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ORIGINAL PAPER

Trajectories of Self-compassion and Psychological Symptoms in Newly Diagnosed Cancer Patients

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Abstract

Objectives More self-compassion has been related to a better psychological functioning in cancer patients, but little is known about the course of self-compassion over time in the trajectory of illness and cancer treatment. This longitudinal study aimed to examine subgroups of cancer patients with differential trajectories of self-compassion and associations of these trajectories with the course of psychological symptoms.

Methods A total of 153 cancer patients participated in this longitudinal study. Self-reported questionnaires were used to measure self-compassion (i.e., overall self-compassion and, separately, positive self-compassion, and negative self-compassion), and depressive and anxiety symptoms. These assessments were taken directly after cancer diagnosis (T1), and at the start (T2) and the end (T3) of medical treatment. Latent class growth modelling and repeated measures ANOVA were applied to examine the research questions.

Results We identified three trajectories of overall self-compassion ("stable low" 82.2%, "late increase" 11.8%, and "late decrease" 6.0%), four trajectories of positive self-compassion ("late decline" 57.2%, "early decline" 22.4%, "large increase" 15.1%, and "large decline" 5.3%), and four trajectories of negative self-compassion ("late decline" 42.1%, "stable negative self-compassion" 40.8%, "large fluctuation" 9.9%, and "large increase" 7.2%). Only the negative self-compassion trajectories were significantly related to the course of depressive and anxiety symptoms.

Conclusions Our findings suggest that subgroups of cancer patients exist that show distinct trajectories of self-compassion over time. We identified a small group of patients at a higher risk of losing self-compassion throughout the cancer trajectory and experiencing psychological symptoms.

Keywords Self-compassion · Positive self-compassion · Negative self-compassion · Trajectories · Psychological symptoms · Cancer patients

Self-compassion can help people to deal with life stressors (MacBeth & Gumley, 2012; Neff et al., 2007). A fast growing body of empirical studies confirms that cancer patients with higher levels of self-compassion report a better psychological adjustment in terms of fewer psychological symptoms (Gillanders et al., 2015; Pinto-Gouveia et al., 2014; Przezdziecki et al., 2013; Schellekens et al., 2017; Todorov et al., 2019; van der Donk et al., 2020). However, given the mostly cross-sectional nature of these studies, still little is known about how self-compassion in cancer patients evolves over time in the context of living with a chronic illness and its intensive treatment. To what extent does this affect patients' levels of self-compassion and do patients differ herein?

Self-compassion involves being touched and open to one's own suffering in a non-judgmental way (rather than avoiding or disconnecting from it), a desire to alleviate one's suffering and to heal oneself with kindness, and seeing one's experience as part of the larger human experience (Neff, 2003a). According to Neff (2003b), self-compassion relates to three key dimensions: (1) being kind and supportive to oneself, rather than harsh and

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self-judgmental, (2) recognizing that such difficulties constitute a normal part of humans' life (common humanity), rather than feeling isolated from other people as a result of one's imperfection, and (3) keeping the personal suffering in rational/mindful awareness, rather than becoming fully over-identified and absorbed by one's problems. Most existing research focused on the overall construct of self-compassion, hereby combining these six aspects (Muris & Otgaar, 2020; Neff, 2003b). Other researchers have elaborated on the conceptualization of self-compassion, and related self-compassion to recognizing suffering and understanding the universality of human suffering, feeling for the person suffering, tolerating uncomfortable feelings, and acting or a motivation to act to alleviate suffering (Strauss et al., 2016). Intervention research has shown that self-compassion is a skill that can be cultivated by practice including meditation (Wilson et al., 2019).

It has more recently also been proposed that it is possible and meaningful to differentiate the positive components of self-compassion (i.e., self-kindness, common humanity, and mindfulness) from the negative components (i.e., self-judgment, isolation, and over-identification) (Muris & Otgaar, 2020; Muris & Petrocchi, 2017; Neff et al., 2018, 2019). This separation of positive and negative self-compassion can be explained by the theory of social mentalities by Gilbert (Gilbert, 2005; Gilbert & Bailey, 2014). According to this theory, there exists three brain-based systems (soothing system, threat system, and drive system) that could be used to guide one's behavior. The soothing system is assumed to be associated with parasympathetic nervous system and may lead to thoughts and actions that would promote positive relationships with oneself and others. This system may therefore be involved in compassionate self-responding (i.e., positive self-compassion). The threat system is assumed to link with the sympathetic nervous system that may elicit thