_p: presence of meaning; smile_s: search for meaning; smile_si: significance; smile_pu: purpose; smile_c: comprehension.

Table 2.2

Comparison of different theory-based structural models of SMILE tested with CFA in Study 2.2 (N=2831)

Model	(*df*)	*p-value*	RMSEA [CI]	CFI	SRMR	Correlations among factors
Model 1 – one-factor structure	913.1 (9)	<.000	.19 [.178-.199]	.89	.05	-
Model 2 – two-factor structure with orthogonal residuals	325.3 (8)	<.000	.12 [.108-.130]	.96	.03	presence with search r=.79
Model 3 – two-factor structure with correlated residuals	109.1 (5)	<.000	.09 [.072-.100]	.99	.02	presence with search r=.77
Model 4 – bi-factor structure	12.9 (2)	.002	.04 [.023-.068]	.99	.00	presence with search r=.86 comprehension with purpose r=.72 comprehension with significance r=.89 significance with purpose r=.82

Note. (df): Chi-square test of model fit (degrees of freedom); RMSEA [CI]: root mean square error of approximation [90 percent confidence interval]; CFI: comparative fit index; SRMR: standardized root mean square residual; Ω: McDonald's omega.

Table 2.3

Standardized factor loadings for Model 3 in Study 2.2 (N=2831)

Item	Factor 1	Factor 2
	Presence of meaning	Search for meaning
SMILE_PC	.717	
SMILE_PP	.781	
SMILE_PS	.878	
SMILE_SC		.723
SMILE_SP		.770
SMILE_SS		.838
McDonald's omega	Ω=.83	Ω=.82

Note. SMILE_PC: presence of comprehension; SMILE_PP: presence of purpose; SMILE_PS: presence of significance; SMILE_SC: search of comprehension; SMILE_SP: search of purpose; SMILE_SS: search of significance.

Table 2.4

Standardized factor loadings for Model 4 in Study 2.2 (N=2831)

Items	Structure 1		Structure 2		
	Factor 1 Presence of meaning	Factor 2 Search for meaning	Factor 1 Comprehension	Factor 2 Significance	Factor 3 Purpose
SMILE_PC	.578		.497		
SMILE_PS	.837			.291	
SMILE_PP	.749				.324
SMILE_SC		.393	.703*		
SMILE_SS		.474		.726*	
SMILE_SP		.413			.745*
McDonald's omega	Ω=.83	Ω=.82			

Note. * Factor loadings fixed to 1 to avoid convergence problems.

SMILE_PC: presence of comprehension; SMILE_PP: presence of purpose; SMILE_PS: presence of significance; SMILE_SC: search of comprehension; SMILE_SP: search of purpose; SMILE_SS: search of significance.

Generalizability evidence across gender and age

From the evaluation of SMILE's structure validity, I found two best solutions, those of Model 3 (two-factor structure with correlated residuals) and Model 4 (bi-factor structure). The generalizability of each factorial structure was examined by testing the equivalence of the measurement structure (i.e., multi-group measurement invariance; Zumbo, 2009) across gender (male, female) and age (emerging adults, adults, older adults). Additionally, I tested the structural invariance of the association between the presence and search for meaning latent factors across gender and age. The nested models were compared by examining the significant worsening of the chi-square $\Delta\chi^2$ ($p<.001$), and the decrease in model fit statistics, where a $\Delta CFI \leq -.01$ and a $\Delta RMSEA \leq .015$ indicates a lack of invariance (Little, 2013).

As shown in Table 2.5, full invariance of the SMILE's two-factor structure (based on Model 3) was found across gender and age. Structural invariance was also confirmed with the association between presence and search for meaning that was .767 across males and females and .774 across the three age-classes. When I examined the configural invariance of model 4 (bi-factor) across gender and age encountered problems of model convergence due to a non-positive covariance matrix that was generated by some negative residuals of the items. Therefore, I decided not to proceed with testing the following levels of invariance.

Table 2.5

Multi-Group Measurement Invariance of the SMILE in Study 2.2 (N=2831)

	χ^2	*df*	*p*	CFI	RMSEA [CI]	SRMR	$\Delta\chi 2$	Δdf	p	ΔCFI	$\Delta RMSEA$
Model 3 – two-factor structure with correlated residuals											
Gender (male; female)											
Configural invariance	118.9	10	.000	.99	.09 [.077-.101]	.03					
Metric invariance	125.0	16	.000	.99	.07 [.059-.081]	.04	6.17	6	.404	.000	-.018
Scalar invariance	152.8	22	.000	.98	.06 [.055-.075]	.04	27.77	6	.000	-.003	-.005
Strict invariance	182.2	28	.000	.98	.06 [.054-.071]	.05	29.38	6	.000	-.002	-.002
Structural invariance	183.5	29	.000	.98	.06 [.053-.070]	.05	1.35	1	.245	.000	-.001
Age (18-35 years; 36-64 years; 65-91 years)											
Configural invariance	121.5	15	.000	.99	.09 [.073-.101]	.02					
Metric invariance	151.8	27	.000	.98	.07 [.059-.081]	.07	30.34	12	.002	-.002	-.017
Scalar invariance	195.1	39	.000	.98	.06 [.056-.074]	.09	43.27	12	.000	-.002	-.005
Strict invariance	280.6	51	.000	.97	.07 [.061-.077]	.12	85.47	12	.000	-.009	.004
Structural invariance	321.8	53	.000	.97	.07 [.066-.081]	.12	41.26	2	.000	-.002	-.002

Note. : Chi-square test of model fit; *df*: degrees of freedom; RMSEA [CI]: root mean square error of approximation [90 percent confidence interval]; CFI: comparative fit index; SRMR: standardized root mean square residual.

Reliability evidence

From the steps conducted so far, the two-factor model with correlated residuals (Model 3) resulted to be the best representation of the SMILE's factorial structure, showing good fit indices and full invariance across gender and age. Therefore, the McDonald's Ω coefficient (i.e., composite reliability) has been calculated directly from the CFA for each sub-scale using the formula provided by McDonald (2013), that represents the ratio between the true score variance and the total observed variance for each subscale. I found both presence and search for meaning to be highly reliable ($\Omega_{presence}$= .83; Ω_{search}= .82).

Criterion validity evidence

Empirical proofs of concurrent criterion validity can be obtained by correlating the measure (i.e., SMILE's presence and search for meaning) with some criterion measures obtained in the present (Zumbo, 2005). The golden role to test the validity evidence of a scale is through SEM models (Humbley & Zumbo, 2011), as they allow to simultaneously include the measurement model for each investigated construct (e.g., SMILE's and Positivity's factorial structure) and to estimate a path of associations between the latent variables, thus controlling for the measurement error (Zumbo, 2009). I followed this procedure by examining the contemporaneous associations between the presence and search for meaning in life latent factors (obtained from the structural model with correlated residuals) and respectively, the positivity latent factor (Model A); the global mental health latent factor (Model B), and the future anxiety latent factor (Model C). As previously discussed in the introduction, the perception of life meaningfulness is a strong predictor of health and well-being, therefore I expected presence of meaning to be positively associated with positivity and mental health, and negatively associated with future anxiety. With respect to the search for meaning dimension, results from the literature are inconsistent regarding its associations

with well-being measures (see the meta-analysis by Li et al., 2021), therefore it was not possible to formulate strict hypothesis regarding the search for meaning.

All the models presented acceptable fit (Model A: $\chi 2(71)=1632.9$, $p<.000$; RMSEA=.09 [.084, .092]; CFI=.93; SRMR=.05; Model B: $\chi 2(161)=1796.2$, $p<.000$; RMSEA=.06 [.057, .062]; CFI=.96; SRMR=.04; Model C: $\chi 2(38)=266.5$, $p<.000$; RMSEA=.05 [.041, .051]; CFI=.99; SRMR=.03). Correlations between latent factors are presented in Table 2.6. As expected, presence of meaning was strongly associated with both measures of well-being and showed a marginal but significant negative association with future anxiety. Search for meaning was also positively associated with well-being and was also positively associated with future anxiety.

Table 2.6

Concurrent criterion evidence of the SMILE in Study 2.2 (N=2831)

	POS (Model A)	GMH (Model B)	DFS (Model C)
SMILE_P	.653**	.559**	-.130**
SMILE_S	.336**	.273**	.174**

Note. *p<.05; **p<.01. SMILE_P: presence of meaning latent factor; SMILE_S: search for meaning latent factor; DFS: Dark Future Scale latent factor; POS: Positivity latent factor; GMH: Global Mental Health latent factor.

Discussion

Except for the mono-factorial model, all the other theory-based models showed acceptable fit indices, confirming the goodness of the SMILE scale composed of items carefully selected from the literature. The best model resulted to be the two-factor with correlated residuals which allows to consider both theoretical structures (structure 1: presence-search; structure 2: comprehension-significance-purpose) while keeping parsimonious. This model showed good internal consistency. However, the bi-factor model also showed good indices, although some parameters were fixed to find convergence. This

model could be suitable if a longer version of the scale is developed, to capture more nuances of the three content dimensions of meaning, by having more than 2 items in each dimension as suggested by the Classical Theory of Test (e.g. Velicer & Fava, 1998). Interestingly, in all the models, the presence and search for meaning dimensions were positively correlated. In the literature, the correlation between presence and search for meaning measured with the MLQ is not consistent (Li et al. 2021) even if it is easier to find negative associations between the two. In Steger's MLQ the search for meaning is operationalized with items that mostly refer to the purpose dimension (e.g., My life has a clear sense of purpose) and to a general sense of life meaningfulness (e.g., I am looking for something that makes my life feel meaningful), with only one item from the presence dimension that explicitly refers to the comprehension (e.g., I understand my life's meaning). Instead, the SMILE proposes a more balanced bipartite view of meaning where coherence, significance and purpose are equally represented in both the presence and the search dimension. The novelties of the SMILE's two-factor structure could explain the positive association between presence and search, even if replication studies are needed to test its stability.

Regarding validity evidence, positive associations between presence of meaning and well-being measures are consistent with the literature. Conversely, search for meaning was positively correlated with both positivity and mental health, and with future anxiety. These associations could be explained by the fact that the SMILE grasps a different aspect of the search for meaning compared to Steger's MLQ. In fact, the search dimension in the MLQ hints at the attempt to fill a lack of meaningfulness (e.g., I am seeking a purpose or mission for my life), that might result in adverse associations with subjective well-being and with presence of meaning (Li et al., 2021). Conversely, the SMILE's search for meaning is more associated with the activation of the meaning-making process following a stressful/traumatic experience in the attempt to make new meanings out of it (e.g., If I think about my future, I

have goals for my life that push me to move forward during the pandemic). In this sense, the positive correlation between search for meaning and well-being outcomes found in this study could represents the typical process of "he who seeks shall finds". While the positive association with future anxiety could be explained by the fact that perceiving uncertainty about the future stimulates people to activate the process of meaning-making. However, this interpretative hypothesis is to be confirmed with subsequent studies.

Study 2.3 Validation of the SMILE measure in a sample of emerging adults

The aim of the third study was to provide a first replication the SMILE's structure found in the second study, and to test the psychometric properties on a sample of emerging adults. Specifically, the two-factor model with correlated residuals was tested with CFA on the new sample and internal consistency was examined with McDonald's omega (Ω). Evidence of convergent validity (with the MLQ), concurrent criterion validity (with measures of well-being and future anxiety), and incremental validity (predictive power of the SMILE over MLQ on measures of well-being) were collected with SEM (Humbley & Zumbo, 2011).

Participants and procedures

Data was gathered from emerging and young adults (19-36 years) living in Lombardia (Italy) in February 2021, during a COVID-19 scenario without ongoing restrictions. Participants were recruited with an intentional sampling and a snow-ball procedure. Those who signed the informed consent completed an anonymous online survey implemented in Qualtrics. The study received the ethical approval from the Ethics Committee of Università Cattolica del Sacro Cuore of Milan (IT). The sample consisted of 283 participants (76% female) with a mean age of 26 years (SD=4.09).

Measures

Situational meaning in life. The same version of the SMILE adopted in the study 2.2 was administered.

Global meaning in life. I administered the Meaning in Life Questionnaire (MLQ; Steger et al., 2006; Italian validation by Negri et al., 2019; $\Omega_{presence}$= .90; Ω_{search}= .90), a 10 item self-report measure assessing the *presence* of meaning in life (e.g. I understand my life's meaning) and the *search* for meaning in life (e.g. I am always looking to find my life's purpose). Participants answered on a 7-point Likert scale (1=strongly disagree; 7=strongly agree).

Satisfaction with life. As measure of well-being, I selected the *Satisfaction with life scale* (Diener et al., 1985; Italian validation by Di Fabio & Busoni, 2020, Ω = .90) which is made of 5 items (e.g., *"I am satisfied with my life"*; *"In most ways my life is close to my ideal"*) assessed on a 7-point Likert scale (1=strongly disagree; 7=strongly agree).

Hope. The Adult Hope Scale (Snyder et al., 1991; Ω_{total}= .88; Ω_{agency}= .80; $\Omega_{pathway}$= .82) was administered. This scale is made of 12 items divided in two dimensions, 4 items belong to *agency* (e.g., *"I energetically pursue my goals"*), 4 items belong to *pathway* (e.g., *"I can think of many ways to get the things in life that are most important to me"*), and four items are fillers. The items were rated on a 7-point Likert scale (1=completely disagree; 7=completely agree).

Future anxiety. The Dark Future Scale (Zaleski et al., 2019; Ω = .90) also adopted in the study 2.2 was administered.

Results

Five cases were identified as multivariate outliers with the Mahalanobis distance (Tabachnick & Fidell, 2013) and were excluded from subsequent analysis, for a final sample of N=278. All the items administered were normally distributed, therefore, Maximum Likelihood was selected as the estimator in subsequent models. The factorial structure of the criterion variable measures (global meaning in life, satisfaction with life, hope, future anxiety) was tested in our sample with CFA.

Data availability. Descriptive statistics of the SMILE items, together with the SPSS and Mplus codes used to conduct the analysis are available in the *Chapter 2* folder at the following OSF link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Score structure and reliability evidence

The two-factor model with correlated residuals (Model 3 in study 2.2) was replicated on the new sample with Confirmatory Factor Analysis by examining fit indices. The model showed acceptable fit indices, with the exception of the RMSEA's estimate which exceeded the desired value of .08 [$\chi 2(5)=22.4$, $p<.001$; RMSEA=.11 [.067, .161]; CFI=.98; SRMR=.05]. Standardized factor loading for the presence dimension ranged from .760-.932, and .743-.868 for search for meaning (Table 2.7). Presence and search for meaning factors were positively correlated (r=.23). Both dimensions showed good reliability ($\Omega_{presence}$= .84; Ω_{search}= .83).

Table 2.7

Factor loadings for the two-factor model with correlated residuals in Study 2.3 (N=278)

Item	Factor 1	Factor 2
	Presence of meaning	Search for meaning
SMILE_PC	.760	
SMILE_PP	.819	
SMILE_PS	.932	
SMILE_SC		.786
SMILE_SP		.743
SMILE_SS		.868
McDonald's omega	Ω=.87	Ω=.84

Note. SMILE_PC: presence of comprehension; SMILE_PP: presence of purpose; SMILE_PS: presence of significance; SMILE_SC: search of comprehension; SMILE_SP: search of purpose; SMILE_SS: search of significance.

Convergent validity evidence

I examined convergent validity by including in a SEM model the measurement models of the SMILE and the MLQ and examining the correlation between their latent factor

scores. Considering that the SMILE was created on the reference of the MLQ, I expected the presence of meaning dimensions of SMILE and MLQ to show a strong positive association, as well as the search for meaning dimensions. In the light of previous literature (Li et al., 2021) and of results from study 2.2, I expected differences in the correlation between presence and search for meaning between the SMILE and the MLQ.

The model fit was acceptable [$\chi2(95)=333.8$, $p<.001$; RMSEA=.09 [.084, .106]; CFI=.93; SRMR=.08]. As shown in Table 2.8, the SMILE's and the MLQ's presence of meaning dimensions were strongly correlated, as well as the search for meaning dimensions in the two scales. However, as expected, presence and search for meaning assessed with the MLQ were not associated, while the correlation between the SMILE's dimensions was positive and significant.

Table 2.8

Convergent validity evidence of the SMILE with MLQ in Study 2.3 (N=278)

	SMILE_P	SMILE_S	MLQ_P	MLQ_S
SMILE_P	1			
SMILE_S	.215**	1		
MLQ_P	.909**	.106	1	
MLQ_S	.139*	.807**	.023	1

Note. *p<.05; **p<.01. _P: presence of meaning latent factor; _S: search for meaning latent factor.

Criterion validity evidence

Empirical proofs of concurrent criterion validity were examined with the same procedure of study 2.2 but including the measures of satisfaction with life (Model A1), hope (Model B1), and future anxiety (Model C1). Coherently with study 2.2 I hypothesized that presence of meaning would be positive associated with life satisfaction and hope, and negatively associated with future anxiety. Regarding search for meaning, in light with results from study 2.2 I expected positive associations with life satisfaction and hope (but less consistent that those of presence of meaning), and with future anxiety.

All the models presented acceptable fit (Model A1: $\chi2(38)=73.2$, p<.000; RMSEA=.06 [.037, .078]; CFI=.98; SRMR=.04; Model B: $\chi2(68)=162.5$, p<.000; RMSEA=.07 [.057, .085]; CFI=.95; SRMR=.05; Model C1: $\chi2(38)=76.6$, p<.000; RMSEA=.06 [.041, .080]; CFI=.97; SRMR=.05). Correlations between latent factors are presented in Table 2.9. As expected, presence of meaning was positively associated with life satisfaction, hope and negatively associated with future anxiety. Contrary to expectations, search for meaning was not significantly associated measures of well-being, but as expected, it was positively associated with future anxiety.

Table 2.9

Concurrent criterion evidence of the SMILE in Study 2.3 (N=278)

	SWLS (Model A1)	HOPE_A (Model B1)	HOPE_P (Model B1)	DFS (Model C1)
SMILE_P	.686**	.753**	.620**	-.521**
SMILE_S	.000	.082	.011	.209**

Note. *p<.05; **p<.01. SMILE_P: presence of meaning latent factor; SMILE_S: search for meaning latent factor; SWLS: Life satisfaction latent factor; HOPE_A: Agency latent factor; HOPE_P: pathway latent factor; DFS: Dark Future Scale latent factor.

Incremental validity evidence

Incremental validity was tested by verifying that the SMILE's dimensions were able to explain a portion of variance of constructs related to well-being that is unique, not explained by the MLQ. I exported the factor scores of each interested construct with the SAVE FACTOR function in Mplus because the sample size was not sufficient to estimates too complex models. Then I test a series of hierarchical regressions in which the criterion variables (outcomes) were the life satisfaction's factor score (MODEL_S), the hope's agency factor score (MODEL_HA), the hope's pathway factor score (MODEL_HP), and the future anxiety's factor score (MODEL_F). In all the four models I entered MLQ's presence and

search for meaning predictors in the first step, while the SMILE's presence and search for meaning were entered as independent predictors in the second step.

Results of the hierarchical regressions (see Table 2.10) suggested that SMILE's presence of meaning (but not the search for meaning) was a significant predictor of all the criterion variables (life satisfaction in MODEL_S; hope's agency and pathway in MODEL_HA and MODEL_HP; future anxiety in MODEL_F) over and above MLQ's dimensions [MODEL_S: $F(4, 268) = 73.79$; $p < .001$; MODEL_HA: $F(4, 270) = 64.10$; $p < .001$; MODEL_HP: $F(4, 270) = 49.09$; $p < .001$; MODEL_F: $F(4, 270) = 38.64$; $p < .001$].

Table 2.10

Hierarchical linear regression to test incremental validity of the SMILE in Study 2.3 (N=278)

	Model coefficients		Model comparison			
	stand. □	*p*	Adjusted R^2	□R^2	F	*p*
MODEL_S (Dependent variable: SWLS)						
Block 1 - MLQ						
MLQ_P	.70	<.001	.50			
MLQ_S	-.12	.005				
Block 2 - SMILE						
MLQ_P	.52	<.001				
MLQ_S	-.16	.006				
SMILE_P	.23	.002	.52	.02	5.10	.007
SMILE_S	.02	.762				
MODEL_HA (Dependent variable: HOPE_A)						
Block 1 - MLQ						
MLQ_P	.68	<.001	.46			
MLQ_S	-.01	.893				
Block 2 - SMILE						
MLQ_P	.48	<.001				
MLQ_S	-.01	.260				
SMILE_P	.26	<.001	.48	.02	5.83	.003
SMILE_S	-.05	.450				
MODEL_HB (Dependent variable: HOPE_P)						
Block 1 - MLQ						
MLQ_P	.63	<.001	.39			
MLQ_S	.00	.991				
Block 2 - SMILE						
MLQ_P	.42	<.001				
MLQ_S	.03	.625				
SMILE_P	.27	.001	.41	.02	5.89	.003
SMILE_S	-.10	.148				
MODEL_F (Dependent variable: DFS)						
Block 1 - MLQ						
MLQ_P	-.50	<.001	.33			
MLQ_S	.29	<.001				
Block 2 - SMILE						
MLQ_P	-.28	<.001				
MLQ_S	.28	<.001				
SMILE_P	-.28	<.001	.35	.03	5.71	.004
SMILE_S	.07	.338				

Note. SMILE_P: presence of meaning's factor score; SMILE_S: search for meaning's factor score; MLQ_P: presence of meaning's factor score; MLQ_S: search for meaning's factor score; SWLS: Life satisfaction's factor score; HOPE_A: Agency's factor score; HOPE_P: pathway's factor score; DFS: Dark Future Scale's factor score.

Discussion

The two-factor structure with correlated residuals was replicated in this study. This results, together with the good internal consistency found for the two dimensions of presence and search for meaning, confirmed the adaptability of the SMILE's structure in a sample of emerging and young adults.

By testing the convergent validity with the MLQ measure I proved that the SMILE is a valid measure to assess presence and search for meaning in life. The correlation between the presence of meaning dimensions was higher than the correlation between the search dimensions, probably because SMILE's search items differentiated more from MLQ's search items. Coherently with study 2.2, I found SMILE's dimensions to be positively correlated (even with a much smaller effect size), while MLQ's dimensions were not. This result is a proof of the SMILE's specificity that does not completely overlap with the MLQ measure. I speculate that the difference in the effect size of the positive correlation between presence and search for meaning compared to study 2.2 is due some differences in the sample characteristics. Indeed, study 2.2 involved a representative Italian sample, while study 2.3 investigated a much more homogeneous sample of young people living in Lombardia, the Italian region that was mostly hit by the pandemic starting from February 2020. Therefore, the higher association between presence and search for meaning could be a hallmark of emerging and young adults living a prolonged contextual stressful situation.

Examination of criterion validity further confirms the positive association of SMILE's presence of meaning with well-being outcomes and the negative association with future anxiety. However, contrary to study 2.2, search for meaning was not associated with positive outcomes, while its positive association with future anxiety was confirmed. This discrepancy with results from study 2.2 could be explained by several factors. First, the two considered samples differed with respect to demographic characteristics, in fact study 2.3 gathered data

from a sample of emerging and young adults that were mostly female and that lived in Lombardia (Italy), while study 2.2 was conducted on a national representative sample. Second, the moment of data collection was different, as study 2.3 was conducted four months before study 2.2, and during the historical time of the COVID-19 pandemic even a relative short period of time could have strong repercussions on the contextual situation lived by individuals. Third, the criterion variables considered in the two studies were different. Fourth, the absence of association between search for meaning with well-being outcomes in study 2.3 could be interpret as reflecting a different functioning of the meaning-making process, where the search for meaning was maybe activated as a strategy to cope with the situation.

Finally, results suggested that the SMILE's presence of meaning scores have incremental validity when compared with MLQ's presence and search for meaning scores in predicting well-being outcomes and future anxiety. This result adds to the convergent validity evidence in proving that the SMILE contributes to explain relevant criterion variables independently from the MLQ. The fact that only the presence of meaning was a significant predictor in the regression models is not surprising considering that the search for meaning did not correlate with the variables related to well-being. To evaluate the predictive power of the search for meaning, different criterion variables should be selected, for example those related to rumination, or identity exploration.

General discussion

This Chapter addressed the methodological challenge of providing the literature with a situational measure of meaning in life dedicated to the study of meaning-making in the context of situational experiences. In study 2.1, starting from the available instruments and the most recent empirical evidence, the process of development of the SMILE scale was presented in detail. Compared to available meaning in life measures, the SMILE possesses two big novelties: (a) it is the first measure that operationalizes the content features of

meaning in life, i.e. comprehension, significance and purpose, both in the version of the presence of meaning and in the version of the search for meaning; and (b) it is the first situational measure of meaning in life that provides anchors to a specific life-events and time-frame to evaluate the subjective experience of meaning in life in the context of situational experiences. In study 2.2, the scale was administered to a representative sample of the Italian population, four theory-based factorial structures were examined, and the psychometric properties of the best solution were tested. The best theoretical structure was the two-factor (presence and search for meaning dimensions) with correlated residuals, which allowed to take into account the multifaceted nature of meaning in life while maintaining a good level of parsimoniousness. The validity evidence confirmed on the one side the positive associations between presence of meaning and well-being measures. On the other side, the positive association between search for meaning and well-being brought to light an inedited view of the SMILE's search for meaning that dwell in the activation of the meaning-making process as either a proactive response to overcome stressful/traumatic events (e.g., Park, 2010), or as a normative process of life exploration and integration of life experiences into a coherent system of meanings (Martela & Steger, 2016; Negru-Subtirica et al., 2016).

Study 2.3 replicated the SMILE's factorial structure and provided additional proofs of its validity. The consistency of the measure in assessing presence and search for meaning was demonstrated with high correlations with the MLQ and with positive correlations between presence of meaning and well-being or distress outcomes. Further proofs of the distinctiveness of the SMILE to the MLQ were collected, especially regarding the search for meaning dimension that was positively correlated with presence of meaning and uncorrelated with measures of well-being (e.g., Newman et al., 2018). Additionally, the unique predictive power of the SMILE against the MLQ was proved by examining incremental validity with criterion variables that were theoretically associated with the construct.

Implications for practice

From the results collected from these studies it is possible to provide indications regarding the applicability of this new scale of situational meaning in life. First, the SMILE measure should be taken into consideration when the aim is to detect presence and search for meaning as two sides of the same construct, by acknowledging comprehension, significance, and purpose as the basic constituents of the meaning in life construct. Second, the SMILE should be preferred to global measures when investigating the process of meaning-making in the context of specific life-experiences. Indeed, the SMILE measure has been designed to be easily adapted to different events or timeframes, therefore it can be easily adopted when researchers want to answer questions such as "what is the impact of the pandemic on people's meaning in life?" or "how individuals are making meaning of the war situation in their life?". Third, due to its shortness, the SMILE is applicable to longitudinal and intensive longitudinal designs in which the interest is to grasp changes in the perception of life meaningfulness and fluctuations in the meaning-making dynamics. Finally, the SMILE's search for meaning allows to more easily detect the normative dimension of the search for meaning therefore it might be used when the target is emerging and young adults (Mayseless & Keren, 2014; Negru-Subtirica et al., 2016).

Limitations and future directions

I acknowledge several limitations in this study, accompanied by future directions. First, the samples were collected within the Italian population during an historical context shacked by the COVID-19 pandemic, therefore the results should be interpreted with this in mind and further studies on different cultures and contextual situations should be conducted to examine the generalizability of results. Second, the criterion related variables that I selected to test the criterion-related validity didn't provide sufficient information about the validity of the search for meaning dimension, as they were not correlated. Therefore, further

proofs of criterion validity should be drawn by including criterion variables more related to the search for meaning dimension, for instance rumination (e.g., Kamijo & Yukawa, 2018) or identity (Glavan et al., 2020). In addition, the ability of the SMILE to predict outcome variables related to traumatic and stressful experiences (e.g., positive reappraisal, perceived stress; Nowicki et al., 2020; Park & Ai, 2006) should be examined. Third, the choice of developing a short measure has the drawback of reducing the theoretical richness of the meaning in life construct, especially regarding the tripartite view of meaning. One future development would be to create a long version of the SMILE scale by including at least three items for each content dimension to grasp the nuances of the construct. Finally, the validation studies were cross-sectional, however, as the SMILE was developed with a processual perspective on the meaning-making process, future research should examine the ability of the SMILE to detect long-term changes and short-term fluctuations in the meaning-making dynamics by using longitudinal and intensive longitudinal designs. In the next Chapter I present two empirical studies that precisely address the aim of investigating the short-term dynamics of the meaning-making process in the context of the daily life, by adopting a version of the SMILE measure adapted for daily diary studies

CHAPTER 3.

Challenge N°3: How to investigate the dynamics of change of the meaning-making process?

Introduction

Now that I have provided a clear theoretical conceptualization of the meaning-making process (with the systematic review presented in Chapter 1), and that I dispose of a situational measure of meaning in life specifically designed to detect meaning-making dynamics (provided by the development and validation studies presented in Chapter 2), it is possible to deal with the third methodological challenge that was outlined in the introduction, that is, to investigate the meaning-making dynamics within a complexity framework. This is the precisely the purpose of this Chapter 3. In this Chapter I present a preliminary discussion about what does it mean to investigate temporal dynamics in psychological processes and which methodological strategies we dispose to serve this scope. Then, I provide an overview on how the meaning-making micro-dynamics has been investigated so far, and which theoretical knowledge we dispose about its functioning in a situational framework. The chapter present two empirical studies, i.e., study 3.1 and study 3.2, that were conducted to address some of the unanswered questions pointed out by the review of the literature.

How to investigate temporal dynamics in psychological processes?

As I stated in the introduction, psychological processes have the property of being governed by temporal dynamics, as they change and develop over time (Hamaker & Wichers, 2017; Jordan et al., 2020). There are two typologies of processes that can be captured when researchers are interested in studying how psychological processes unfold over time:

developmental processes, and *stable processes* (Jongerling et al., 2015; McNeish & Hamaker, 2020).

Developmental processes are expected to show long-time changes in the means of their observed indicators over a quite large observation window (Bolger & Laurenceau, 2013; Schultzberg & Muthén, 2018). To detect such *macro-dynamics*, data are usually collected with longitudinal designs (also called panel designs; Schultzberg & Muthen, 2018; Bolger & Laurenceau, 2013), in which few repeated measurements (usually less then 5) are assessed over long-time intervals, usually months or years. Statistical models such as mixed-effect models, latent growth models, or latent change score models (e.g., Grimm et al., 2017) are the best suited to model the developmental trajectories of psychological processes across large samples of individuals. When researchers are interested in examining the role of exogenous covariates, their hypotheses concern their ability of exogenous predictors to explain changes in the developmental trajectories (McNeish & Hamaker, 2020).

On the other side there are *stable processes*, which assume that the mean levels of the indicators do not systematically change over time, instead, they are stable on a determined level all through the measurement occasions (McNeish & Hamaker, 2020). The primary interest when investigating stable processes are detecting the *micro-dynamics* governing time-to-time fluctuations around the stable mean. This level of change requires more dense observations to be detected (Bolger & Laurenceau, 2013), and research designs adaptive to ecological settings, to capture the naturally occurring dynamics that happen in real life (Bolger et al., 2003). To serve this scope, intensive longitudinal designs are the preferred choice (ILD; Walls & Shafer, 2006), as they involve sequential measurements of five or more (usually >20; McNeish et al., 2021) occasions closed together (i.e., hour-by-hour; day-by-day), during which an instantaneous change from one point to another is expected to unfold within each subject (Bolger & Laurenceau, 2013; McNeish & Hamaker, 2020). The short-

term fluctuations generate some peaks and valleys in the process course that are usually the target of predictive hypotheses in which exogenous factors, for instance the occurrence of daily events, are expected to shape the dynamics of the process under investigation (Hamaker & Wichers, 2017; Bolger et al., 2003). The best way to analyze this kind of stable data is by using time-series models, when a single individual is followed over time, or multilevel modelling, when data are collected by multiple individuals (Hamaker et al., 2015; McNeish & Hamaker, 2020).

In the last decade, the technological advancements such as the development of user-friendly devices (e.g., smartphones) and software (e.g., applications) made easier to collect data across multiple occasions by involving large samples of individuals (Hamaker & Wichers, 2017). Consequently, researchers incremented the use of intensive longitudinal designs such as experience sampling methods (ESM), ecological momentary assessment (EMS), ambulatory assessments (Conner & Mehl, 2015), and daily diaries (Bolger et al., 2003; Bolger & Laurenceau, 2013) to investigate the micro-dynamics governing psychological process in situational and naturally occurring contexts. Thanks to this new line of research, at present we know that most of psychological processes that have been traditionally considered as purely developmental, such as identity (e.g., Becht et al., 2021; De Ruiter & Gmelin, 2021; Hatano et al., 2022), or personality (e.g., Lazarus et al., 2020; Nezlek, 2007; Zimmermann et al., 2019), are instead governed by both typologies of temporal dynamics. Indeed, psychological processes are nowadays acknowledged as expressions of both situationally determined states, encoding the momentary fluctuations that are naturally occurring and context specific, and stable traits, or relatively enduring psychological characteristics that can slowly change over time unfolding developmental trajectories (Nezlek, 2007).

Investigating micro-dynamics of psychological processes

I am now going to dig deeper into the different research questions that can be formulated about the micro-dynamics of a psychological process, as this is the framework adopted in the present thesis to investigate the meaning-making process.

First, among the within-person dynamics it is possible to investigate the tendency of the process to remain stable over time, what is called *stability* or inertia of a process (Hamaker et al., 2018; Hamaker & Wichers, 2017; Houben et al., 2020). Usually, this dynamic effect is quantified as the *autoregressive* effect of a variable, representing the predictive association between two consecutive assessments of the same variable (McNeish & Hamaker, 2020; Hamaker & Wichers, 2017).

If the psychological process is conceptually defined as composed by different features, the temporal dynamics of each of them can be investigated, together with their *concurrent association* (Houben et al., 2020), that measure how much two variables are associated within each measurement occasion (i.e., hour, day) for each individual. The concurrent associations at the within level should always be estimated controlling for the autoregressive effect of each variable. In this case the concurrent correlation is computed between the average individual deviations from the means of the considered indicators, therefore it is possible to draw conclusions about the potential co-occurrence of two variables that are changing together over time.

Additionally, it is possible to investigate the *temporal influence* between at least two variables over time (Usami et al., 2019). This typology of research questions can be answered by examining the *cross-lagged* dynamic effects between two variables assessed in two consecutive measurement occasions, that, from a statistical level, are obtained by regressing one variable on the other at the previous measurement occasion (McNeish & Hamaker, 2020; Hamaker et al., 2018). From the examination of lagged relationships, it is possible to infer

within-person predictive relationship over time, that can give some insights about the causal mechanism underling process dynamics (i.e., which is the dynamic feature that activate, or generate a change in the process?), even tough, in the context of pure intensive longitudinal designs (i.e., without any experimental manipulation) the interpretation of cross-lagged dynamic effects must be restricted to the concept of Granger causality (see for details Hamaker & Wichers, 2017).

When intensive longitudinal data are collected from multiple individuals, a huge richness of data is obtained. This data complexity is generated by two sources of variability in the data, that are intraindividual (i.e., within-person) variability, representing how people change over time, and interindividual (i.e., between-person) variability, encoding *individual differences* in the process dynamics (Borsboom et al., 2004; Hamaker et al., 2018; Nesselroade, 1991). Within-person variability is the source of information that we take into consideration when answering questions related to temporal dynamics (i.e., stability, reciprocal influence, and concurrent associations) that I already presented. Instead, between-person variability encodes information about the generalizability of the temporal dynamics across individuals in the sample. I herein include the between-person variability of within-person dynamics within the panorama of the micro-dynamics even if they do not provide properly "temporal" information. However, intra-individual variability plays central role and should always be considered when data is collected from multiple people. In some cases, between-person variability is not considered as a source of information and is partitioned out before analysing within-people dynamics. In other cases, specific research questions are formulated to understand why some people show a greater or lesser activation of specific dynamics (Hamaker et al., 2017; Hamaker et al., 2007; Nesselroade, 1991), for instance by examining if some individual factors or stable traits (e.g., age, gender, personality traits) shared by subgroups of participants can explain the individual variability of dynamic effects.

What DO WE KNOW about meaning-making dynamics?

With respect to the meaning-making process, as pointed out in the systematic review, most of the studies have been cross-sectional, through which it was possible to observe only the static configuration of the process. Instead, the knowledge on meaning-making temporal dynamics is limited, especially the literature regarding micro-dynamics. From one side, as I previously elucidated, the onerousness of collecting intensive longitudinal designs probably harmed the investigation of meaning-making temporal dynamics. On the other side, this cross-sectional tradition is connected with the theorization of meaning in life that, along with other similar individual characteristics such as identity or personal values, has traditionally been considered as a stable trait or dispositions that is mostly permanent across individuals (Newman et al., 2018; Nezlek, 2007). However, in Chapter one I came out with a new integrated conceptual definition of meaning-making that points out the situational nature of meaning-making, as a psychological process that grounds in the life experiences lived by individuals. In this sense, the very experience of meaning in life is something beyond a global judgement of life meaningfulness but is a "quality of everyday existence" (King et al., 2006, p.181), and as such, it is supposed to fluctuate at least on a daily level for each individual. Echoing this theoretical background, in this Thesis I aimed at zooming in the meaning-making micro-dynamics in the context of everyday life experiences to uncover how individuals foster their inner system of meanings in a very real and concrete way.

To have a clear map of what knowledge is currently available on the temporal micro-dynamics of meaning-making, I conducted a brief literature review through the PsycInfo database, looking for peer-review articles that studied the topic of meaning-making and meaning in life with intensive longitudinal designs[9]. The search string included the keywords

[9] In study 1 we identified only two studies adopting an intensive design to investigate the meaning-making process. In the present section we decided to also include the literature on the construct of meaning in life to

"meaning in life" OR "meaning of life" OR "meaning-making" and the major categories of ILD as described by Bolger & Laurenceau, (2013), that are "intensive longitudinal" OR "daily diary" OR "experience sampling" OR "ecological momentary". The keywords had been searched in all the article's sections except for the main text. As the aim of the present thesis is to investigate meaning-making dynamics within a complexity framework, I annotated for each record information regarding a) which features constituted the meaning-making process; b) which temporal dynamics were investigated; and c) if some contextual, situational, or individual factors were examined as covariates of the process.

Among the 23 works retrieved, 7 were excluded as they didn't investigate any temporal dynamic related to meaning in life or meaning-making, for a final pool of 16 works that are presented in Table 3.1.

be sure to retrieve all available information on micro-dynamics related to the process of meaning construction that could be useful to formulate solid hypothesis in study 3.1 and study 3.2.

Table 3.1

Empirical studies that investigated meaning-making and meaning in life with intensive longitudinal designs

Study	Meaning-making features	Meaning-making temporal dynamics[a]	Meaning-making exogenous factors[b]
Kashdan & Steger (2007)	Presence and search for meaning (four items)	C: daily association between curiosity, pleasure and presence/search for meaning (separately) T: lagged effects (lag= 1 day) of daily curiosity and pleasure on presence and search; positive and negative affect added as predictors I: trait curiosity and personality traits as moderators of concurrent associations	I: curiosity (within and between); pleasure and affect (within); personality traits (between)
Steger et al. (2007)	Presence of meaning* (two items composing the Daily Meaning Scale)	S: autoregressive effect was controlled C: daily association between eudaimonic and hedonic behaviors, well-being and meaning in life T: cross-lagged effects (lag= 1 day) between eudaimonic and hedonic behaviours and meaning in life	S: eudaimonic and hedonic behaviors (within)
Kiang (2012)	Purpose of life (single item)	C: daily association between daily events related to family assistance, leisure time, social role fulfilment and purpose I: gender, grade and generation as predictors of concurrent associations	I: gender, grade in school, generation (between) S: daily events (within)
Kashdan & Nezlek (2012)	Presence of meaning* (two items from DMS)	C: daily association between spirituality and meaning in life T: lagged analysis (lag= 1 day) of daily spirituality on meaning in life I: trait spirituality as moderator of concurrent effects	I: spirituality (within and between)
Steger & Kashdan (2013)	Presence and search for meaning (presence items from the DMS, search items adapted from the MLQ)	S: temporal instability of presence of meaning I: average levels of presence and search of meaning, affect, depression, social connectedness correlated with meaning instability	I: affect, depression, social connectedness (between)
Allan et al. (2013)	Presence of meaning* (two items from DMS)	C: daily association between gratitude and meaning; Thanksgiving holiday days as predictor of daily meaning. I: trait gratitude as moderator of daily meaning	I: gratitude (within and between); S: thanksgiving holiday (within)
McMahan et al. (2013)	Presence of meaning* (two items from Steger et al., 2007)	C: daily association between eudaimonic behaviours and meaning I: trait level of eudaimonic conception as moderator of daily meaning	I: eudaimonic behaviours (within); eudaimonic conceptions (between)

(*table continues*)

Table 3.1 (*continued*)

Study	Meaning-making features	Meaning-making temporal dynamics[a]	Meaning-making exogenous factors[b]
Machell, Kashdan, et al. (2015)	Presence of meaning (two items from DMS)	C: daily association between daily events and meaning in life. Daily affect added as covariate. I: trait depressive symptoms as moderators of concurrent associations	I: daily affect (within); depressive symptoms, sex, age (between) S: positive/negative social and achievement events (within)
Machell, Goodman, et al. (2015)	Presence of meaning* (two items from DMS)	C: daily association between experimental avoidance and meaning in life.	I: experimental avoidance (within)
Newman et al. (2018)	Presence and search for meaning (four items from Kashdan & Steger, 2007)	S: autoregressive effect was controlled C: daily association between presence, search for meaning and well-being. T: cross-lagged effects (lag= 1 day) between presence and search I: trait presence and search as moderators of cross-lagged effects.	I: well-being variables (within); trait presence and search (between)
Kashdan et al. (2018)	Presence of meaning* (single item adapted from MLQ)	T: lagged effects (lag=1 and 2 days) of sexual episodes on meaning in life I: gender, relationship status, relationship closeness, and relationship length as moderators of lagged effects	S: sexual episodes (within); gender, relationship status closeness and length (between)
Heintzelman & King (2019)	Presence of meaning (MLQ presence subscale)	C: momentary associations between routine behaviors and meaning in life. Momentary mood added as covariate.	I: momentary mood (within) S: routine behaviors, weekday vs weekend (within)
Newman & Nezlek (2019)	Presence and search for meaning** (four items from Kashdan & Steger, 2007)	C: daily associations between rumination and reflection with presence and search for meaning (separately) T: lagged effects (lag= 1 day) of daily reflection and rumination on presence and search for meaning	I: rumination and reflection (within)
Stavrova et al. (2020)	Presence of meaning (single item ad hoc)	C: daily associations between self-control and meaning in life I: trait self-control as predictor of daily meaning in life	I: self-control (within and between); trait presence and search (between)
Chu et al. (2020)	Presence of meaning* (two items from the DMS)	C: daily associations between positive affect and meaning in life I: age as moderator of the concurrent associations	I: positive affect (within); age (between)
Dakin et al. (2022)	Presence of meaning* (two items from Newman et al. 2018)	S: autoregressive effect was controlled C: daily associations between prosociality and meaning in life T: cross-lagged effects (lag= 1 day) between prosociality and meaning in life	I: prosociality (within)

Note. * In these studies, presence of meaning in life was explicitly considered as a component of eudemonic well-being. ** In this study presence (considered as a well-being component) and search for meaning were included as separated constructs, so their reciprocal influence was not examined.

[a] S: Stability; T: Temporal influence; C: Concurrent associations; I: Individual differences.

[b] S: situational factors; I: individual factors

Meaning-making as a system of interacting elements

Most of included studies (N=12) didn't directly target the meaning-making process but investigated only presence of meaning in life in a daily framework. Among those, 8 works considered life meaningfulness as one component of eudaimonic well-being that was investigated most of times as the outcome of other psychological process such as prosociality (e.g., Dakin et al., 2022) or spirituality (Kashdan & Nezlek, 2012). Four studies were dedicated to the investigation of meaning-making micro-dynamics by adopting Steger's framework, including presence and search for meaning. However, the two dimensions were considered as separate constructs in three out of the four works (e.g., Newman & Nezlek, 2019; Steger & Kashdan, 2013; Kashdan & Steger, 2007). Only Newman et al. (2018) considered the meaning-making process as the resultant of the intertwined association between presence and search for meaning, by examining their reciprocal daily and temporal association. In the studies, meaning in life was operationalized with a single item (e.g., Stavrova et al., 2020) or with two face-validated items (or similar versions) composing the Daily Meaning Scale (e.g. How meaningful does your life feel?; How much do you feel your life has purpose?) firstly proposed by Kashdan & Steger (2007). Daily search for meaning items were formulated as parallel versions of the presence items (e.g., How much were you searching for meaning in your life today?; How much were you looking to find your life's purpose? in Kashdan & Steger, 2007).

Meaning-making as a temporal process

14 studies examined the meaning-making situational dynamics by conducting daily dairy studies of 7-28 days on multiple individuals, and one study (Heintzelman & King, 2019) made use of an experience sampling method (6 assessments a day for 7 days).

Stability. Only four studies took into consideration the *stability* of meaning in life across days. In most of the cases, the autoregressive effect is included in multilevel models to

be controlled with the aim of investigating temporal dynamics. Only Steger & Kashdan (2013) formulated specific research questions about the instability of presence of meaning (calculated as individual deviation from the mean and mean square of successive differences; see Steger & Kashdan, 2013 for details). The authors found that meaning in life was rather stable for most participants and for those whose meaning in life fluctuate the most, a lower adjustment and well-being was recorded.

Concurrent association. Examining *concurrent daily associations* between the daily perception of meaning in life and other psychological processes (e.g., positive affect in Chu et al., 2020; gratitude in Allan et al., 2013; spirituality in Kashdan & Nezlek, 2012), was the main interest for most studies. Some studies investigated how the occurrence of daily events (e.g., eudaimonic behaviors in Steger et al., 2007; social and achievement events in Machell, Kashdan, et al. (2015); routines in Heintzelman & King, 2019) was associated with the daily or momentary perception of life meaningfulness, these results will be discussed in the following paragraph about meaning-making and exogenous factors. The daily concurrent association between daily presence and search for meaning was only examined in Newman et al. (2018) and resulted in a significant and positive concurrent daily association between the two dimensions.

Temporal influence. The last of dynamic effect that I considered was the *temporal influence* over time. When the theoretical knowledge allowed for specific hypotheses regarding causal influences, a specific lagged effect was examined where the perception of other constructs (i.e., spirituality in Kashdan & Nezlek, 2012; daily rumination and reflection in Newman & Nezlek, 2019) or the occurrence of situational events (i.e., sexual episodes in Kashdan et al., 2018) on a given day were tested as predictors of the perception of meaning in life the day after (lag= 1 day). In absence of clear directional hypotheses, the reciprocal temporal influence between the considered constructs has been tested (e.g., Dakin et al.,

2022; Steger et al., 2007). Among the retrieved works, only one study (Newman et al., 2018) examined the reciprocal temporal influence between two features of the meaning-making process. The examination of cross-lagged associations is crucial in illuminating the direction of influence of process dynamics and test different plausible theoretical modes. In their study, Newman et al. (2018) tested the cross-lagged associations between presence and search for meaning to discern which theoretical model was the best representation of the meaning-making daily functioning between the *presence-to-search* and the *search-to-presence* model (Steger et al., 2008). According to the *presence-to-search model* an increase in the presence of meaning should lead to a decrease in search for meaning. This model is based on the homeostasis model (Baumeister, 1991) and the meaning maintenance model (Heine et al., 2006), arguing that when people perceive a lack of meaning in life, they are pushed towards a greater search for meaning, conversely, when someone finds meaning in life, they search for meaning to a lesser extent. On the other side, the *search-to-presence model* argues that an increased engagement in the search of meaning could lead to acquiring more meaning in life. This model grounds in Frankl's (1963) conception of the search for meaning in life as the primary motivational force for humans and is also sustained by Park's (2010, 2017) meaning-making framework, according to which searching for meaning, if accompanied by an increase of the perception of life meaning, is an indicator of the proper functioning of the meaning-making process. Newman et al. (2018) discovered that a greater search of meaning on one day led to a greater presence of meaning the next day, thus supporting the search-to-presence model at the daily level.

Individual differences. The examined studies demonstrated that meaning-making dynamics significantly vary between individuals at the daily level (e.g., the intra-class correlation of meaning measures was examined in some studies finding that a proportion of variance between 53-61% was attributable to between-person differences, e.g., Machell,

Kashdan, et al. 2015; Kashdan & Nezlek, 2012; Stavrova et al., 2020). Even if the between-person variance in temporal dynamics was accounted in all the studied adopting multilevel modelling (N=13), only 9 studies tested the predictors of such individual variability. In some cases, the individual trait levels of the considered constructs (e.g., trait gratitude in Allan et al., 2013) or demographic factors such as gender and age (e.g. Chu et al., 2020; Kiang, 2012) were examined as predictors of between-level variability in daily meaning (e.g., Allan et al., 2013; Stavrova et al., 2020) or concurrent associations (e.g., Chu et al., 2020; 2020; Kiang, 2012). Steger & Kashdan (2013) examined if the average levels of presence and search of meaning were associated with instability in presence of meaning and found that people whose ratings of meaning in life fluctuated the most from day-to-day reported lower levels of average daily meaning, more negative affect and depression and less social connectedness. Newman et al. (2018) verified if trait presence and search for meaning were moderators of the cross-lagged effects examined at the within-level, and they found that the lagged relationship from search to presence was moderated by the trait level of presence such that people with low trait levels of presence showed a higher lagged-effect.

Meaning making as a process sensitive to exogenous factors

Individual factors. The investigation of exogenous factors associated with meaning-making was anticipated in the previous paragraph on temporal dynamics. All the studied considered some exogenous factors or processes as interrelated with daily meaning in life. Most of the studies tested the role of *individual factors* that differentiated individuals from each other by investigating if other psychological processes co-occurred with meaning-making at the within-level. This is for example the case of Dakin et al. (2022) who found prosocial behaviors to be associated with an increase in daily meaning; and Newman and Nezlek (2019), discovering that daily rumination led to increased presence of meaning in life the following day. Others verified if individual characteristics (e.g., age, gender) or

personological traits (e.g., personality traits, trait gratitude) explained at the between-level individual differences in the activation of process dynamics (Chu et al., 2020; Kashdan & Steger, 2007; Kiang, 2012). Individual differences were observed in the association between positive affect and daily meaning in life between younger and older adults in Chu et al. (2020); daily associations between feeling like a good student and purpose in life was stronger for females in Kiang (2012); and Kashdan and Steger (2007) found a daily interaction between neuroticism and curiosity in predicting presence of meaning.

Situational factors. The second typology of exogenous factors examined was *situational events*. The occurrence of daily events was found to be associated with daily fluctuations of meaning in life at the within-level. For instance, Kashdan et al. (2018) found that individuals who lived a sexual episode in one day experienced an increased meaning in life in the next day. Kiang (2012) examined if daily experiences and events within family, school, and extracurricular domains were related to adolescents' daily feelings of purpose in life and found a positive concurrent association between daily purpose and relational events related to family assistance and social fulfillment. Allan (2013) focused on the Thanksgiving holidays and found that the perception of life meaningfulness among undergraduate students didn't change compared to working days. Steger et al. (2007) found that the daily experience of eudaimonic behaviors, such as volunteering, express gratitude, listen to others point of view, had a positive impact on meaning in life on the same day and the next day. Machell, Kashdan, et al., (2015) examined if social and achievement events in both the positive and negative valence was positively related with daily meaning in life. They found positive within-person relationships between positive social events and meaning in life, while daily relationships between negative social and achievement events and meaning were negative. Finally, Heintzelman & King (2019) investigated whether engaging in routine behaviors was

associated with higher sense of meaning in life at present time; even controlling for mood, routine predicted meaning in life perceptions at the within-person level.

What DO WE NOT KNOW about meaning-making dynamics?

Examined studies demonstrated that meaning in life fluctuates over time generating a rich path of dynamics that also differ between individuals. However, there are still several open questions regarding the meaning-making functioning, some of which are going to be addressed in the last two empirical studies (study 3.1 and 3.2) of the present doctoral thesis.

Meaning-making as a system of interacting elements

In most of studies the meaning-making process was overlapped with the daily fluctuations in the perception of presence of meaning in life. The two process dimensions of meaning in life were considered only in three studies (Kashdan & Steger, 2007; Newman et al., 2018, Newman & Nezlek, 2019; Steger & Kashdan, 2013), but eventually, only Newman et al. (2018) studied the interaction between the two meaning-making elements, by targeting the mutual interaction between presence and search for meaning. Instead, there is no study that currently examined meaning-making temporal dynamics by adopting the tripartite conception of meaning (Martela & Steger, 2016), thus considering comprehension/coherence, purpose and significance/mattering as three basic interacting features that generates the meaning-making process in a natural daily context.

Meaning-making temporal dynamics

Actually, we still don't know how the process of meaning-making works in a daily framework. Indeed, the stability of presence of meaning was considered as a source of information only in Steger & Kashdan (2013), who proved that individuals more unstable in their life meaningfulness are also the less adapted; conversely, we do not have any information about the stability of the daily search for meaning. In other studies (e.g., Newman et al., 2018) the autoregressive effect of presence and/or search for meaning was

controlled to have a more reliable estimate of temporal dynamics but was not considered as a source of information. The only study examining the temporal dynamics (both concurrent associations and temporal influence) structuring the change of the configuration of meaning-making was again Newman et al. (2018). Interestingly, they found a positive daily association between presence and search for meaning, and the temporal interaction between the two dimensions provided evidence for the search-to-presence theoretical model (Steger et al. 2008). However, further evidence should be gathered to demonstrate that these dynamics are generalizable across different samples, situations and contexts. Indeed, their sample is made of a relatively homogenous group of undergraduate students in the United States who shared a similar socio-cultural context.

Meaning-making and exogenous factors

Daily *situational events* certainly have an impact on the meaning-making process, however few studies investigated their role as exogenous factors. Among the types of events most investigated there are social and relational episodes (e.g., Kashdan et al., 2018; Kiang, 2012; Machell, Kashdan, et al., 2015) and events related to life-achievement (e.g. Machell, Kashdan, et al., 2015). At a cross-sectional level, research on life events and meaning in life tends to overemphasize negative events (e.g., Krause, 2007; Park, 2010), while from the reviewed studies, it appears that mundane experiences and positive events have been the most explored at the daily level. Only one study (Machell, Kashdan, et al., 2015) compared the valence of lived experiences to understand whether positive and negative events impact meaning in life in a different way, finding that the experience of a positive event was associated with an increase in presence of meaning, while negative events were associated with a loss in life meaningfulness. However, the association between daily events, positive or negative, and the process of daily searching for meaning has not yet been investigated. Furthermore, to our knowledge no study assessed whether the number of events experienced

by individuals (at the between level) in the space of a few weeks has an impact on the activation of meaning-making dynamics. In other words, what happens when people find themselves experiencing "a series of unfortunate events"?

Most of the external factors that have been so far considered concern *individual differences* such as the trait dimension of psychological constructs as mood or personality traits (e.g., Heintzelman & King, 2019; Kashdan & Steger, 2007). More rarely, socio-demographic factors (e.g., gender, grade in school, generation in Kiang, 2012; relationship status closeness and length in Kashdan et al. 2018) have been investigated. Most of the included studies involved samples of college students that are a quite homogeneous population of emerging adults (Arnett, 2007) at least in western societies, as they share a similar lifestyle, and they aim to conquer the same developmental tasks such as graduating and structuring a solid relational network (Billari & Liefbroer, 2010; Chevalier, 2021; Shanahan et al., 2008). Future studies should investigate if the same meaning-making dynamics hold in older populations considering that there are well-known differences in the average levels of presence ad search for meaning showed by individuals across the lifespan. Specifically, a high search-low presence configuration is a hallmark characteristic of young people who are still exploring life possibilities regarding their career and social roles, while a low search-high presence path is associated with well-adapted adults who are fully committed with their identity (Brassai et al., 2011; Kiang & Fuligni, 2010; Luyckx et al., 2008; Negru-Subtirica et al., 2016; Steger et al., 2009; Zambelli & Tagliabue, 2022). However, even within the transition to adulthood, we cannot assume that the meaning-making dynamics are generalizable to every young individual. The population of emerging and young adults is very wide and varied as this life-period extends for almost two decades, from 18 to 35 years old (Arnett, 2014), thus young people change very much along the way. Cross-sectional studies demonstrated that different transitional conditions lived by emerging and young adults can

determine a different activation of the meaning-making process. Indeed, young people who already conquest more adult roles, such as being in a solid romantic relationship (Hadden & Knee, 2018), or being committed in purposeful career goals (Steger & Dik, 2009) report a greater global meaning in life, and a lower engagement in search for meaning (Zambelli & Tagliabue, 2022). Therefore, further studies should examine if a portion of the between-person variability usually found in daily dynamics could be explained by different transitional conditions lived by individuals.

Finally, *contextual factors* such as the reference culture, socio-economic conditions, collective events have not been investigated in their impact on daily dynamics to date. According to Brofenbrenner (1979) the social and relational context in which people are immersed can directly affect their daily life. Major unexpected changes in the ecological setting can shatters the person's north, disrupt their certainties, and make people fall into a crisis of meaning (Schnell, 2009). Several studies found that after major collective traumatic events such as terroristic attacks (Park et al., 2012), conflicts (Noviana et al., 2016), or natural disasters (Lew et al., 2020) people engage in the meaning-making process as a psychological response to recover from the trauma (Hall & Hill, 2019; Park & George, 2013; Park, 2016b; Park et al., 2016; Steger et al., 2015). One of the most recent hurtful events that hit people worldwide starting from March 2020 was the COVID-19 pandemic. Studies that examined the role of meaning-making during this event confirmed the protective role of meaning in life to reduce the stress burden experienced by people (Humphrey & Vari, 2021; Samios et al., 2021). The pandemic was particularly overwhelming for young people (Kowal et al., 2020; Zhou et al., 2022) who, during the hardest times of restrictions, were prevent from progressing in their life transition in the normative way, thus experiencing stress, maladjustment and worries that negatively impacted on their future perspectives (Arslan & Allen, 2021; Zambelli et al., 2022). All the studies conducted so far on meaning-making

situational dynamics examined the daily experience of people living a contextual condition of general well-being and pace typical of wealthy Western societies. Considering the relevance of the meaning-making process in traumatic conditions, it is of utmost importance to expand the investigation of the meaning-making daily functioning in different stressful or traumatic experiences (e.g., war, conflicts, natural disasters, chronic illness). Additionally, cross-cultural and cross-national studies have found differences in the association between presence and search for meaning at the cross-sectional level (e.g., Fischer et al., 2021; Steger et al., 2008; Zambelli et al., 2022), therefore further studies are necessary to identify which meaning-making situational dynamics are generalizable to different cultural and social contexts.

Outline of Study 3.1 and Study 3.2

With the aim of cover some of the unanswered research questions about the meaning-making process, in this doctoral thesis I present two empirical studies in which data collected with a daily diary methodology from a sample of emerging and young adults were analyzed to unveil both within-person dynamics and between-person differences.

In study 3.1, I first aimed at investigating the stability, the concurrent daily association and the reciprocal temporal influence between daily presence and search for meaning in life, with the aim of adding to the current evidence on meaning-making micro-dynamics in a daily context. A second purpose was to examine if the occurrence of daily significant events, both positive and negative, was a predictor of daily presence and search for meaning in life. Additionally, I tested if the number of events lived by young people across the 14 days of the study was a moderator of meaning-making daily dynamics. From a methodological point of view, I collected data with a 14-days daily diary study on a large sample of emerging and young adults and I administered the SMILE measure to collect the daily perception of participants presence and search for meaning in life. From a statistical

level, in this study I showed up the potentialities of the Dynamic Structural Equation Models approach (DSEM; Asparohuov et al., 2018) to explore the complexity of the meaning-making process with data collected with intensive longitudinal designs.

In study 3.2, the purpose was to provide a first exploratory insight into the micro-dynamics sustaining the reciprocal interaction between the basic components of meaning-making, that were defined as the daily perception of presence of comprehension, significance and purpose in life and the daily engagement in the search of the same three components. The second purpose was to examine the role of two typologies of exogenous factors on daily dynamics. First, I investigated if the transitional condition (i.e., balance, imbalance; Zambelli & Tagliabue, 2022) lived by emerging and young adults in the domains of love and work determined a different activation of meaning-making. Then, by using a measurement burst design, I tested if the meaning-making dynamics activated by youths during the first strict lock-down of the COVID-19 pandemic were invariant after 10 months, in the absence of any restrictions related to the pandemic. From a statistical level, in this study I applied some of the more recent introduction of the Network Psychometric Framework (Borsboom et al., 2021; Epskamp et al., 2017), to explore the complexity of the meaning-making process with data collected with intensive longitudinal designs.

Study 3.1 Examining the complexity of the meaning-making process with Dynamic Structural Equation Modeling

Introduction

In this study I examined the complexity of meaning-making dynamics and its connection with the occurrence of significant life events among a sample of emerging and young adults. In the present study I conceptualized the meaning-making process as composed of two process-oriented dimensions, presence of meaning and search for meaning, and the focus of investigation is their intertwined association over time. This choice allowed us to compare our findings with the previous literature adopting the same conceptualization of meaning-making, and to examine some unresolved questions related to the daily functioning of the process.

Study Aims and Hypotheses

Two major goals were addressed which are formulated below together with the corresponding research aims and hypothesis.

The *first goal* was to investigate the temporal dynamics of the meaning-making process in a situational daily framework. Four specific aims that were addressed include:

Aim 1a: To investigate the stability of presence and search for meaning over time.

I predicted a rather substantive stability over time in the individual average levels of presence and search for meaning, in line with previous literature (Steger & Kashdan, 2013). However, I also expect to observe some day-to-day fluctuations in individual perceptions of presence and search for meaning, representing the state, or time-varying, component of the process.

Aim 1b: To investigate the concurrent relationship between presence and search for meaning on a day-to-day level.

I expected a positive concurrent association between daily presence and search for meaning measured at the same time with the SMILE, thus supporting Newman's et al. (2018) results

and mirroring the cross-sectional positive association that I found in study 2 between presence and search for meaning.

Aim 1c: To investigate the predictive relations between presence and search for meaning over time.

Considering the temporal reciprocal influence between presence and search for meaning sustained at the theoretical level (see Introduction), as well as the scarcity of empirical evidence sustaining it, I examined the cross-lagged effects between presence and search for meaning in life from one day to the next (lag =1 day). I compared our results with those from Newman's et al. (2018), who found evidence of a lagged effect of the search on the presence of meaning, despite involving a younger sample and considering a different context[10].

Aim 1d: To investigate individual differences in the temporal dynamics of meaning-making.

Considering that our sample was diverse in terms of socio-demographic characteristics and transitional markers (see the method section), I expected that the temporal dynamics (i.e., stability and reciprocal influence of presence and search for meaning) would show substantive between-person variability, in line with previous literature (e.g., Newman et al., 2018; Steger & Kashdan, 2007).

The *second goal* was to investigate the impact of daily events on the temporal dynamics of meaning-making. Besides investigating the overall impact of daily events, I was also interested in differentiating the role of positive and negative events. Therefore, the following two aims were formulated for positive and negative events separately.

Aim 2a: To investigate if the occurrence of an impactful event had an impact on the next day's perception of presence and search for meaning.

[10] Newman's study: data colleted in 2018, undergraduate students, M_{age}=18.5; SD_{age}=51.55; Our study: data collected during the COVID-19 pandemic, emerging and young adults, 56.7% workers, M_{age}=25.5; SD_{age}=4.06).

I was interested in understanding whether emerging adults who lived a subjectively impactful event on a given day directly experienced a change in their daily perception of presence and search for meaning the following day. I hypothesized that emerging adults who lived a negative event suddenly experienced a decrease of presence of meaning (Machell, Kashdan, et al., 2015) and that a positive event would increase the daily perception of presence of meaning (Machell, Kashdan, et al., 2015; Steger et al., 2008). Regarding the impact of daily events on the search for meaning dimension I did not have enough information from the literature to formulate specific hypotheses.

Aim 2b: To investigate if the number of impactful events experienced during a two-week period influenced the temporal dynamics of meaning-making.

In this aim I wanted to examine if having experienced many impactful events across a relative short period of time (14 days) determined how emerging adults activated (or not) the meaning-making dynamics (i.e., stability and predictive relations between presence and search for meaning). It is reasonable to expect that living many events would determine a different activation of the meaning-making process, for instance by showing a higher instability (i.e., lower autoregressive effects) of both presence and search for meaning compared to people who didn't experienced many impactful events.

Method

Research design and participants

To investigate both the temporal dynamics of meaning-making and the individual differences in such dynamics, I collected intensive longitudinal data (Bolger & Laurenceau, 2013) with a measurement burst design[11] consisting of two 14-day daily diary studies from a sample of Italian emerging and young adults (aged 18-35; Arnett, 2014). For this study, I used data obtained from the first wave, consisting of a daily diary study of 14 days involving

[11] The full measurement burst design will be considered in study 3.2.

a sample of 328 emerging and young adults living in Lombardia (the Italian region most affected by COVID-19) between April 18 and May 15, 2020. Participants completed a daily questionnaire for an average of 12.6 days (range= 1-14; SD=2.9).

The sample was recruited through an intentional sampling procedure. Participants were informed about the study's aims, procedure and study design, data protection, and participant's rights via an online infographic implemented in Qualtrics[12]. Participants who agreed to participate and signed the informed consent were asked to build an alphanumeric identification code to pair the daily questionnaires to ensure anonymity. They were also asked to provide a WhatsApp phone contact or an e-mail address to receive Qualtrics links to the daily questionnaires. No reward was provided for participation. Ethical approval was issued by the Ethics Committee of Università Cattolica del Sacro Cuore of Milan (IT).

As inclusion criteria, participants needed to be aged 18-37 and to live in Lombardia. Working as a healthcare professional in hospitals was considered an exclusion criterion due to the particularity of this pandemic experience. Participants were aged 18-37 years (M=25.47; SD=4.06), they were 69.4% females, 43.3% students, 34.1% singles, and 65.5% were cohabitating with parents. Each participant answered a three-minute questionnaire each evening (sometime from 7 to 9 p.m.) for 14 consecutive days. The survey was sent on their mobile phones and included the SMILE measure in the daily version (presented in the instrument section). In addition, they were asked if some relevant events occurred in the previous 24 hours, and to categorize each event as having a positive or negative impact on their life.

[12] A detailed description of the methodological and procedural choices adopted to comply with the golden standards of ethics in scientific research and to the Open Science framework are available in the Chapter 3 folder at the link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Instruments

Situational meaning in life. In this study I administered the SMILE measure that was developed in the daily version (see Table 3.2.2) Data were collected during the first lock-down of the COVID-19 pandemic in Italy, therefore I provided each item with the event-related reference "the pandemic" (e.g., "Today, I can say that my life has value during the pandemic"). For all the items, the temporal reference was "Today" as the aim was to make participants reflect on their perception of life meaningfulness at the present time, considering what they lived in the previous 24 hours. For this reason, participants were given the following instructions "Looking back on what has happened, and what you have been thinking and doing in the past 24 hours, we ask you to evaluate how much do you agree with the following statements". The items were rated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree).

To estimate the within- and between-level variance of presence and search for meaning indicators, I conducted a two-level unconditional model (days nested within person; Nezlek, 2017). Descriptive statistics are presented in Table 3.1.1. Following Geldhof et al. (2014), the composite reliability of the SMILE structure was estimated at both the within-level and the between-level to consider the two-level structure of our data. The internal consistency was adequate at both levels (see Table 3.1.1).

Table 3.1.1

Descriptive statistics and reliability of daily presence and search for meaning

Daily measure	Grand-mean	Within-level		Between-level	
		Variance	Reliability	Variance	Reliability
Presence of meaning	3.92	.79	.73	2.0	.96
Search for meaning	2.87	.90	.74	1.58	.98

Occurrence of impactful daily events. Participants were asked to answer the following open question: "Did any positive or negative event relevant to you or to your life happened in the

previous 24 hours?". Participants could write up to three events, and, for each of them, they evaluated how much it impacted their life giving a score from one to five. Each event was categorized as positive or negative by a team of researchers. For the purposes of the study, I selected for each participant and each day the most impactful event that had a clear positive or negative valence. Reported events covered several domains such as social and family relationships (e.g., positive: "I video called my friends"; negative; "I had a fight with my father"), work/study achievements (positive: "I graduated today"; negative "they reduced my salary"), health and covid-related events (positive: "they announced the end of lock-down"; negative "I am positive to Covid-19"). Then, I created three dummy variables encoding the occurrence (1) or the non-occurrence (0) of an impactful general event (general_event), a positive event (positive_event), or a negative event (negative_event) in the previous 24 hours for each of the 14 measurement occasions. On average, participants reported the occurrence of a significant event in 2.5 days (range=1-14; SD= 2.4) out of 14. A total of 799 significant events were reported by the entire sample across the 14 days, with a daily average of 57.1 events (range=23-103; SD=22.8).

Data Analysis

To answer the study aims I conducted a set of analyses within the Dynamic Structural Equation Modeling framework (DSEM; Asparouhov et al., 2018). An overview of the DSEM framework is presented in **METHO-BOX N°1**. Specifically, in the present study I applied a multilevel VAR(1) model to simultaneously describe the temporal dynamics of the meaning-making process (aims 1a, 1b, 1c) and the between-person differences in such dynamics (aim 1d). An extension of the mlVAR(1) model that accommodates exogenous predictors was used to investigate the impact of daily events on meaning-making dynamics (aims 2a, 2b).

METHO-BOX N°1. The DSEM approach for Intensive Longitudinal Designs

In recent years a new powerful modelling approach dedicated to the analysis of intensive longitudinal data (e.g., Bolger & Laurenceau, 2013) has been developed, under the name of Dynamic Structural Equation Models (DSEM; Asparouhov et al., 2018). DSEM integrates three statistical frameworks: a) time-series analysis, to investigate temporal effects (i.e., lagged relations) of repeated measures; b) multilevel modelling, by considering individual differences in the parameters describing the temporal dynamics; c) and structural equation modelling, that allows to work with multivariate data and latent variables (Hamaker et al., 2021; McNeish & Hamaker, 2020). Muthèn and Muthèn (2017) developed a module in the software Mplus version 8 dedicated to the application of different families of DSEM models, thanks to which these models are spreading in psychological research (Asparouhov et al., 2017). Within the DSEM framework a large family of VAR (vector-autoregressive) models can be estimated, starting from the N=1 time-series, to the multilevel extension for N>1, with the possibility of including a single outcome variable (univariate model) or multiple variables (multivariate model). Additionally, DSEM models offer the opportunity of including time-varying covariates (i.e., variables that change together with the outcomes at each measurement occasion), and time-invariant covariates (i.e., variables that are constant across measurement occasions but that vary between individuals). In this work I applied a multilevel first-order vector autoregressive model (mlVAR(1)) specifically designed to analyze data from multivariate time-series estimated for multiple individuals (e.g. McNeish & Hamaker, 2020).

Before running DSEM models, I tested the validity of the SMILE_daily scale by conducting a *cross-classified confirmatory factor analysis* (McNeish et al., 2021) of which a detailed description is reported in the **METHO-BOX N°2**. Additionally, I also verified that

the VAR models' assumptions were met in our data. DSEM are based on Bayesian Markov Chain Monte Carlo (MCMC) estimation. Within this framework missing data are handled via the Kalman filter, which allows obtaining a reliable estimation of DSEM parameters even if the majority of occasions (80-85% of the total entries) have either a missing outcome or predictor (Asparouhov et al., 2018). Therefore, I retained participants who completed at least 3 days out of 14 (78.6% of missingness at the respondent level), for a total of 318 cases[13].

METHO-BOX N°2. Testing measurement invariance with cross-classified confirmatory factor analysis

When multi-dimensional scales are used in intensive longitudinal designs it is important to verify that the meaning of the construct is the same across both time and individuals before averaging or summing the indicators into composite scores (Asparouhov & Muthén, 2015; Fried et al., 2016; McNeish et al., 2021). Recently, McNeish et al. (2021) proposed a new approach to test measurement invariance, called *cross-classified confirmatory factor analysis (CCFA).* Each measurement parameter (item intercepts, item factor loading and latent variables) are expressed as the resultant of a fixed effect component (capturing the average level aggregated over time and people), a person-level random effect (representing the variance of the parameter across people), and a time-level random effect (indicating how much the parameter vary across occasions). Based upon the concept of *approximate invariance* (Asparouhov & Muthén, 2015; Jak et al., 2014), measurement invariance is evaluated by analyzing the random effects of item parameters (factor loadings and intercepts) to obtain an estimate of the variability across both occasions and people. In this way the measurement invariance of the scale's structure can be assessed both *across time,* by verifying that the items relate to the construct in the same way over all measurement

[13] On average participants completed 12.9 of the 14 daily questionnaires. The 4.1% (N=13) participated less than 7 days, the 6.9% (N=22) completed from 7 to 10 daily questionnaires, and the 74.6% completed from 11 to 14 daily questionnaires.

occasions (i.e., also called longitudinal invariance), and *across people*, by ensuring that the items are interpreted similarly across individuals (Adolf et al., 2014; Millsap, 2010; Vandenberg & Lance, 2000). If the assumption of measurement invariance does not hold at one or both levels, researchers should interpret results with caution. Specifically, if longitudinal invariance is not met, an observed change in the outcome variables (i.e., an increase in presence of meaning) could reflect both a change in the underline construct, but also a change in the interpretation of items at different measurement occasions (Rutter & Sroufe, 2000). At the same time, if between-people invariance is not met, mean-score differences across individuals might reflect different levels of the underlined construct (i.e., people with high or low levels of presence of meaning), but also differences in the way individuals interpreted or responded to the items (Vandenberg & Lance, 2000).

Statistical analyses were conducted with R version 4.2 (for data visualization and detrending) and Mplus version 8.4 (for cross-classified CFA and the DSEM models).

Data availability. Descriptive statistics of the investigated variables, together with the R and Mplus codes for data detrending, cross-classified analysis and the application of DSEM models are available in the *Chapter 3* folder at OSF link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Data analysis and Results

Validity Examination of the SMILE with cross-classified CFA

In the present study, the measurement invariance of the SMILE two-factor structure was tested through a *cross-classified confirmatory factor analysis* (McNeish et al., 2021). Specifically, for each of the two SMILE's dimensions (presence and search for meaning), the factorial structure was tested by estimating a *fixed effect* and two *random effects* (between-

time and between-people) for the intercept and factor loading of each item[14]. The random effects were then interpreted to regarding the scale's measurement invariance between-time and between-people, that is confirmed for values reasonably small and closed to zero (McNeish et al., 2021). Given the model is based on Bayesian estimation, the significance level of each parameter was evaluated by consulting the credible intervals (CI), which are derived from the posterior distribution as the corresponding 2.5^{th} and 97.5^{th} percentile. A credible interval that does not contain a 0 indicates a statistically credible parameter. Table 3.1.2 presents the results of the cross-classified CFA.

Measurement invariance across-time: Regarding the SMILE's measurement invariance across-time, all the item intercepts showed very low between-time variability for both the presence (random effects $\leq .04$) and the search (random effects $\leq .02$) dimension, indicating that the average item responses for all the six items were stable over time. When looking at the variability of factor loadings over time, this variance appears to be null for all six items, indicating that the contribution of each item to the meaning in life construct, in both dimensions of presence and search for meaning, was stable across time. Full measurement invariance across time was confirmed, so I could conclude that participants interpreted the six items regarding meaning in life at the same way across the 14 measurement occasions.

[14] The analyses were conducted with Mplus Version 8.4 following McNeish et al. (2021) indications (see their paper for details about estimation methods and priors used). *Fixed effects* represent the average level of the measurement parameters (intercept of factor loading) aggregated across time and across people; *Random effects between-person* represent the variance of measurement parameters (intercept or factor loading) averaged over measurement occasions; *Random effects between-time* represent the variance of measurement parameters (intercept or factor loading) averaged over people.

Table 3.1.2

Results of the Cross-classified Confirmatory Factor Analysis of SMILE's items in Study 3 (N=318)

	Item 1: Comprehension		Item 2: Purpose		Item 3: Significance	
Parameter	Est.	CI	Est.	CI	Est.	CI
Presence of meaning dimension						
Fixed effects						
Intercept	2.31	2.09-2.71	3.22	2.94-3.66	2.77	2.53-3.28
Factor loading	.66	.62-.71	.68	.64-.72	.82	.78-.85
Random effects between-time						
Intercept	.00	.00-.02	.03	.01-.10	.00	.00-.06
Factor loading	.00	.00-.00	.00	.00-.00	.00	.00-.00
Random effects between-person						
Intercept	.25	.16-.39	.45	.35-.57	.01	.00-.04
Factor loading	.07	.05-.09	.03	.02-.05	.03	.02-.04
Search for meaning dimension						
Fixed effects						
Intercept	1.13	1.09-1.17	1.50	1.39-1.63	1.25	1.19-1.32
Factor loading	.67	.62-.72	.79	.74-.84	.78	.73-.83
Random effects between-time						
Intercept	.00	.00-.01	.01	.00-.05	.01	.00-.03
Factor loading	.00	.00-.00	.00	.00-.00	.00	.00-.00
Random effects between-person						
Intercept	.00	.00-.00	.05	.01-.12	.00	.00-.01
Factor loading	.09	.07-.12	.09	.07-.12	.10	.08-.13

Note. Est.= parameter estimate taken from the median of the posterior distribution; CI=95% credible intervals.

Measurement invariance across-people: For the presence for meaning dimension, only the random effect of the intercept of the significance item was close to zero (.01), while there was much more variance across people for the intercepts of the comprehension item (.25) and the purpose item (.45), thus indicating substantial differences among how participants rated on average (over time) this two items. Conversely, for the search for meaning dimension, the random effects of the intercepts of the three items varied between zero (for the comprehension and significance items) and .05 (for the purpose item). Finally, the between-person variance for the unstandardized factor loadings was non-zero for all the

items, but never exceed .10, thus meaning that the factor loadings (on average over time) slightly varied across people. Specifically, the factor loadings' random effects were between .03 and .07 for the presence of meaning, and between .09 and .10 for the search for meaning items. In conclusion, the SMILE measure demonstrated a full-invariance across-time, and a partial invariance across-people.

Verifying VAR models assumptions

VAR models include three central assumptions about the investigated process: a) the data are normally distributed; b) the temporal dynamics are assumed to be constant over time (*stationarity* of the process); c) the measurement occasions are equally spaced.

As a preliminary step I verified that these three assumptions held in our data. Specifically, the items' distribution was examined to verify the normality assumption. To examine the stationarity of the process, I checked for any linear *trends* over time, represented by a systematical increase or decrease of values across measurement occasions. I fitted a series of fixed-effects linear regressions (with alpha set to .05) with the day number as predictor to each of the six variables of the SMILE. If trends were present, these were interpreted and then data were detrended following the procedure presented in Borsboom et al. (2021). The detrended indicators were then averaged to create the presence and search for meaning indicators to be used in following models (e.e., Mansueto et al., 2022). Finally, the assumption of equidistance between time intervals was met, as the daily diary design was planned with each measurement occasion separated by 24 hours.

All the SMILE's items were normally distributed[15] across all measurement occasions, as showed by values of kurtosis and skewness never exceeding $|1.2|$ (Muthén & Kaplan, 1985), thus confirming the first assumption of VAR models. Regarding stationarity, there

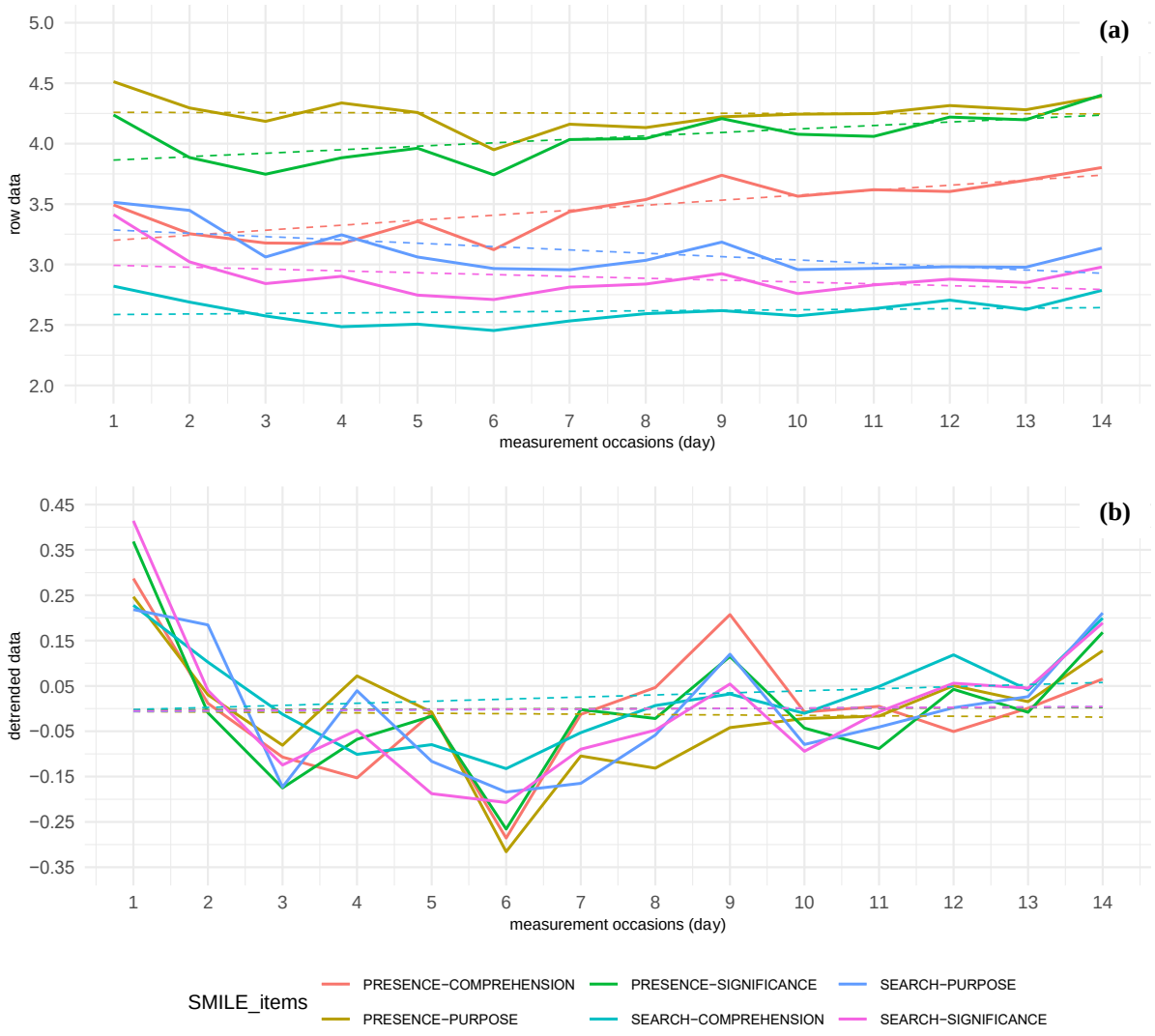
[15] Item analysis available in the Chapter 3 folder at: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

were linear trends in the data especially in the presence of meaning items showing a positive linear trend across the 14 days, while the search for meaning items overall showed an inverse trend (see Figure 3.1.1 a). I detrended each variable by running a multivariate fixed effect linear regression with time (number of day) as the only predictor.

As shown in Figure 3.1.1 (b), in detrended data the pattern of fluctuations around the mean were still visible, but the mean level was stable over time and set around zero. Detrended items were then averaged to create the indicators of presence and search for meaning in life to be included in subsequent DSEM models.

Figure 3.1.1

Linear plot of the six SMILE's items using (a) raw data and (b) detrended data



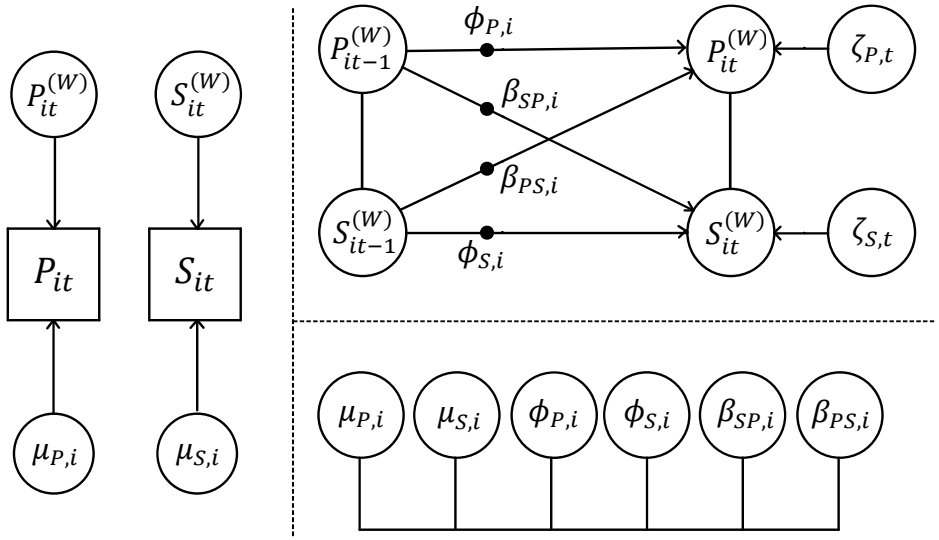
Note. Means for each variable are shown as dashed lines.

Application of the mlVAR(1) model to investigate meaning-making dynamics

In order to answer the first aim, I applied a bivariate multilevel first-order vector autoregressive model, referred as mlVAR(1), as described by Hamaker et al. (2018). mlVAR models are based on the decomposition of variance of the observed indicators into a *between-person variance*, that represents the stable, trait-like variation between persons, and a *within-person variance*, encoding the temporal deviations (e.g., day-to-day deviations) from the mean. In our study, presence and search for meaning are the two outcome variables collected across 14 repeated days[16]. Figure 3.1.2 depicts a path diagram of the mlVAR(1) model applied to our data.

Figure 3.1.2

Representation of the mlVAR(1) model with presence and search for meaning



Note. The path diagram represents the model described by equations 1, 2 and 3. The left part represents the variance decomposition of observed indicators into a within-person and a between-person component. Top right contains the VAR(1) model at the within-level. Bottom-right contains the between-level model in which the between-person parameters are correlated. The squares represent observed indicators, the circles represent latent variables. Solid black circles represent dynamic factors which have been estimated as random effects at the between level. Lines represent correlations and arrows represent regressions.

[16] The outcome variables, i.e., presence and search for meaning, are latent person-mean centered by default. The default priors included in Mplus have been used to estimate the model parameters. A detailed description of the basic priors can be consulted in Asparouhov & Muthén (2010). Additionally, priors for all parameters used to estimate the mlVAR(1) model can be consulted in the TECH1 output section of the DSEM_PS.out syntax available in OSF: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

As shown in Equation (1), for each individual *i* at occasion *t*, the two observed indicators of presence (P_{it}) and search for meaning (S_{it}) were decomposed into a within-person mean ($\mu_{P,i}$ and $\mu_{S,i}$), and a temporal deviation from that mean ($P_{it}^{(W)}$and $S_{it}^{(W)}$).

$$\begin{aligned} P_{it} &= \mu_{P,i} + P_{it}^{(W)} \\ S_{it} &= \mu_{S,i} + S_{it}^{(W)} \end{aligned} \tag{1}$$

Within-person level. The temporal deviations were modelled at the within-level with a bivariate time-series to account for the dynamic association within a person over time, as represented in the following equations:

$$\begin{aligned} P_{it}^{(W)} &= \phi_{P,i} P_{it-1}^{(W)} + \beta_{PS,i} S_{it-1}^{(W)} + \zeta_{P,t} \\ S_{it}^{(W)} &= \phi_{S,i} S_{it-1}^{(W)} + \beta_{SP,i} P_{it-1}^{(W)} + \zeta_{S,t} \end{aligned} \tag{2}$$

The temporal deviations at time t ($P_{it}^{(W)}$and $S_{it}^{(W)}$) were regressed on themselves at the previous measurement occasion ($P_{it-1}^{(W)}$ and $S_{it-1}^{(W)}$) to obtain two *autoregessive effects*, representing the individual *stability* or *carry-over* of both presence ($\phi_{P,i}$) and search ($\phi_{S,i}$) for meaning over time. The temporal deviations were also regressed on each other at *t-1* to obtain two *cross-lagged effects*, reflecting the *predictive relationship* or *spill-over* of presence on search for meaning ($\beta_{SP,i}$), and vice-versa ($\beta_{PS,i}$). The residual variances ($\zeta_{P,t}$ and $\zeta_{S,t}$), also called *innovations* or *dynamic errors*, follow a multivariate normal distribution. Additionally, Mplus offer the default option of examining the covariation between the fixed effects of the within-person means ($\mu_{P,i}$ and $\mu_{S,i}$), which was interpreted as an indication of the concurrent association between presence and search for meaning

Between-person level. As represented in equations (1) and (2), there are six person-specific parameters, namely within-person means ($\mu_{P,i}$ and $\mu_{S,i}$), autoregressive effects ($\phi_{P,i}$ and $\phi_{S,i}$) and cross-lagged parameters ($\beta_{SP,i}$ and $\beta_{PS,i}$), while the residual variances were fixed to be equal across individuals in our model. These parameters have a subject index *i*

indicating that they can vary across-individuals, however they do not possess an index *t* due to the stationarity assumption of temporal dynamics. At the between-level, a set of equations can be estimated for all the person-specific parameters, so that each coefficient is modelled as the result of a *fixed effect* (γ) representing the average effect across people, and a person-specific *random effect* (υ_i) capturing the individual deviations from the average.

$$\begin{aligned} \mu_{P,i} &= \gamma_P + \upsilon_{P,i} \\ \mu_{S,i} &= \gamma_S + \upsilon_{S,i} \\ \phi_{P,i} &= \gamma_{PP} + \upsilon_{PP,i} \\ \phi_{S,i} &= \gamma_{SS} + \upsilon_{SS,i} \\ \beta_{SP,i} &= \gamma_{SP} + \upsilon_{SP,i} \\ \beta_{PS,i} &= \gamma_{PS} + \upsilon_{PS,i} \end{aligned} \quad (3)$$

A covariance matrix can be estimated at the between level that includes the random parameters. In our study the six random parameters were allowed to covary[17].

The model was estimated using 40,000 iterations, two chains and a thinning of two[18]. The model converged properly as indicated by the proportional scale reduction criterion (PRC), which was stable and very close to 1 (Hamaker et al., 2018). The parameter estimates for the fixed and random effects together with their 95% credible intervals are reported in Table 3.1.3.

To answer aims 1a (investigate the stability of meaning indicators) and 1c (investigate the predictive relations between meaning indicators), I examined the fixed effects of autoregressive and cross-lagged parameters. The fixed effects of the autoregressive parameters were significant for both presence and search for meaning, as demonstrated by their CIs that didn't contain zero. The parameter estimates revealed that both presence of meaning ($\phi_{P,i}$ =.45; CI[.37, .53]) and search for meaning ($\phi_{S,i}$ =.27; CI[.18, .37])[19] were

[17] Results and interpretation of the covariance matrix between random parameters can be consulted in the Chapter 3 folder at the link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.
[18] To reduce the complexity of the model and the risk of non-convergence, I allowed the covariation of random effects with a mean level different from zero.
[19] The autoregressive coefficients can range -1 to 1 due to the stationarity assumption.

quite stable over time. Regarding cross-lagged effects, the CI of the $\beta_{PS,i}$ parameter included zero (CI[-.07, .09]), thus indicating the absence of an effect of search for meaning on the presence of meaning over time in our sample. Conversely, I found a significant cross-lagged fixed effect of the presence of meaning on the search for meaning ($\beta_{PS,i} = .11; \text{CI } [.03, .19]$) meaning that, on average across all individuals, an increase in perceived presence of meaning on a given day, was related to an increase of search of meaning the day after. I named this dynamic process the *virtuous cycle*, as it suggests that finding some meaningfulness in life one day pushed emerging adults in engaging in a higher search for meaning the following day, thus activating a positive meaning-making process. I looked at the correlation between within person means to answer aim 1b (investigate the contemporaneous association between meaning indicators), finding a positive and consistent association between daily presence and search for meaning (Cov ($\mu_{P,i}$, $\mu_{S,i}$)=.45; CI[.41, .56]) on average in our sample.

Table 3.1.3

Estimates and 95% credible intervals for the bivariate multilevel VAR (1) Model

Dynamic Effect	Notation	Fixed effects (means)		Random effects (variances)	
		Est.	CI	Est.	CI[1]
Within-person Mean P[1]	$\mu_{P,i}$	**-.49**	**[-.76, -.25]**	**1.82**	**[1.35, 2.44]**
Within-person Mean S[1]	$\mu_{S,i}$	-.12	[-.33, .08]	**1.56**	**[1.16, 2.08]**
Autoregressive P	$\phi_{P,i}$	**.45**	**[.37, .53]**	**.14**	**[.11, .19]**
Autoregressive S	$\phi_{S,i}$	**.27**	**[.18, .37]**	**.11**	**[.07, .15]**
Cross-lagged S on P	$\beta_{PS,i}$	.01	[-.07, .09]	**.02**	**[.00, .05]**
Cross-lagged P on S	$\beta_{SP,i}$	**.11**	**[.03, .19]**	**.13**	**[.07, .20]**
Residual P	$\zeta_{P,t}$	**.84**	**[.77, .92]**	-	-
Residual S	$\zeta_{S,t}$	**.87**	**[.79, .96]**	-	-
Covariance P with S	Cov ($\mu_{P,i}$, $\mu_{S,i}$)	**.45**	**[.41, .56]**	-	-
DIC(25)= 11121.46					

Note. P=presence of meaning; S=search for meaning; DIC(df)= Deviance Information Criterion (degrees of freedom).

[1] The CI of random effects cannot include zero as specified by priors.

The random effects of the autoregressive and cross-lagged effects were examined to answer aim 1d (investigate individual differences in meaning-making dynamic effects). These parameters revealed that the random effect of the autoregressive parameters of presence (.14) and search for meaning (.11), and the presence on search cross-lagged parameter (.13) denoted a similar individual variability. Considering that the autoregressive and cross-lagged parameters can range from -1 to 1 (McNeish & Hamaker, 2020), even a relatively small variance can represent quite important individual differences in the parameter, depending on the corresponding fix effect. Indeed, the $\beta_{SP,i}$ parameter, which represents the virtuous cycle, has a fixed effect of .11 and a variance of .13, indicating that the meaning-making virtuous cycle was not activated by all the emerging adults in our sample, as for some of them this parameter was null or even negative[20]. Conversely, the variance of the cross-lagged parameter of search on presence ($\beta_{PS,i}$) was very small (.02; CI [.00, .05]), meaning that this parameter was close to zero for all individuals. The existence of consistent individual variability in the dynamic effects of meaning-making led us to investigate the role of external sources in explaining this between-person variance.

Adding daily events as exogenous covariates to the mlVAR(1) model

In order to answer aim 2a, I investigated the impact of daily events (general, positive and negative events) on meaning-making dynamic effects. For aim 2b, I investigated the impact of the number of experienced daily events (general, positive and negative events) on between-person differences in dynamic effects. To address these two aims, I extended the mlVAR(1) model applied previously to accommodate exogenous covariates. Specifically, I

[20] Based on the normality assumption of latent variables we can apply the formula $\gamma \pm 1.96\sqrt{\upsilon}$, where γ is the parameter fixed effect and υ the corresponding random effect, to calculate the min-max values of the person-specific effect showed by the 95% of people in the sample. For example, applying the formula to $\beta_{SP,i}$ parameter, with a fixed effect of .11 and a random effect of .13, I find out that the 95% of participants in our sample showed a person-specific value between -.60, .82. For the $\phi_{P,i}$ parameter, the 95% of person-specific effects ranged from -.30, 1.18; and for the $\phi_{S,i}$ parameter the range was -.38, .92.

included the three event-related dummy variables (general_event, positive_event, negative_event), where a value of 1 indicated the occurrence of an impactful general/positive/negative event in the previous 24 hours. These three variables are considered both as time-varying covariates, and as time-invariant covariates (Hamaker et al., 2021; McNeish et al., 2020). Indeed, at the *within-level* they represent the variability across-days of the number of events experienced by participants, allowing to distinguish days in which many events occurred, from days in which few events occurred. At the *between-level* these variables encode variability across-people, differentiating people who experienced many daily events across the 14 days, from individuals who experienced few.

To test the predictive effect of these three event-related predictors on meaning-making dynamics, I developed an extended version of the mlVAR(1) model in which an event-related predictor (E_{it}) was included as an exogenous covariate. Following the same variance decomposition process of the meaning indicators, the event-related observed indicator (E_{it}) was decomposed into a within-time (or time-varying) component ($E_{it}^{(W)}$), and a time-invariant component ($E_{i}^{(B)}$). Then, the time-varying component was included as a within-level predictor of daily presence and search for meaning, and the time-invariant component as between-level predictor of the dynamic effects[21]. This model is presented in Equation 4 and in Figure 3.1.3.

Within level

$$P_{it}^{(W)} = \phi_{P,i}P_{it-1}^{(W)} + \beta_{PS,i}S_{it-1}^{(W)} + \beta_{PE,i}E_{it}^{(W)} + \zeta_{P,t}$$
$$S_{it}^{(W)} = \phi_{S,i}S_{it-1}^{(W)} + \beta_{SP,i}P_{it-1}^{(W)} + \beta_{SE,i}E_{it}^{(W)} + \zeta_{S,t}$$

Between level

$$\begin{aligned} \mu_{P,i} &= \gamma_P + \upsilon_{P,i} \\ \mu_{S,i} &= \gamma_S + \upsilon_{S,i} \\ \phi_{P,i} &= \gamma_{PP} + \gamma_{E1}E_{i}^{(B)} + \upsilon_{PP,i} \end{aligned} \quad (4)$$

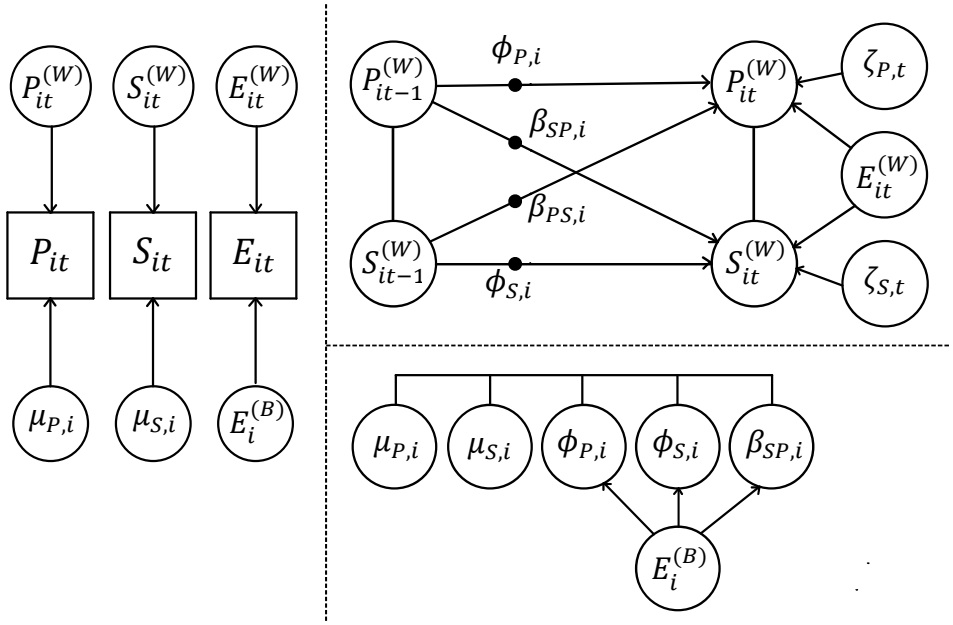
[21] The three event-related predictors were latent person-mean centered (Asparouhov et al., 2018) as implemented by default in Mplus for variables that are decomposed into both within and between levels. Accordingly, these variables do not appear in a WITHIN or BETWEEN statement in the Mplus syntax.

$$\phi_{S,i} = \gamma_{SS} + \gamma_{E2}E_i^{(B)} + \upsilon_{SS,i}$$
$$\beta_{SP,i} = \gamma_{SP} + \gamma_{E3}E_i^{(B)} + \upsilon_{SP,i}$$
$$\beta_{PS,i} = \gamma_{PS} + \upsilon_{PS,i}$$
$$\beta_{PE,i} = \gamma_{PE} + \upsilon_{PE,i}$$
$$\beta_{SE,i} = \gamma_{SE} + \upsilon_{SE,i}$$

At the within level, a regression parameter was added to each equation ($\beta_{PE,i}$ and $\beta_{SE,i}$) to account for the lagged effect of the time-varying covariate $E_{it}^{(W)}$on the daily level of presence and search for meaning. At the between level, three person-specific effects were added to capture the predictive effect of the time-invariant $E_i^{(B)}$covariate respectively on the two autoregressive parameters ($\gamma_{E1}E_i^{(B)}$and $\gamma_{E2}E_i^{(B)}$), and on the presence to search cross-lagged parameter ($\gamma_{E3}E_i^{(B)}$). To answer the study aims, the same model was tested thrice, one for each of the event-related predictors, that are general events in Model A, positive events in Model B, and negative events in Model C.

Figure 3.1.3

Representation of the mlVAR(1) model with daily events as an exogenous covariate



Note. The left part represents the variance decomposition into within and between part. Top right contains the VAR(1) model with the within-level predictor. At the between-level (bottom right) the regression path of the between-level predictor with the considered dynamic effects and correlations between person-specific parameters are reported. Squares represent observed indicators; circles represent latent variables. Solid black circles represent dynamic factors which have been estimated as random effects at the between level. Lines represent correlations and arrows represent regressions.

The model was estimated using 10,000 iterations, two chains and a thinning of two, and the estimation option ALGORITHM=GIBBS(RW)[22]. The model converged properly as confirmed by PRC values. For each regression coefficient the parameter estimates are reported together with their 95% credible intervals in Table 3.1.4.

Table 3.1.4

Estimates and 95% credible intervals for regression parameters estimated in Model A, B and C

		Model A: general event		Model B: positive event		Model C: negative event	
Parameter	Notation	Est.	CI	Est.	CI	Est.	CI
Within-level							
$E_{it}^{(W)}$ on $\mu_{P,i}$	$\beta_{PE,i}$	**.27**	**[.18, .35]**	**.56**	**[.46, .64]**	**-.50**	**[-.66, -.34]**
$E_{it}^{(W)}$ on $\mu_{S,i}$	$\beta_{SE,i}$	**.28**	**[.19, .37]**	**.43**	**[.33, .53]**	-.17	[-.34, .01]
Between-level							
$E_{i}^{(B)}$ on $\phi_{P,i}$	γ_{E1}	-.35	[-.79, .07]	-.33	[-.95, .26]	-.80	[-2.07, .45]
$E_{i}^{(B)}$ on $\phi_{S,i}$	γ_{E2}	.07	[-.37, .53]	-.19	[-.83, .45]	.54	[-.77, 1.87]
$E_{i}^{(B)}$ on $\beta_{SP,i}$	γ_{E3}	**-.40**	**[-.76, -.08]**	-.42	[-.89, .03]	-.69	[-1.97, .27]
		DIC(31)= 26751.6		DIC(31)= 25518.0		DIC(31)= 21613.3	

Note. DIC (df)= Deviance Information Criterion (degrees of freedom). Significant parameters in bold.
Each of the three models were mlVAR(1) with daily events (general events in Model A, positive events in Model B, and negative events in Model C) as predictors of presence and search for meaning within person means ($\mu_{P,i}$ and $\mu_{S,i}$) at the within-level, and predictors of autoregressive effects ($\phi_{P,i}$ and $\phi_{S,i}$) and the presence on search cross-lagged effect ($\beta_{SP,i}$) at the between level.

In Model A the covariate was the occurrence of an impactful event in the previous 24 hours. At the within level, the occurrence of a daily event ($E_{it}^{(W)}$) was a significant predictor of both presence ($\beta_{PE,i}$ =.27; CI[.18, .35]) and search for meaning ($\beta_{SE,i}$ =.28; CI[.19, .37]), indicating that, on average in our sample, the daily perception of both presence and search for meaning was higher when an impactful event occurred in the previous 24 hours. At the between-level, the only significant parameter (with a negative direction) was the regression

[22] This option must be included instead of the defaults in Mplus when the variance covariance matrix is not block-diagonal, for instance when a between level covariate is included as predictor of an outcome variable as in this case (see Asparouhov & Muthén (2022) for more details).

coefficient representing the impact of daily events on the presence to search cross-lagged effect, that is the meaning-making *virtuous cycle* (γ_{E3} = -.40; CI[-.76, -.08]). This result indicates that emerging adults who lived many impactful events across the 14 days of the study experienced less the meaning-making virtuous circle compared to those who experienced fewer events.

In Model B I examined the role of daily positive events on the same dynamics. Both within-level regression parameters were significant and positive, showing a larger effect size than general events in Model A. Specifically, experiencing a positive event in the previous 24 hours made emerging adults in our sample perceiving higher presence ($\beta_{PE,i}$ =.56; CI[.46, .64]) and higher search for meaning in life ($\beta_{SE,i}$ =.43; CI[.33, .53]). Between level parameters were not significant.

Finally, Model C focused on the impact of daily negative events. At the within level, I found a strong negative predictive effect on the daily level of presence of meaning in life ($\beta_{PE,i}$ = -.50; CI[-.66, -.34]). This effect suggests that the occurrence of a negative event in the previous 24 hours was associated with a diminished perception of presence of meaning in life among emerging adults in our sample. None of the other tested effects were significant.

Discussion

In this study, I zoomed into the dynamics of meaning-making process in an attempt to investigate how the presence and search for meaning in life mutually co-occur and influence each other in a daily framework, taking into consideration individual differences in such dynamics in a sample of emerging and young adults. Additionally, I investigated the role of impactful daily events, both positive and negative, as exogenous factors able to activate or de-active the meaning-making process dynamics. Given that full invariance was found across measurement occasions of the SMILE's two dimensions, it is possible to affirm that the

temporal dynamics that were observed are reliable representations of daily fluctuations of both presence and search for meaning.

I first examined the stability of meaning-making indicators that, as expected, showed a consistent trait-like component that was stable over time (aim 1a). The stability in presence of meaning over days is theoretically sound, because even if investigated at the situational level, the meaning-making process is strictly related to the global system of meanings, made of the global values about the self, the other and the world (Janoff-Bulman, 1989; Poulin & Silver, 2019). Therefore, the trait component of meaning-making is not supposed to change day-by-day within individuals. The search for meaning dimension showed more fluctuations across days probably because this dimension is more connected with individuals' motivation to actively look for meaning in daily life. However, the consistent stability found probably represents a trait characteristic of emerging adults from whom we usually expect a normative high activation of the search for meaning that is a developmental feature in this life-stage (Mayseless & Keren, 2014).

The concurrent association between the daily perception of presence and search for meaning (aim 1b) was significant and positive. This indicates that emerging and young adults who were highly engaged in the search for meaning on a given day were also perceiving high presence of meaning that same day. This result is consistent with the positive correlation between the SMILE's facets of presence and search for meaning obtained from the cross-sectional validity examination of the scale in study 2, and with previous studies (Newman et al., 2018; Steger & Kashdan, 2013). This confirms that being in search for meaning for emerging adults is an indicator of the positive functioning of the meaning-making process, that is related with their identity development (Brassai et al., 2010; Mayseless & Keren, 2014; Negru-Subtirica et al., 2016).

The last temporal effect that I examined was the reciprocal relation between presence and search for meaning (aim 1c), which revealed new insights. I found evidence of a positive predictive effect from presence of meaning to search for meaning the day after, which I called the *virtuous cycle*. Conversely, the search on presence predictive effect that was found by Newman et al. (2018) was not significant in our sample and context. It is likely that the virtuous cycle might represent a different meaning-making functioning that gets activated during specific conditions. Our study is the first investigating the meaning-making process with a situational perspective during a stressful contextual condition; moreover, compared to Newman et al. (2018), our sample is more varied and includes both young students and young workers, who certainly experienced unexpected challenges during the pandemic that made it more difficult to achieve their development goals (e.g., Arslan & Allen, 2021; Kowal et al., 2020; Zhou et al., 2022).

It is worth noting that the presence-to-search dynamic that I found in this study does not correspond to the presence-to-search model supported by the homeostasis model (Baumeister, 1991) and the meaning maintenance model (Heine et al., 2006), which hypothesize a negative predictive effect between the two components, such as when people feel a gain in presence of meaning they tend to reduce their engagement in the search for meaning. Conversely, the virtuous cycle is represented by a positive predictive effect of presence of meaning on search for meaning, such that finding new meanings in life push emerging and young adults to search for additional meaning the day after.

In the classical presence-to-search model, the search for meaning is considered as a subordinate component of presence of meaning, which is activated as long as there is a perceived need to construct new meanings. This model fits well into the stress and trauma literature (Park, 2010, 2017), according to which, when stressful and traumatic events occur, people can perceive a discrepancy with their own system of meanings, and then activate the

meaning-making process to restore their original balance. If is plausible that, for the adult population, the search for meaning is activated by request only when there is a need to recover from some sort of meaning disruption, this process can get more complex when considering the population of emerging and young adults. Indeed, being in search for meaning is a normative developmental configuration for emerging and young adults who are still building their system of meanings (Brassai et al., 2011; Negru-Subtirica et al., 2016; Steger et al., 2009; Zambelli & Tagliabue, 2022). The virtuous circle found in this study is consistent with this theoretical framework that sees the search for meaning as the engine of the meaning-making process during the transition to adulthood, and can be interpreted as the process that push young people to continue in their normative process of meaning-making (e.g. Mayseless & Keren, 2014) even during a stressful and hurtful condition such the Covid-19 pandemic.

Finally, as expected, I found consistent individual variability in the dynamics of meaning-making (aim 1d). This result should not be underestimated. In fact, it tells us that, at least among emerging and young adults involved in this study, the meaning-making process was activated in different ways across people. The person-oriented literature of meaning-making has long shown that, at a cross-sectional level, different profiles of meaning-making exist among young people (e.g., Krok, 2018; Dezutter et al., 2014; Zambelli & Tagliabue, 2022), which can be partially explained by different individual and transitional characteristics (Zambelli & Tagliabue, 2022). The existence of a consistent person-specific variability in meaning-making dynamics even on a daily basis opens up future studies on the investigation of individual predictors of this variability. However, the variability found reflects in part a difference in the way young people interpreted some items of the SMILE, especially regarding the presence of meaning, as shown by the cross-classified CFA.

Regarding the second aim, I observed that experiencing impactful events during a 24-hour window had a direct positive impact on individuals' perception of daily presence and search for meaning in life the day after, thus demonstrating that meaning-making is a process grounded in everyday life and sensitive to the impact of situational exogenous factors (Heintzelman & King, 2019; King et al., 2006; Steger et al., 2008). Moreover, in line with the literature (Steger et al., 2007; Machell, Kashdan, et al., 2015), I found that the occurrence of positive events determined an increase in the perceptions of life meaningfulness. I additionally observed that positive events are predictors of the daily search for meaning. These results are highly relevant to the meaning-making literature as they make evident that positive events are the activators of the meaning-making process among young people, despite their role has been under investigated in the cross-sectional literature in favor of the study of negative events (e.g., Krause, 2007; Park, 2010).

Conversely, the occurrence of negative events was linked to lower daily perception of meaning in life but did not have impact on the search for meaning. One interpretation could be that negative events require to be preliminary reworked, and the eventual disruption of life meaningfulness needs to be partially recovered before people have sufficient resources to increment their search for meaning. Another valid interpretation could be that the occurrence of daily negative events does not have a direct impact on the daily search for meaning, suggesting that the normative process of meaning-making activated by emerging and young adults is sufficiently impermeable to external negative events to guarantee stability in their developmental process even under unfavorable conditions. Lastly, I found that the number of events experienced during a 14-day period influenced the virtuous cycle activated by emerging adults, with people who lived many events across the 14 days who experienced less the meaning-making virtuous circle. This can be an indication of some sort of freezing effect, where the experience of too many impactful events in a relatively short period of time could

act as a deactivator of the meaning-making process. This condition recalls the concept of developmental crises described by Robinson et al (2020). These are transitional episodes occurring when young people face the inability to cope with the transitional challenges thus feeling stuck in a limbo without the resources to move in any direction. It is conceivable that, in these situations, people need to stop and recover some balance before getting back and engage in the meaning-making process.

Conclusion remarks, limitations, and future perspectives

This study provided new insights into the meaning-making process functioning. First, it unveiled the fundamental role of the search for meaning as the engine of the meaning-making process among emerging and young adults. If for adults the outcome of meaning-making is to reach and maintain a solid perception of life meaningfulness, the lifegoal for young people is to activate a functional search for meaning that leads them to discover themselves and commit to a solid identity (Glavan et al., 2019; Mayseless & Keren, 2014; Negru-Subtirica et al., 2016). Second, I found empirical evidence that the creation of life meaningfulness is nurtured by everyday life experiences, as the meaning-making process can be activated or de-activated by mundane experiences (e.g., cook the favorite dish; yoga-time) or special events, both positive (e.g., obtaining a promotion at work), or negative (e.g., having an argue with the partner). This study showed that when young people are challenged by hard circumstances, such as the Covid-19 pandemic, it is important for them to focus on the positive experiences of everyday life to maintain and increment a positive activation of the meaning-making process. The evidence suggests that young people have enough resources to manage the occasional occurrence of negative events, however, when they feel overwhelmed by external events, they tend to show a reduction in the activation of the virtuous circle of meaning-making. Although the presented evidence on the meaning-making situational dynamics must be replicated in other studies, our findings provide useful practical indications

for the development meaning-making interventions to help young people activate a functional meaning-making process during unfavorable conditions.

This study possesses several limitations that should be addressed by future studies. First, it focuses on a national non-representative sample living a very specific contextual condition. It is important to underline that meaning-making is a complex psychological process that probably performs differently across the life span and across different conditions. Therefore, replication using different populations (e.g., adolescents, adults, older adults), cultures (e.g., western vs non-western) and contextual conditions (e.g., stressful vs traumatic vs normative conditions) should be examined to broaden the available knowledge on meaning-making daily dynamics.

In this study the meaning-making process was considered as a stable process (Jongerling et al., 2015; McNeish & Hamaker, 2020), and the focused was on the daily fluctuations around stable means of presence and search for meaning. However, I observed some linear trends in the data that were removed in order to respect the stationarity assumption of VAR models. These linear trends indicate that the meaning-making could probably behave also as a developmental process. Future studies should investigate meaning-making macro-dynamics and examine the possible interaction between micro and macro dynamics. Indeed, research in other relative fields, such as identity (Becht et al., 2016), demonstrated that micro-dynamics occurring at the daily level (e.g., short-term daily identity levels in adolescence) could directly determine a long-term change in the overall identity configuration.

Finally, compared to previous studies, I adopted a multidimensional measure of meaning-making which is certainly more complete because it considers all three content dimensions of the construct (i.e., comprehension, significance, purpose) which, however, were collapsed into an overall score of presence and search for meaning. Future studies

should evaluate the process dynamics of the single features of meaning-making to understand which of these are the actual drivers of the functioning of the meaning-making process. The next study in the present thesis (study 3.2) deals with this specific challenge.

Study 3.2. Examining the complexity of the meaning-making process with Multilevel Network Analysis

Introduction

In this study I still aimed at examining the meaning-making dynamics within a complexity framework, by investigating its dynamics of change and individual differences among emerging and young adults. The conceptualization of the meaning-making process is the main difference between the current study and study 3.1. In the present study, the meaning-making process has been conceptualized as a system of interacting elements where the six meaning components measured by the SMILE's items (comprehension, purpose and significance in the presence and search versions) are the nodes of the system which are connected by a network of edges. In this perspective, the meaning-making functioning emerges from the network of associations generated by the interaction between the six basic components.

Study Aims and Hypotheses

The *first aim* was to investigate the functioning of the meaning-making process, as previously conceptualized, in the context of the daily life. To do this, the role of each of the six components within the system has been observed at different levels. First, I investigated the co-occurrence of the six meaning features in the same day, by examining the network generated by the set of concurrent associations between each couple of nodes. This network is usually called "contemporaneous" as it represents a snapshot of the meaning-making process in a single frame. As the main goal of this study was the investigation of dynamics of change, I also examined the temporal associations between the meaning features, that is, how the six components of the process changed over time and how they affected each other from day to day, allowing the system to evolve. To serve this scope I examined a "temporal" network by which it was also possible to observe the different role played by each component

as drivers or targets of change. My last interest was to examine individual differences in the unique associations between the meaning components to understand how, on average, the six components were associated across days in our sample; this information were encoded in a "between-person" network.

Given the lack of research investigating the unique contribution of the comprehension, significance and purpose components in the meaning-making dynamics, this study was largely exploratory. However, based on the theoretical literature and the studies previously conducted in the current thesis I advanced few hypotheses: first, I expected some of the meaning components to be more closely associated than others, for example those linked to the same sub-process (presence vs search for meaning), thus generating clusters of nodes within the network at each level of investigation (contemporary, temporal and between). Additionally, at the temporal level I expected the six components to show different roles in activating the meaning-making network of reciprocal associations, as proof of their uniqueness.

The *second aim* was to investigate if the transitional condition (balanced vs imbalanced) lived by emerging and young adults in the domains of love and work determined a different activation of the meaning-making process. Considering that previous cross-sectional literature found different meaning-making configurations among young people living different steps in their transition to adulthood (Steger et al., 2009; Zambelli & Tagliabue, 2022), my expectation was to observe differences also in daily dynamics. Specifically, I predicted that individuals living an imbalanced condition in either the love or the work personal domain was experiencing a more intense activation of the process, with a denser network of contemporaneous and temporal dynamics.

Finally, the *third aim* was to evaluate if the meaning-making dynamics previously observed were stable after 10 months, in a different contextual condition, when the

restrictions imposed to control the Covid-19 spread were removed. As for aim 2, a plausible hypothesis would be that during the climax phase of the pandemic (i.e., during the lock-down) the meaning-making process was more instable and more activated by young people, especially at the level of contemporaneous and temporal associations.

Method

Research design and participants

Data was collected between March 2020 and February 2021 with a measurement burst design composed of two 14-days daily diary studies from a sample of Italian emerging and young adults. The first burst occurred in March 2020 during the first Italian lock-down, this data has been previously analyzed in Study 3.1 and was analyzed in the present study to answer the first two aims. Participants have been contacted after 10 months (February 2021) when the restrictions imposed due to the pandemic were temporally eased, to participate in the second wave of the measurement burst study. To reach a sufficient sample size to make comparison across the two waves, the recruitment was opened for new participants in order to reach a sample size of 300 units. The same sampling procedure and inclusion criteria were set up for data collection in both waves: participants needed to be aged 18-37 and to live in Lombardia (Italian region). Working as a healthcare professional in hospitals was considered an exclusion criterion due to the particularity of this pandemic experience. Before participating in both waves, participants signed an informed consent about the study's aims, procedure and study design, data protection, and participant's rights via an online infographic implemented in Qualtrics[23]. An alphanumeric identification code was used to pair the daily questionnaires across the two waves guaranteeing anonymity. No reward for participation

[23] A detailed description of the methodological and procedural choices adopted to comply with the golden standards of ethics in scientific research and to the Open Science framework are available in the Chapter 3 folder at the link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

was provided. Ethical approval was issued by the Ethics Committee of Università Cattolica del Sacro Cuore of Milan (IT).

A baseline survey was administered at the beginning of each wave to collect socio-demographic information (age, gender, transitional conditions) and other individual characteristics such as identity, post traumatic growth and well-being, that were not investigated in this study[24]. Starting from the following day, each participant completed 14 short daily questionnaires that were sent on their mobile phones each evening at 7 p.m. The daily questionnaires included the daily version of the SMILE (the same version administered in study 3.1) to measure their daily perception of presence and search of comprehension, significance and purpose in their life.

A total of 529 participants took part in the measurement burst design[25]. The 27.6% (N=146) took part in both waves, the 34.4% (N=182) completed only the first wave and the 38% (N=201) completed only the second wave. On average, participants completed 12.6 daily questionnaires (range= 1-14; SD=2.9) in Wave 1, and 11 daily questionnaires (range= 1-14; SD=4.1) in Wave 2. Descriptive statistics of the general sample and a comparison between the two waves are reported in Table 3.2.1

[24] A list of the variables administered in the baseline survey can be consulted in at OSF link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

[25] In this study the two waves of the measurement burst design were considered as independent samples, in the discussion section the implications of this choice are discussed.

Table 3.2.1

Descriptive statistics and comparison between the two waves

	Descriptive statistics		Comparison	
Socio-demographic variable	Wave 1 (N=328)	Wave 2 (N=347)	Statistical value t/ χ2 (df)	*p* value
Age (mean SD)	25.5 (4.1)	25.5 (4.1)	-.107(684)	.915
Males (% N)	30.6% (100)	22% (76)	6.98(1)	.008
Involved in a romantic relationship (% N)	65.9% (216)	60.8% (219)	1.86(1)	.173
Living with parents (% N)	65.5% (215)	60.3% (217)	2.04(1)	.153
Occupation (% N)				
Student	43.3% (142)	44.4% (160)		
Worker*	50.3% (165)	49.2% (177)	.10(2)	.953
Nor student nor worker	6.4% (21)	6.4% (23)		
Education (% N)				
Middle school diploma	1.8% (6)	1.1% (4)		
High school diploma	40.9% (134)	40.3% (145)		
Bachelor degree	25% (82)	23.9% (86)	1.18(4)	.882
Master degree	25.3% (83)	26.4% (96)		
Post graduate education	7% (23)	8.3% (30)		

Note. t: statistical value of Student's t-test; χ2: statistical value of Pearson chi-square.
*Trainees are included as workers

Instruments

Baseline measures in Wave 1

Transitional Condition in the Domains of Love and Work. The baseline survey of the first wave included information about participants' romantic relationship status and professional condition. Specifically, participants were asked if they were involved in a romantic relationship (yes-no), and for those who were in couple, the level of engagement in their romantic relationship was asked with the question "How are you living your romantic relationship?". Participants answered on a 4 point Likert scale with 1 (I live the relation day by day, because I think it won't last long), 2 (I take it seriously, but I don't know if it will

last), 3 (I think this relationship is decisive for me, it will last a long time) and 4 (It's absolutely the right one for me, it will last forever). The *transitional condition in love* variable was created following the indications reported in Zambelli & Tagliabue (2022). Specifically, participants were categorized into one of two categories, *balanced in love* and *imbalanced in love*. The imbalanced category included individuals who were not engaged in a romantic relationship and individuals with a low engagement in the romantic relationship (answering 1 or 2 to the engagement question), while the balanced category included people who were highly engaged in their romantic relationship (answering 3 or 4 to the engagement question).

For the domain of work, participants were asked their professional status (student, worker, neither student nor worker). The *transitional condition in work* variable included workers in the *balanced in work* category, while students, trainee and unemployed were categorized in the *imbalanced in work* group. This distinction is based on the developmental literature according to which achieving a stable job position is one of the most important developmental steps that emerging adults need to take to achieve the adult status and commit to an adult identity (e.g., Mayseless & Keren, 2014). Students, as well as unemployed or trainee, are instead still immersed in the process of exploration of life directions and trying to understand who they want to become, and which position they would like to take in the adult world.

Daily measures in Wave 1 and Wave 2

Situational meaning in life. In each wave, the daily version of the SMILE measure was administered (see Table 3.2.2). A detailed description of the instructions and items of the SMILE has already been presented in study 3.1. The six items were rated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree). Following Nezlek (2017) indications, an unconditional two-level model (days nested within person) was conducted to extract

multilevel descriptive statistics of the six items (mean and within- and between-person variance) in the two waves. Descriptive statistics and mean-level comparisons across the two waves are presented in Table 3.2.2 In the two waves all the items showed consistent variance at both levels to conduct multilevel analysis. The grand-mean levels of the six items were comparable in the two waves for three out of the six items.

Table 3.2.2

Multilevel descriptive statistics of the SMILE items and comparison across the two waves

Daily measure	Variance				Grand-mean		Grand-mean comparison
	Within-level		Between-level				
	W1	W2	W1	W2	W1	W2	t(df), *p* value
Presence comprehension *Today, I think I comprehend the meaning of my life during this pandemic*	1.20	1.07	2.27	2.09	3.46	3.61	24.96 (7848), <.001
Presence significance *Today, I feel that my life has value during this pandemic*	1.22	1.23	2.26	1.95	4.04	4.04	7.68 (7852), .89
Presence purpose *Today, I think I have goals for my life that push me to move forward during this pandemic*	1.20	1.31	2.15	1.85	4.25	4.14	7.80 (7855), .01
Search comprehension *Today, I tried to understand the meaning the meaning of my life during this pandemic*	1.14	1.10	1.56	1.60	2.61	2.81	3.44 (7847), <.001
Search significance *Today, I tried to understand what values my life in this pandemic*	1.39	1.21	1.67	1.62	2.90	2.96	17.21 (7854), .08
Search purpose *Today, I searched goals for my life that will push me to move forward during this pandemic*	1.59	1.35	1.74	1.59	3.11	3.10	31.64 (7850), .77

Note. W1= wave 1; W2= wave 2; t: statistical value of Student's t-test.

Analytic strategy

In order to analyze this complex multilevel data I opted for the Network Psychometric approach as it offers the best representation of the concept of dynamic system of interacting elements (Borsboom et al., 2021; Marsman & Rhemtulla, 2022). A detailed overview of the Network Psychometric framework and the *psychonetrics* analytical toolbox is presented in **METHO-BOX N°3**.

METHO-BOX N°3 - Network Psychometrics for intensive longitudinal designs
The network psychometric approach offers the best representation of the concept of dynamic system of interacting elements (Borsboom et al., 2021; Marsman & Rhemtulla, 2022; van der Maas et al., 2006). This approach emerged in the last decade as an alternative way to the traditional latent variable approach to investigate patterns of associations among variables in a multivariate framework (Borsboom et al., 2021; Borsboom & Cramer, 2013; Fried et al., 2017). Based on the idea of the mutualism model (van der Maas et al., 2006), each psychological process (e.g., intelligence, attitudes) is conceptualized as a complex system made of several elements (i.e., memory, decision, reasoning) in a dynamical interaction, from which the development of the entire system is generated (Borsboom, 2017; Marsman & Rhemtulla, 2022). Within this framework, a psychological process can therefore be visualized as a network of positive intercorrelation ("edges") between the constitutive elements ("nodes") of the system (Borsboom et al., 2021). A cross-sectional network is usually estimated modelling observed indicators as the nodes of the system and the connection between these nodes as partial correlations, that are unique associations between each couple of nodes after controlling for the associations with all the other nodes (Epskamp, Borsboom, et al., 2018).

Recently, network models from time-series and panel data have been developed to offer a thoughtful insight into multivariate pattern of temporal dynamics of psychological processes collected from multiple individuals (Borsboom et al., 2021; Bringmann et al., 2013; Epskamp, Waldorp, et al., 2018; Epskamp, 2020b). Similarly to the DSEM framework, multilevel temporal networks (when time is nested within people) can be estimated as *mlVAR* models following the variance decomposition in a within-level component, encoding dynamic effects, and a between-level component, representing individual differences (Epskamp, 2020b). At the within-level, two networks are estimated: the temporal network encodes predictive effects over time, it is generated from a matrix of directed vector autoregressive coefficients that assesses if a deviation from a subject's mean predicts a deviation from a subject's mean in the same variable (i.e., stability) or in another variable (i.e., reciprocal temporal influence) at the next measurement occasion (Epskamp, 2020b; Jordan et al., 2020); the residual matrix obtained from the temporal network estimation is modelled as a contemporaneous network mapping the within-person partial correlations (i.e., concurrent associations) between variables at the same time point after conditioning for the previous measurement occasion (Borsboom et al., 2021). This network is displayed as a personalized undirected network structure based on the Gaussian graphical model (Epskamp, Waldorp, et al., 2018). Finally, when data are collected from multiple individuals, a third matrix can be estimated to form a GGM model encoding how the stationary means of different subjects relate to one another, this is called between-person network (Epskamp, 2020b).

Psychonetrics: a toolbox for confirmatory testing in network psychometrics

Thanks to its data driven approach, the network analysis methodology was born as a powerful tool for exploratory research (Epskamp, Waldorp, et al., 2018), to be used when prior knowledge about process dynamics is not sufficient to make strong causal hypothesis.

However, recently researchers dealt with the challenge of extending the network psychometrics to test confirmatory hypothesis, for instance evaluating group differences in the network structure (Marsman & Rhemtulla, 2022). To answer this gap, a new toolbox was recently developed by Epskamp (2020a) and his team, named *Psychonetrics* (http://psychonetrics.org/). The psychonetrics toolbox allows to combine the exploratory search of the Gaussian Network Modeling with the Confirmatory testing of the SEM framework, by introducing fit indices, parameter significance and the possibility to estimate multi-group models.

Within this framework, a psychological process can be visualized as a network of positive intercorrelation (*edges*) between the constitutive elements (*nodes*) of the system (Borsboom et al., 2021). In this study, the six features of meaning-making are the nodes, and the reciprocal dynamic interactions between these elements are precisely the target of investigation. In order to deal with intensive longitudinal data with a nested structure (days nested within person) I applied a recent extension of networks psychometric analysis proposed by Epskamp (2020b) to examine temporal relationships over time in a multilevel framework. I selected a model named *multilevel ts-lvgvar* (Epskamp, 2020b) specifically designed for intensive longitudinal data that allows to estimate a series of nested gaussian graphical models (GGM) to examine within-person dynamics (contemporaneous associations and temporal influences) and between-person differences. This model has been implemented in the R software package *psychonetrics* (Epskamp, 2020a) which offers the opportunity to estimate model fit indices for each estimated model and to test for confirmatory hypothesis such as evaluating group differences in the network structure. With this statistical tool I was able to explore the within-subject dynamics and the between-subject effects of the meaning-making process in a daily framework (aim 1); to compare such dynamics between young

people in balance and imbalance conditions (aim 2); and to examine the stability of meaning-making dynamics across two different contextual conditions (aim 3).

All statistical analyses were conducted with the statistical software R Version 4.1.2. The codes are available in the *Chapter3* folder at OSF link: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Data analysis and Results

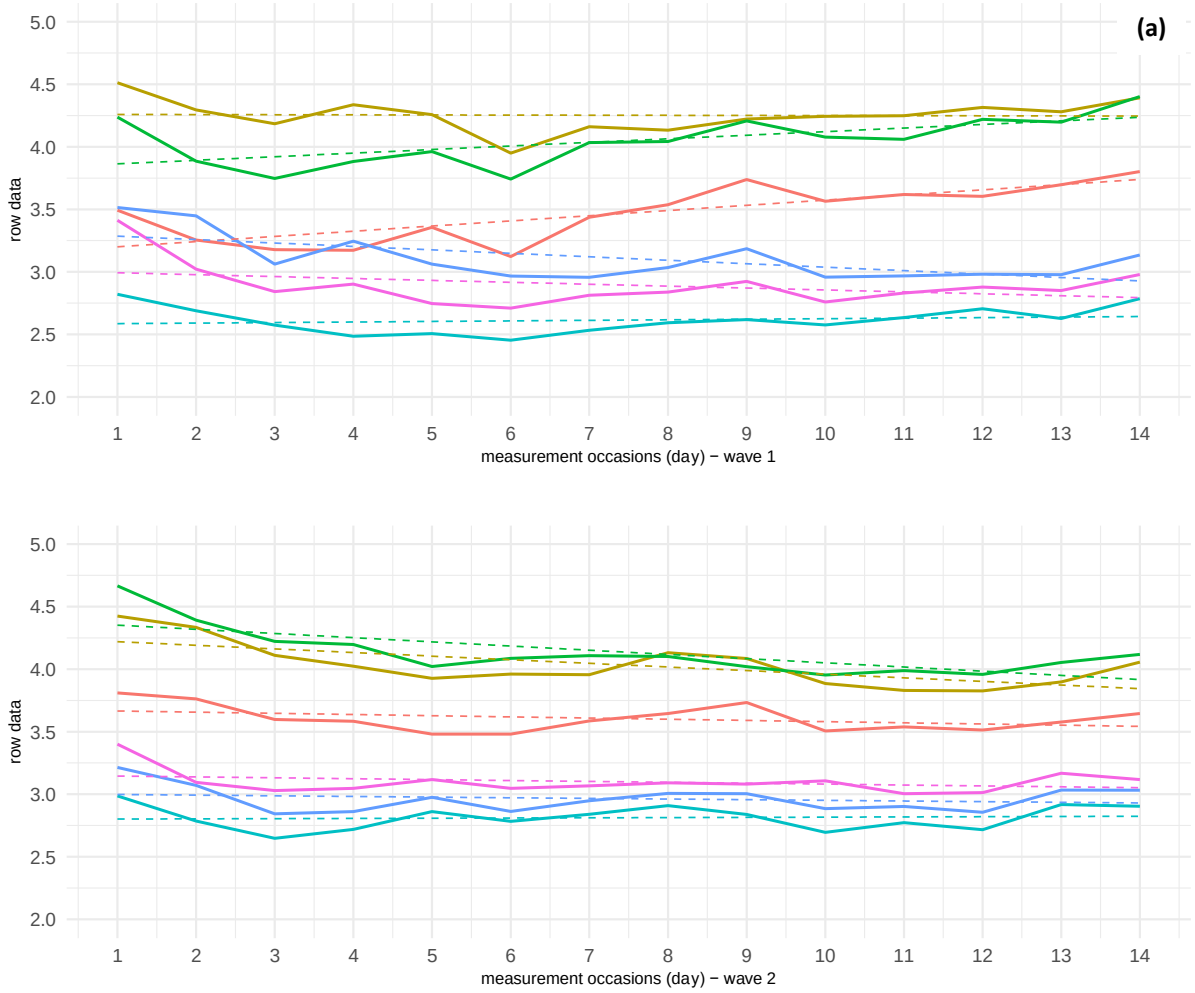
Preliminary analysis

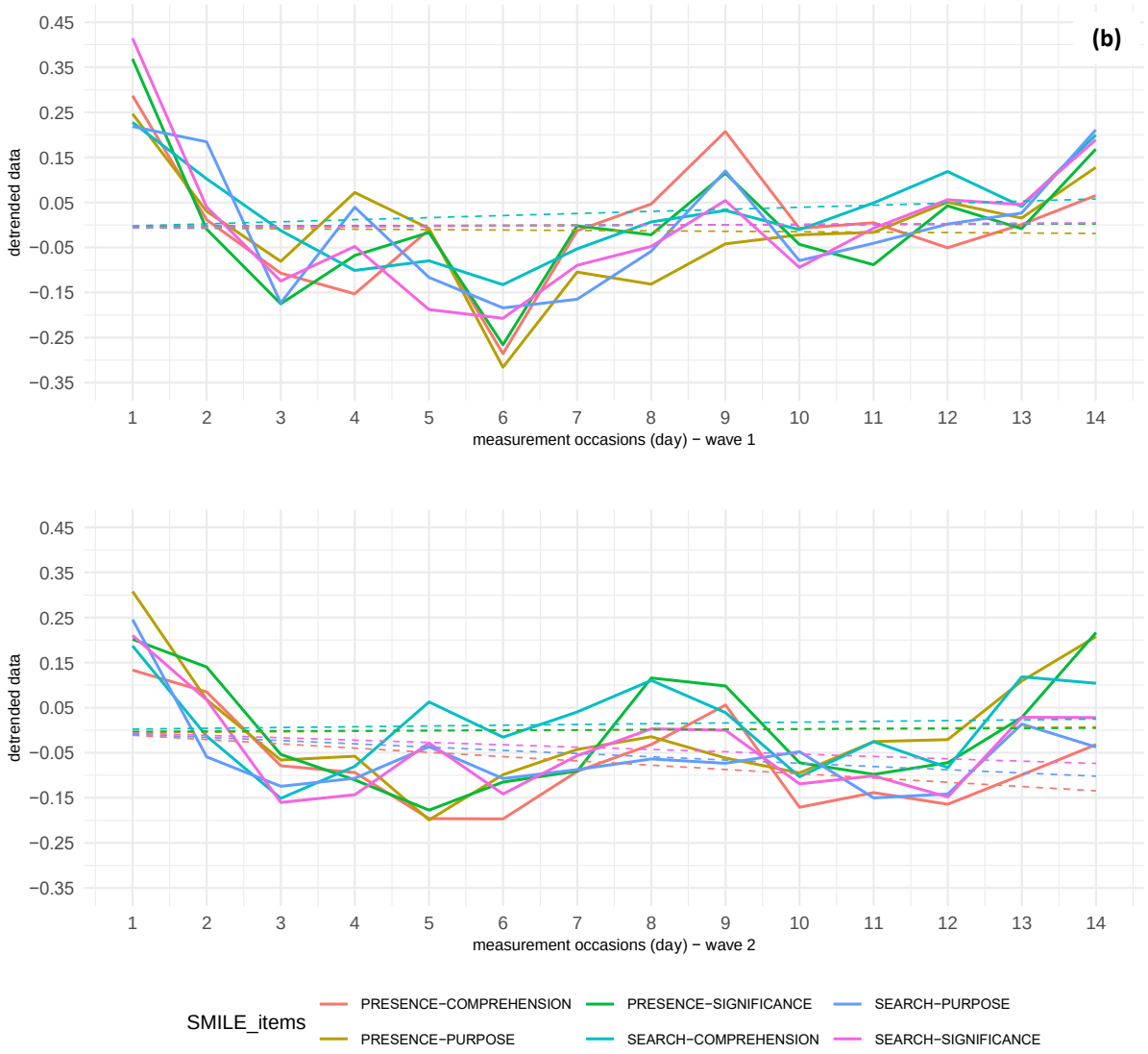
Missing data were handled with FIML (full information maximum likelihood), however, I decided to exclude in each wave participants with more than 80% of missing values in the SMILE items across the 14 days to reduce the risk of model non-identification. The final sample is made of 318 cases in Wave 1 and 320 case in Wave 2. The *multilevel ts-lvgvar* model is based on a multilevel graphical vector-autoregression model (*mlGVAR*) therefore it possesses the same assumptions of VAR models, that are: a) the normality of items distribution; b) the stationarity of parameters; and c) the equality of time intervals (Epskamp, Waldorp, et al., 2018). These assumptions have already been tested in Study 3.1 for the first wave and were checked in this study also for the second wave.

Items were normally distributed also in Wave 2, as shown by values of kurtosis and skewness never exceeding $|1.2|$ (Muthén & Kaplan, 1985). As shown in Figure 3.2.1 linear trends were present in both waves with some differences. Presence of meaning items showed a positive linear trend in Wave 1 and a negative linear trend in Wave 2, while search for meaning items showed a slight decrease in Wave 1 and were almost stable in Wave 2. Therefore, I detrended data separately for each wave following the detrending procedure used in Borsboom et al. (2021).

Figure 3.2.1

Linear plot of the six SMILE's items in Wave 1 and Wave 2 using (a) raw data and (b) detrended data.





Note. Means for each variable are shown as dashed lines. In both the sections (a) and (b) the top image represents Wave 1 and the bottom image represent Wave 2.

Aim 1: investigating the dynamics of the meaning-making process in a daily framework

To answer the first aim, I examined data from the first wave. A multilevel ts-lvgvar model was estimated by including the six detrended SMILE items as the network's nodes[26]. The FIML estimator was specified to handle missing data, and the standardization with s-scores was required to obtain a satisfying model convergence. The *contemporaneous network* was examined to explore the concurrent associations between the six meaning-making

[26] The *ts-lvgvar* model requires the dataset to be set in long format (each row indicated one person at one time point).

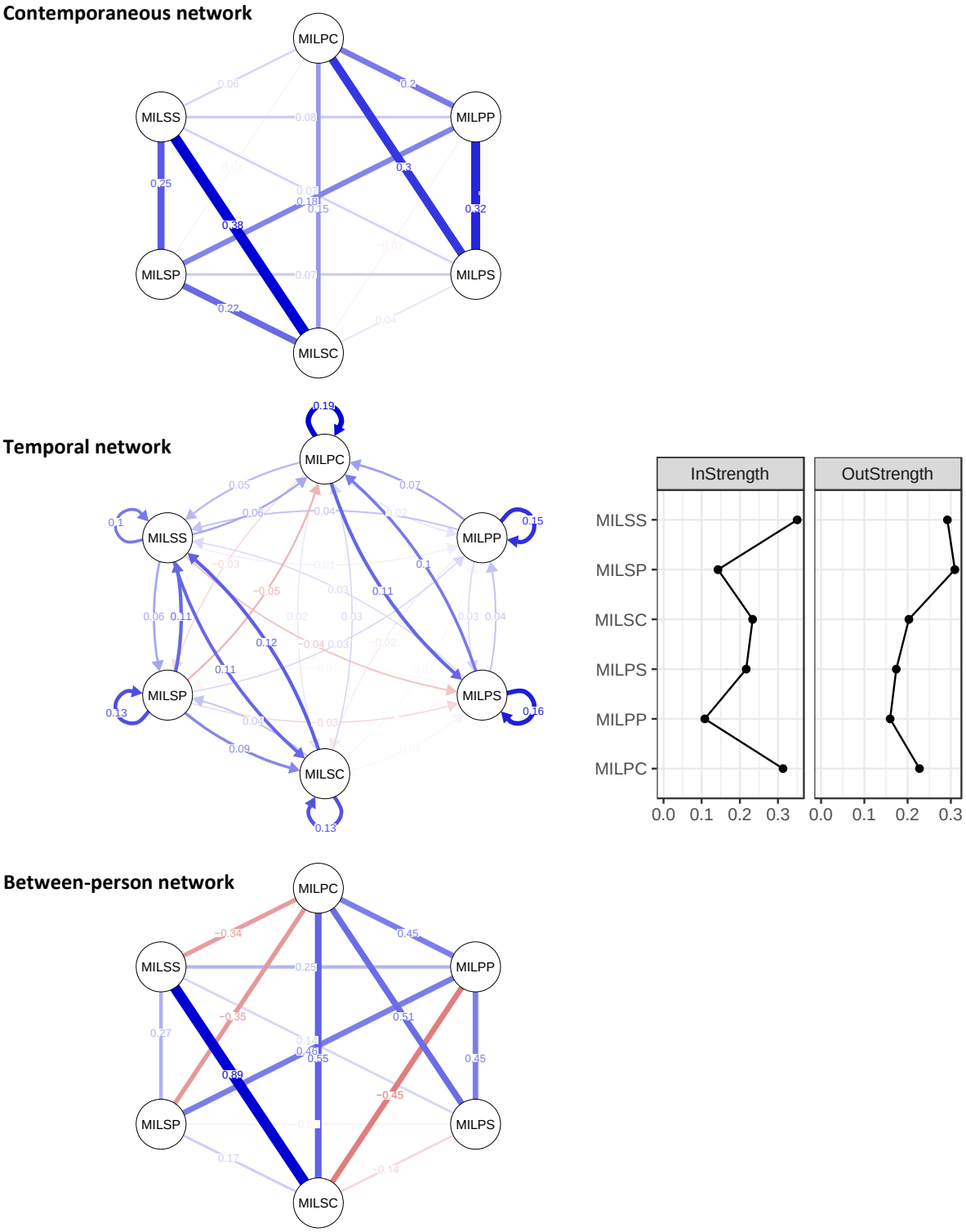
features. The *temporal network* was estimated with a time-lag set at 1 day and was examined to interpret the stability of each node, and the reciprocal predictive relations between the six meaning-making features over time. The *between-person network* was consulted to examine individual differences in the associations of the meaning-making features. The adaptability of the model was evaluated with fit indices provided by the *psychonetrics* R package: the χ^2 (Cheung & Rensvold, 2002), the comparative fit index (CFI; acceptable fit for values $\geq .90$; Little, 2013), the root mean square error of approximation (RMSEA; acceptable fit for values $\leq .08$; Little, 2013), the AIC (Akaike Information Criterion; Akaike, 1987) and the BIC (Bayesian Information Criterion; Schwartz, 1978) for which lower values are desirable.

In order to investigate which nodes were most influential in generating a change in the meaning-making configuration, I computed the *in-strength* and the *out-strenght* centrality measure for the temporal network, using the *qgraph* package (Costantini et al., 2015, 2019). The in-strenght index indicates how much each node is influenced by other nodes (i.e., is the *target* of other nodes activity), while the out-strenght index describe how much each node is a predictor of other nodes (i.e., is the *driver* of change in other nodes). The accuracy of the strength centrality measures was evaluated with the *correlation stability coefficient* (CS; Epskamp et al., 2017; available in the R package *bootnet*) with values >.50 indicating a sufficient stability to proceed with the interpretation of strength indexes.

The overall model showed acceptable fit indices ($\chi^2(3570)= 6787.7$, $p<.001$; CFI=.89; RMSEA=.053 [.051-.055]; AIC=43854.3; BIC=44170.3). Then I estimated the three network structures from the respective matrices, and I plotted the networks with the *qgraph* package (Epskamp et al., 2012). Figure 3.2.2 shows the contemporaneous, temporal, and between-person networks with the corresponding fixed effects.

Figure 3.2.2

Representation of the contemporaneous, temporal and between-person network in Wave 1.



Note. Circles represent the variables: MILPC= presence of comprehension, MILPS= presence of significance, MILPP=presence of purpose, MILSC=search for comprehension, MILSS=search for significance, MILSP=search for purpose. Blue lines represent positive partial correlations, red lines represent negative partial correlations. Values on the x-axis of the In-strenght and Out-strenght plot represent the sum in absolute value of the inbound and outbound edges for each node.

Contemporaneous network

The top panel in Figure 3.2.2 shows the daily concurrent associations between the six meaning-making features controlling for the other variables assessed at the same time and for temporal effects. From the graphical visualization two clusters of nodes are visible, made by nodes that are connected by thick lines; the first cluster encloses the three items of presence of meaning, the second cluster is formed by the three items of search for meaning. Within the first cluster, presence of comprehension was positively correlated with presence of significance ($r=.30$, $p<.001$) and presence of purpose ($r=.20$, $p<.001$) that was also uniquely associated with presence of significance ($r=.32$, $p<.001$). A very similar pattern of associations was found within the second cluster, where search of comprehension was positively associated with both search for significance ($r=.38$, $p<.001$) and search for purpose ($r=.22$, $p<.001$), that was in turn associated with search for significance ($r=.25$, $p<.001$). It is also interesting to note some positive associations between presence and search items. The strongest associations were between presence and search for comprehension ($r=.15$, $p<.001$) and presence and search for purpose ($r=.18$, $p<.001$). Some significant but small associations were also found between presence and search for significance ($r=.07$, $p<.001$), presence of purpose and search for significance ($r=.08$, $p<.001$), and presence of significance and search for purpose ($r=.07$, $p<.001$).

Temporal network

The central panel of Figure 3.2.2 shows the temporal network. For each node, the self-loops indicate the autoregressive effects, and the directional arrows between couples of nodes represent the lagged effects from one day to the next. All the nodes showed a significant autoregressive effect, thus confirming the presence of a trait dimension for each meaning-making features that is rather stable over time. For instance, presence of comprehension

shows an autoregressive effect of .19, meaning that the fluctuation registered for this item on a given day predicted the fluctuation of the same item the day after.

Moving to the reciprocal influences, the temporal network shows some bi-directional temporal associations. For instance, presence of comprehension and presence of significance reciprocally influenced each other from one day to the other, such that an increase in presence of comprehension on one day predicted an increase in presence of significance the day after ($r=.11$, $p>.001$), and vice-versa ($r=.10$, $p<.001$). A similar pattern was present between search for comprehension and search for significance, indicating that whenever a person experienced an increase in the search for comprehension in one day, this person started searching more significance the day after ($r=.12$, $p<.001$) and vice versa ($r=.11$, $p<.001$). Another notable significant association was the direct influence of search for purpose on search for significance ($r=.11$, $p<.001$). A bunch of other significant positive associations with effects smaller than .10 were present and can be consulted by examining the beta matrix available in: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

The strength centrality plot depicted in Figure 3.2.2 indicates that search for significance and presence of comprehension scored higher on in-strength, meaning that these features were the most strongly predicted by the other features over time. The presence and search for purpose features were instead the less influenced as indicated by the lowest in-strength indexes. Search for purpose and search for significance had the highest out-strength values, meaning that they were the strongest predictors of temporal change of other nodes in the network. The correlation stability coefficient ranged between .58 and .59, thus centrality measures can be considered as sufficiently stable.

Between-person network

The between-subjects network is shown in the bottom panel of Figure 3.2.2 and presents the partial correlations between the mean levels of nodes across the 14 days. The

three items belonging to the cluster of presence of meaning were strongly positively correlated with partial correlation coefficients ranging between .45 and .51, meaning that, over the 14 days of the study, people experienced high or low presence of meaning at the same level for the three dimensions of meaning. The three nodes of the search for meaning cluster were also positively associated, especially search for comprehension and search for significance (r=.89; p<.001), meaning that people who had been highly engaged in the search for significance during the 14 days of the study, were also strongly searching for comprehension. It is interesting to note that individuals with high presence of comprehension over the 14 days, were also high on search for comprehension (r=-.55; p<.001), low in search for purpose (r=-.35, p<.001) and low in search for significance (r=-.34, p<.001). People with higher levels of presence of purpose showed higher levels of search for purpose (r=.46, p<.001), higher levels on search for significance (r=.25, p<.001), but lower levels of search for comprehension (r=-.45, p<.001).

Aim 2: Compare meaning-making dynamics across the transitional conditions in love and work

In order to answer the second aim, I included in the dataset two dummy variables (0=balanced; 1=imbalanced) encoding the transitional condition in the domains of love and work. First, I estimated two multi-group *ml_ts_lvgvar* models using the *groups* function available in the psychonetrics package by indicating as grouping variable the transitional condition in love in Model A, and the transitional condition in work in Model B. In these models the parameters of the three matrices (contemporaneous, temporal and between) were free to vary across the two levels (balanced and imbalanced) of the grouping variables. Then, I fitted three constrained models, in each of which the parameters of one of the three matrices were forced to equality across the two groups, by using the *groupequal* function. The fit indexes of the constrained models were then compared with the general free model to

evaluate the existence of significant differences across the balanced and imbalanced groups in both domains of love and work. In the present work I decided to rely on the BIC criterion (Schwarz, 1978) index to identify significant differences between the nested models as it is the most restrictive index that penalizes model complexity[27]. Between two competing models, the one with the lower BIC would be selected as the model with the best balance between model fit and model complexity (Lin et al., 2017).

Results of the model comparisons for both the transition in love and the transition in work variable are presented in Table 3.2.3. The BIC was always lower in the constrained models compared to the free model, thus suggesting that the path of relations observed in the contemporaneous, temporal, and between-person networks were not significantly different across the balanced and the imbalanced condition in love and work[28].

Table 3.2.3

Comparison between the multi-group free model and the constrained models across the transitional conditions in love and work

	X^2	Δdf	$\Delta\chi^2$	p	RMSEA	AIC	BIC
Model A: Transitional condition in love							
Model_free	14021.0 (7140)		-	-	.08	43864.2	44496.3
Contemporaneous_constrained	14044.9 (7155)	15	23.8	.07	.08	43858.1	44433.7
Temporal_constrained	14094.9 (7176)	36	73.9	<.001	.08	43866.2	44362.8
Between_constrained	14059.5 (7155)	15	38.5	=.001	.08	43872.8	44448.4
Model B: Transitional condition in work							
Model_free	14074.6 (7140)		-	-	.08	43860.3	44492.3
Contemporaneous_constrained	14114.5 (7155)	15	39.9	<.001	.08	43870.1	44445.7
Temporal_constrained	14128.8 (7176)	36	54.2	=.03	.08	43842.5	44339.1
Between_constrained	14123.1 (7155)	15	48.5	<.001	.08	43878.8	44454.4

Note. X^2= Chi-square; $\Delta\chi^2$= Chi-square difference between nested models; RMSEA=Root Mean Square Error of Approximation; AIC =Akaike Information Criterion; BIC=Bayesian Information Criterion.

[27] The BIC weights the estimate according to the degrees of freedom of the model as indicated by the following equation: BIC = T − df *ln*(N), where T is the chi-square test statistic of the constrained model (vs the baseline model), df are the degrees of freedom of the constrained model, and N are the number of cases (Lin et al., 2017).

[28] I also tested a model in which all the three matrixes were constrained to equality across the groups. According to the BIC, the constrained model was better compared to the free model in both the transitional condition in love and work models. Results, and the network representations reproduced separately in the two groups (balanced vs imbalanced in both love and work) can be consulted in the Study3.2.html file at: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Aim 3: Examining the stability of meaning-making dynamics across different contextual conditions

Data from the two waves were merged in a single dataset in long format, with a dummy variable indicating the belongingness to wave 1 or wave 2. The same procedure presented for aim 2 was conducted to examine the invariance of the three matrices (contemporaneous, temporal, between-subject) across the two waves. Results are presented in Table 3.2.4. The BIC indicated that constraining the temporal matrix and the between-person matrix across the two waves didn't significantly worsen the model fit. Instead, constraining the contemporaneous matrices to equality determined an increase of the BIC, thus suggesting that at least one of the constrained parameters was different across the two waves.

To identify the non-invariant parameters, I inspected the contemporaneous matrix in the two waves from the free model[29]. The contemporaneous networks in the two waves are represented in the left side of Figure 3.2.3. The global path of contemporaneous associations was very similar across the two waves, however, in wave 2 the associations between nodes within the same cluster (presence and search) were stronger than wave 1; additionally, the associations between daily presence of purpose and search for significance, and presence of significance and search for purpose were significant only in wave 1[30].

Table 3.2.4

Model comparison of multi-group network analysis across the two waves

	X^2	$\Delta\chi^2$	p	RMSEA	AIC	BIC
Model_free	13000.8 (7140)	-	-	.05	80385.5	81334.5
Contemporaneous_constrained	13300.9 (7155)	300.1	<.001	.05	80655.6	81337.7
Temporal_constrained	13085.2 (7176)	84.5	<.001	.05	80397.9	80986.5
Between_constrained	13048.5 (7155)	47.7	<.001	.05	80403.2	81085.3

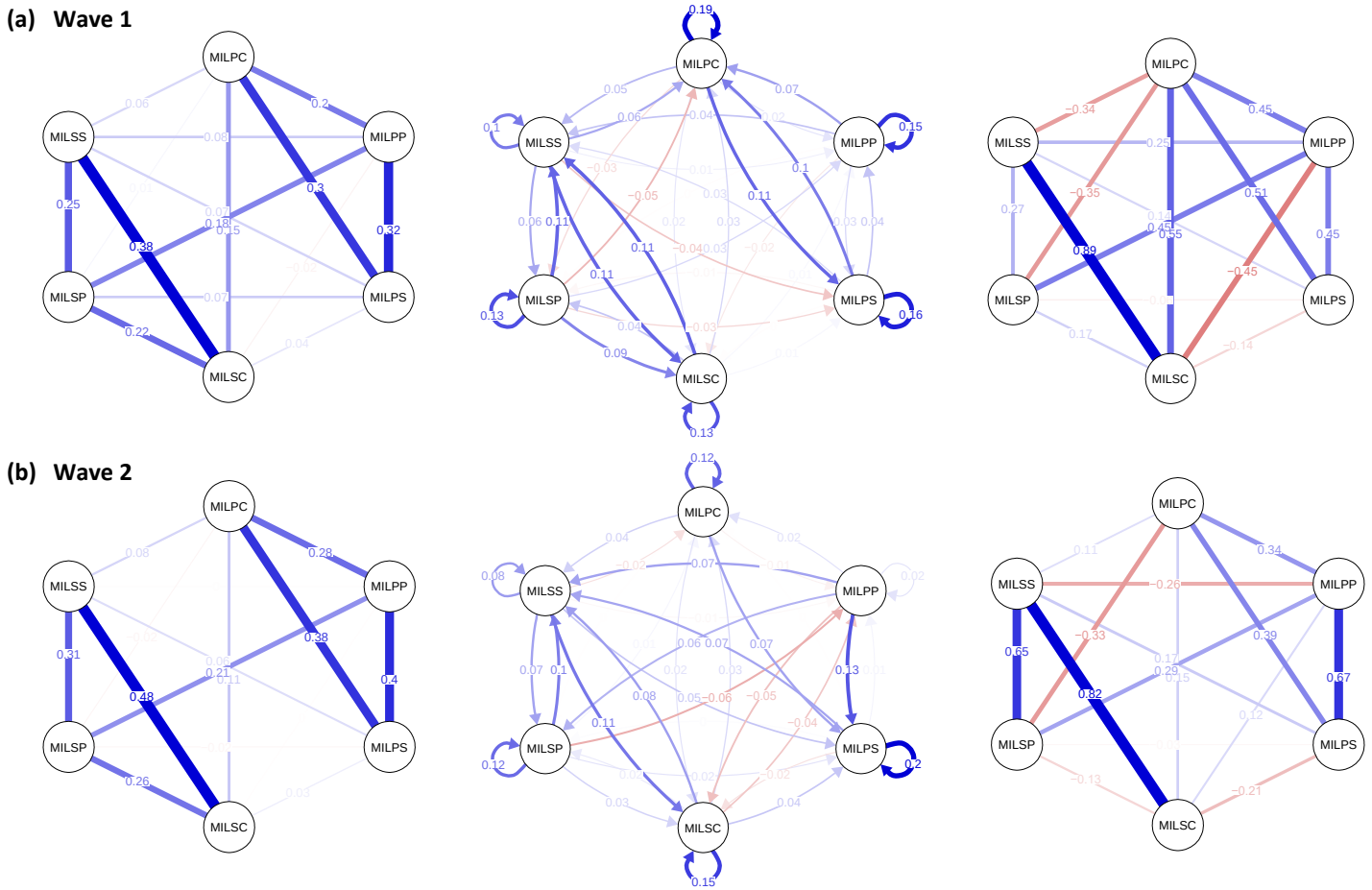
Note. X^2= Chi-square; $\Delta\chi^2$= Chi-square difference between nested models; RMSEA=Root Mean Square Error of Approximation; AIC =Akaike Information Criterion; BIC=Bayesian Information Criterion

[29] The parameters of contemporaneous matrices in the two waves can be consulted in the Study 3.2_CODES.html file available at: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd

[30] I also tested a model in which all the three matrixes were constrained to equality across the two waves; results confirmed that the free model was better than the constrained one according to the BIC. Results can be consulted in the Study3.2.html file at: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2.

Figure 3.2.3

Representation of the contemporaneous, temporal and between-person network across the two waves.



Note. Left: contemporaneous network; center: temporal network; right: between network. MILPC= presence of comprehension, MILPS= presence of significance, MILPP=presence of purpose, MILSC=search for comprehension, MILSS=search for significance, MILSP=search for purpose. Blue lines represent positive partial correlations, red lines represent negative partial correlations. Blue lines represent positive partial correlations, red lines represent negative partial correlations.

Discussion

In this study I investigated the micro-dynamics of the meaning-making process considered as a system composed of six basic features that reciprocally interact in a situational daily framework. I also examined the generalizability of the meaning-making dynamics across the transitional condition lived by youths in the romantic and work domain, and the stability of the dynamics of change after 10 months, during a different contextual condition.

As expected, I found the items grasping the presence of meaning being strongly associated within the same day, and the same was true for the items measuring the search for meaning, thus forming two clusters of nodes (i.e., the presence of meaning cluster, and the search for meaning cluster) in the contemporaneous network. From a more careful examination of the contemporaneous network, it was possible to note a positive connection between presence and search for comprehension, and presence and search for purpose. These connections acted as bridges between the presence and search clusters and indicated that emerging and young adults who were highly engaged in the search for purpose and the search for comprehension in one day were also perceiving high presence of purpose and comprehension in the same day. Conversely, being in search for significance was not associated with perceiving their own life as significant at the same time and vice-versa. These results inform us that the positive concurrent association identified in study 3.1 between presence and search for meaning is a fair representation of the relation between purpose and comprehension features, but not of the significance ones. It is noteworthy that the MLQ items are unbalanced on the side of significance and purpose, while they do not represent the dimension of comprehension (see Chapter 2).

The temporal network brought further insights into the meaning-making dynamics of change. First of all, the rich path of temporal dynamics that emerged proved that the

meaning-making is a situational process that is based on daily micro-dynamics. A dense path of reciprocal influences was observed especially among the items of the same cluster, thus confirming the evidence obtained from the contemporaneous network. Each of the meaning components showed a quite consistent autoregressive effect, with larger effects sizes showed by the presence of meaning items, meaning that when participants reached a certain level of life meaningfulness, they tended to maintain it over days on the three components of meaning. It was also interesting to note the activation of two reciprocal temporal dynamics, one between the nodes of presence of comprehension and significance, and one between the nodes of search for comprehension and significance. Conversely, presence and search for purpose were not reciprocally predicting each other. These results suggest that during the stressful condition of the Covid-19 pandemic, emerging and young adults were mostly into the comprehension of what was happening (Reker & Wong, 2012; Martela & Steger, 2016), and the reflection about what made their life significant and worth living even in such an uncomfortable situation (Martela & Steger, 2016; Reker & Wong, 2012). Among the meaning features, comprehension and significance are the most concrete, bound to the cognitive and emotional elaboration of the lived experiences, thus they are reasonably influencing each other in the continuous timeframe of the daily life. Considering the purpose components, the nature of life goals to which emerging and young adults are committed to, such as graduating, find a purposeful job or reach independence from the family of origin are typically medium to long-time oriented. Therefore, it is reasonable that engaging in search for purposes, which is a normative position during this life stage, does not directly create new life purposes from one day to another. Taken together, these results suggest that, in the context of potentially harmful experiences a time perspective more present- and past-oriented is probably activated also by young people, who are called to maintain a continuity in their life narrative and carry on their daily life despite the upheavals of reality. Conversely, in a

contextual condition of general well-being and stability emerging and young adults are expected to be especially oriented toward the future (Dwivedi & Rastogi, 2017, 2016; Webster & Ma, 2013).

The examination of the strength indexes furnished a descriptive summary of the different role played by each feature in the meaning-making network of temporal dynamics. The presence of purpose node was the most independent of the network, suggesting that the process of identification of life purposes does not show at the daily level, as it is maybe more related to the developmental process of the meaning formation. Conversely, the search for purpose was the most important driver of the process, showing the larger overall predictive effect on the other nodes of the network. People who felt the urge to search for new purposes on one day started searching for more significance and comprehension the day after. The search for significance node was the most central node of the network as it was both the target and the driver of other nodes, thus corroborating the importance of the present-oriented time perspective for young people living an unstable contextual condition.

The between network was examined to infer about how the nodes were associated on average among the participants. Even in this network, the cluster of presence of meaning appeared as a rather unitary dimension, in fact, people who perceived high levels of meaning in life across the 14 days, had this feeling in all the three areas of comprehension, significance and purpose. Instead, for most young people, being in search of meaning has mostly been about trying to understand and contextualize events and looking for something to fulfill their life with meaning. Young people with an overall high perception of life purpose were also activated in a search for purpose but were not activated in the search for comprehension. Conversely, people more focused on the comprehension dimension (high presence of comprehension) were less oriented toward the search for significance and purpose.

After identifying the dynamics of meaning-making in the overall sample, I investigated whether there were significant differences based on the transitional condition lived by youths (aim 2). Contrary to the expectations, the contemporaneous, temporal and between-person dynamics of meaning-making resulted to be invariant across people living a balanced vs an imbalanced transitional condition in both the love and work domains. This tells us that the activation of the meaning-making process occurred in a very similar way between young people who were facing a moment of transitive balance and young people who were instead dealing with a transition challenge. However, it is possible that the statistical power was insufficient in this study to detect the smallest differences in specific micro-dynamics of the process. In fact, I relied on the conservative BIC criterion to determine the existence of any significant differences, to be sure to highlight only the real differences, and to avoid the risk of over-interpretation. However, from the visual inspection of the networks (which are consultable at: https://osf.io/zu6gj/?view_only=c72a98d8be3b4f5f9ff61cca12de3dd2) it is possible to note that the temporal network was denser in the two imbalanced groups compared to the balanced ones (as hypothesized). Future studies should investigate in more depth which exogenous factors (individual or situational) can influence the process of meaning-making and especially its micro-dynamics.

The last aim was to discover whether meaning-making dynamics were stable after 10 months, when the Covid-19 pandemic reduced its negative impact on the situational context. The meaning-making dynamics were invariant across the two waves, except for some concurrent associations. Specifically, the clusters of presence and search for meaning were more closely associated in the second wave, meaning that young people perceived the three components of meaning in a much more similar way on the same day while they were living in a more stable contextual condition. Furthermore, in the first wave there were two positive

associations (presence of purpose-search for significance; presence of significance-search for purpose) that were not significant in the second wave. These results indicate that during the peak of a stressful situation, the meaning-making functioning emerged in a subtle different way due to the activation of specific daily dynamics.

Conclusions, limitations and future directions

I opened this chapter by questioning about how the basic components of meaning-making contributed to the development of the meaning-making process in a situational framework. Taken together, the results allowed me to draw some conclusions about how the meaning-making process was functioning among emerging and young adults facing the Covid-19 pandemic. Cross-sectional literature has mainly been based on the conceptualization of the construct of meaning in life as composed of two orthogonal dimensions of presence and search for meaning (e.g., Steger et al., 2006); here we found evidence that having a vision of one's life that is comprehensible, significant and oriented by purposes and being in search for this awareness are two sub-processes that reciprocally interact to generate the meaning-making process. One of the most significant results is the evidence that each of the features brings a unique contribution to the functioning of the entire system; indeed, there are features that mainly played the role of change drivers (such as the search for purpose), while others were mainly targets (such as the presence of comprehensions). Although the hypotheses of this study were mainly exploratory, the results are in line with the studies previously conducted in the current thesis. The introduction of the tripartite conception of meaning (e.g., Martela & Steger, 2016) has a solid theoretical basis, however empirical studies are still in their infancy; in the present study I focused on the micro-dynamics in a daily context, but further studies should also investigate macro-level changes assuming a developmental perspective. I also tested the moderating role of the

transitional condition lived by youths on the micro-dynamics, finding no significant differences in the overall network structure.

However, it is necessary to consider some limitations of the present study. One limitation concerns the applied models which may have lacked sensitivity in detecting the finer differences between groups. Considering that the models used are based on the multiple decomposition of variance, our sample may not have been large enough, both in terms of sample size and number of assessments, to have good statistical power, especially for conducting multi-group models. The results obtained are therefore to be interpreted with caution, and further studies should be conducted on larger samples to fully exploit the potential of these statistical models. Psychonetrics is a newborn powerful toolbox and there are currently no studies in the literature that show its application to such complex research designs. In order to compare the two waves of the measurement burst design I had to consider the two waves as independent samples although some participants took part in both waves; in this regard, a statistical reflection on the best way to manage non-independence in measurement burst designs should be opened in the future. In the application to our data, I encountered some computational issues, in fact, the R software returned a warning for each tested model (consultable in the Study3.2.html file at: https://osf.io/zu6gj/?view_only= c72a98d8be3b4f5f9ff61cca12de3dd2.) regarding the accuracy of results, which seem to be due to the optimizers made available by the R package. Further simulation studies could be conducted to improve the reliability of the estimates.

To conclude, the use of a systemic approach such as network psychometric has undoubtedly illuminated the functioning of meaning-making considered as a complex system of interacting elements. However, these results are only unspoken evidence and further studies are needed to substantiate results and furtherly uncover the functioning of the meaning-making process across several context, domains, and individuals.

General discussion

This chapter addressed the methodological challenge of investigating the meaning-making dynamics within a complexity framework. In the introduction of the chapter, I provided a review of studies that investigated the micro dynamics of change of meaning-making, from which several gaps and unanswered questions regarding the meaning-making functioning emerged. The meaning-making process has mostly been conceptualized as made of a single component, i.e., the perception of life meaningfulness, that has been studied in association with other psychological processes. The review made clear that the evidence on the micro-dynamics of the process is still too little to sustain any claim about the mechanisms of meaning-making functioning. Additionally, all the studies examined the daily experience of young people living a contextual condition of general well-being and pace typical of wealthy Western societies.

Prompted by the gaps that emerged from the literature, in this chapter I demonstrated how the adoption of a complexity framework can illuminate the functioning of the meaning-making in a situational context. I conducted two empirical studies in which I conceptualized the meaning-making process as a system of interacting elements, and I investigated the dynamics of change of the process in a situational daily context, taking into consideration the role of situational, individual, and contextual factors in contributing to the change of the system.

In Study 3.1 I conceptualized the meaning-making according to the most widespread framework that see two sub-processes as governing the overall-process, that are the process of finding new meanings in life and the process of searching for meanings in life. The main findings are that the dynamics of change of meaning-making are activated on a daily level, specifically, for the emerging and young people involved in this study, the activation of a virtuous circle emerged, in which people who perceived an increase in presence of meaning

in one day, tend to seek further meaning the next day. I discovered that the occurrence of both positive and negative events had a direct impact on the meaning-making process; if the occurrence of positive events produced a greater activation of the meaning-making process, negative events caused a decrement of life meaningfulness. Furthermore, the activation of the virtuous circle was hindered when young people found themselves facing too many events at the same time.

In Study 3.2 I conceptualized the meaning-making as a system of interacting elements, in which the six basic components were considered as unique but interconnected elements from which the process of meaning-making originates. This theoretical conceptualization is in line with the theoretical literature on the tripartite view of meaning in life, but also expands it, by assuming that the six meaning-making features give a unique contribution to the dynamics of change of the meaning-making process. A rich path of temporal dynamics emerged, thus confirming that the meaning-making is a situational process based on daily micro-dynamics. The examination of temporal dynamics unveiled that the dynamics of change of meaning-making activated by young people were mostly linked to the comprehension of what was happening, and the reflection about what made their life significant and worth living during the pandemic. Conversely, being in search and having purposes for the future were not reciprocally predicting each other in a daily framework, and that having purposes was the less connected node of the system. These results suggested that being oriented toward future goals is a normative condition for young people, therefore, among the three facets of meaning in life (comprehension, significance, and purpose), this is less implicated at a daily level. Regarding the generalizability of the meaning-making dynamics, I found that the transitional condition lived by youths in love and work didn't determine a different activation of the meaning-making process, and only few differences at the contemporaneous level emerged in the comparison between the first Covid-19 pandemic

lock down and the situation after 10 months. Taking a joint reading with the results of study 3.1 on the activation of meaning-making in the context of a stressful and traumatic collective situation such as the pandemic, the evidence seems to indicate that the subjective experience of the pandemic (the occurrence of individual daily events) was more impactful than the objective experience of the pandemic (living the collective experience of a strict lock-down) on the meaning-making process of emerging and young adults (e.g., Zambelli et al., 2022).

Limitations and future directions

The same considerations apply to both studies with respect to limits and future perspectives. A first reflection concerns the sample, which was composed of a quite homogeneous population of emerging and young adults in conditions of general well-being. Therefore, it is not possible to generalize these results outside of this context. However, the evidence obtained lays the foundations for expanding the study of the dynamics of change in meaning-making to different age groups (e.g., adults and older adults), to clinical samples (e.g., chronic patients or patients with psychopathological disorders), to populations at risk (e.g., migrants, at risk youths, and marginalized individuals), to different cultures and nationalities (e.g., non-western societies). A second limitation relates to the context of the Covid-19 pandemic during which participants lived. If on the one hand this has been an opportunity to observe the functioning of the meaning-making process during a chronic traumatic collective situation (that is a rare event), on the other hand it remains to be verified whether the same dynamics also hold in a context of the ordinary life.

From a methodological and statistical point of view, the models I applied made it possible to enhance the complexity and richness of the data while maintaining a sufficient level of parsimony. However, even in the current thesis it had been necessary to simplify the process in order to model it. In fact, the meaning-making was considered as a stationary process, whose dynamics did not vary over time, which is unrealistic for most psychological

processes, as demonstrated for the meaning-making process by the existence of trends that we had to artificially eliminate. In this regard, there are statistical models that allow the investigation of non-stationary processes (for instance the auto-regressive moving-average (ARIMA) models; see Hamaker & Dolan, 2009; Ariens et al., 2020), however, they require larger samples and larger number of assessments which were not available in these studies. In the current thesis, I decided to study the micro-dynamics of change of the meaning-making process in the daily context, however, the complexity of psychological processes can emerge at different levels of functioning, and the meaning-making process deserves to be studied also as a developmental process to find out how dynamics of change can evolve over time (Boker et al., 2016).

CONCLUSION

In the current thesis I have shown how it is possible to study the meaning-making process with a complexity framework, paying attention to the methodological challenges that need to be faced. In this way, I believe I have enriched the literature on the meaning-making process and offered new avenues of investigation for the future. At the same time, delving into the complexity of meaning-making provided me new awareness which can be extended more generally to the study of psychological processes. I would like to dedicate this concluding section to reflect on the methodological challenges and opportunities that researchers must consider when they want to study psychological processes with a complexity perspective.

Challenge N°1: How to theoretically conceptualize psychological processes?

The first question the researcher should ask himself is "what is the psychological process I want to investigate?". It is important to start from the theorizations but also from the empirical evidence to understand how the process has been conceptualized in the history of the discipline and to know if there is empirical evidence to support the theory. One of the main challenges in psychology is to distinguish psychological processes from each other because in each human being they are always interrelated. At the methodological level, the available tools to respond to this aim are systematic reviews and meta-analysis. These methodological tools should not be used with the only aim of synthesizing the literature, but with the aim of providing a critical revision that helps researchers to better define the psychological process and provide useful indications for the implementation of empirical studies (e.g., Siddaway et al., 2019). In the current thesis, the critical review of both the theoretical and empirical literature published on the meaning-making process, made it possible to propose a new integrated definition of meaning-making, and to identify several methodological gaps in the study of the dynamics of the process, some of which have become

the aims of the subsequent studies conducted in this thesis. Research is an iterative process, as such, conceptual issues can undermine all aspects of research, from the operationalization to the statistical methods used to answer the research questions (Bringman et al., 2022). Indeed, the conceptual ambiguities and different conceptualization of a psychological process that might arise from the literature, must be explicitly discussed before making ultimate decisions on which measurement methods to use and planning data collection.

Challenge N°2: How to measure psychological processes?

Often the issue of measuring constructs and processes is considered less important than data analysis strategies; instead, the measurement tool we use to measure the process must be built with great care. The accuracy and reliability of an instrument should be evaluated every time a study is conducted. Bringmann et al. (2022) recommended that the conceptual definition of the construct should be linked to the measures and researchers should provide a detailed explanation of how their measurement procedures are expected to assess the phenomenon as it has been defined. When the interest is to investigate psychological processes, a good measurement tool should be able to discriminate which are the basic components of the process, to capture the dynamics of change under investigation, and to take into consideration the context in which the dynamics of the process are supposed to be revealed. In the current thesis I have shown how to build a self-report measure that takes into consideration the complexity of the process it aims to investigate; in fact, the SMILE measures the six main components of meaning-making that emerged from the critical review of the literature, it includes a temporal anchor that was coherent with the design methodology and the level of functioning I was interested in (daily process), and possesses a situational reference that I adapted to grasp the meaning-making functioning in the specific context of the pandemic. The reflection on how to measure psychological processes is still immature but should be paid more attention in the literature because, if the measurement tool

lacks precision, then it becomes difficult to answer research questions regardless of their quality and relevance. There are statistical techniques capable of providing us with a quantitative assessment of the reliability of the measurement scale in measuring the process. In this study we showed the potential of the CCFA which suited our study because it allowed to evaluate the stability of the factorial structure both across measurement occasions and across individuals. Considering that in study 3.1 I formulated hypotheses both on the dynamics of change and on the differences between individuals, having verified that the measurement structure of the scale was reliable at both levels allowed to interpret the results excluding measurement biases.

Challenge N°3: How to investigate the dynamics of change of psychological process?

This methodological challenge determines two important choices, namely which research design to use and which analysis technique to apply. With respect to the first question, when we formulate research questions on the change of psychological processes, it is necessary to choose a temporal research design, which allows to map the dynamics of change and/or the change of dynamics over time (Boker et al., 2016). Obviously, this choice derives from the conceptualization of the process and the research questions of the researcher. In the current thesis, I focused on the meaning-making process observed as a stable process, with the aim of investigating the dynamics of change that support the development of the process in a short timeframe; therefore, among the intensive longitudinal designs I chose the daily diary methodology. In study 3.2 I formulated a research question related to the change of dynamics over time, therefore, I structured a measurement burst design which allowed me to discover that the dynamics of change of the meaning-making process were stable after 10 months. It is necessary to recognize that collecting data with intensive designs is very burdensome and laborious for both researchers and the participants. Therefore, it is often necessary to find a compromise with feasibility. In my opinion, the winning can be to limit

the investigation to a specific level of functioning of the phenomenon and to structure a research design that is tailored to answer specific research questions. We should remember that as researchers we have professional and scientific responsibilities towards society and each participant, that include the administration of instruments and tests that are appropriate in light of the research questions (American Psychological Association, 2017). Therefore, collecting data that are unnecessary to answer the research aims can be considered unethical behaviour. The second choice pertains the analytic strategies to analyse complex data. The analysis techniques must be powerful and refined enough to measure temporal processes taking into account the inherent complexity. In recent years we have seen the development of statistical models suitable for studying complex processes, many of which have been imported from other fields, including econometrics and computational science, which have been adapted to investigate psychological processes (e.g., Guest & Martin, 2021; Zhang, 2003). Among the opportunities that these approaches have brought to our field there is the possibility of going beyond linear models and modelling the non-linear dynamics of psychological processes (Kunnen & Bosma, 2000), and the possibility of distinguishing temporal dynamics from individual differences. In the current thesis, I applied two of the most recently developed psychometric models, the DSEM framework and the Network Psychometric framework. These models are very similar from a mathematical point of view; however, they are able to illuminate different aspects of a psychological process as they are based on different assumptions about the data generating mechanisms (Christensen et al., 2020). In the current thesis, both models made it possible to answer research questions on the daily functioning of the meaning-making process, conceptualized in one case as the interrelation between two sub-processes (presence and search for meaning), and in the other case a system of six interacting components, and to assess the degree to which these dynamics varied among young adults.

These new statistical advancements are not only an opportunity to study psychological processes in greater depth, but also involve risks. Parsimony is a value in research, in fact, the goal should always be to represent the functioning of the process in the simplest way possible (e.g., Haslbeck et al., 2021); however, in some cases complex statistical models are required, even if they become more difficult to apply. A substantive knowledge of mathematical and statistical properties of these models is indeed needed to be able to apply them correctly; at the same time, the interpretation of the outcomes provided by these models becomes tricky without a deep theoretical knowledge of the process. In fact, statistical models cannot provide us with an interpretation of the functioning of the phenomenon; for that, the conceptual work of the researcher is necessary (Borsboom, 2004; Bringman et al., 2022).

I would like to dedicate a final consideration to the role of theory and technique for the development of the psychological discipline. One of the main risks we face today, is that the speed with which new data analysis methods are developed bypasses the development of theory (Borsboom, 2022). This can generate a disconnection between psychometric theories (e.g., formal models informed by theory) and psychometric analysis (i.e., statistical modelling tools) (Borsboom, 2022). The psychometric theories and the statistical modelling approaches should always be aligned as this is the only case in which the scientific inference (i.e., the target of theory-based research questions) corresponds to the statistical inference (i.e., the goodness of a statistical model under certain fixed conditions) (Borsboom, 2022; Rhemtulla et al., 2020). As Borsboom (2004) said "no amount of empirical data can fill a theoretical gap" (p. 1068). Solid foundations in psychological science would need more conceptual clarity in the definition of psychological phenomena (Bringmann et al., 2022), deep attention to measurement and the concept of validity (Rhemtulla et al., 2020), and statistical models that are informed by solid theories (Borsboom, 2022).

Appendix

A.1: The Situational Meaning in Life Evaluation (SMILE)

Instructions: Looking back on what has happened, and what you have been thinking and doing since the occurrence of [event/situation], we ask you to evaluate how much do you agree with the following statements.

Use the following scale to answer considering that 1 corresponds to "strongly disagree" and 7 corresponds to "strongly agree".

Presence - comprehension	If I look back at my life, I feel I have understood the meaning of the [event/situation] in my life
Presence - significance	Today I can say that my life has value during this [event/situation]
Presence - purpose	If I think about my future, I have goals for my life that push me to move forward during this [event/situation]
Search - comprehension	If I look back at my life, I'm trying to understand the meaning of the [event/situation] in my life
Search - significance	Today I'm trying to understand what values my life in this [event/situation]
Search - purpose	If I think about my future, I'm searching goals for my life that push me to move forward during this [event/situation]

A.2: The Situational Meaning in Life Evaluation (SMILE) – daily version

Instructions: Looking back on what has happened, and what you have been thinking and doing in the past 24 hours, we ask you to evaluate how much do you agree with the following statements.

Use the following scale to answer considering that 1 corresponds to "strongly disagree" and 7 corresponds to "strongly agree".

Presence - comprehension	Today, I think I comprehend the meaning of my life during this [event/situation]
Presence - significance	Today, I feel that my life has value during this [event/situation]
Presence - purpose	Today, I think I have goals for my life that push me to move forward during this [event/situation]
Search - comprehension	Today, I tried to understand the meaning the meaning of my life during this [event/situation]
Search - significance	Today, I tried to understand what values my life in this [event/situation]
Search - purpose	Today, I searched goals for my life that will push me to move forward during this [event/situation]

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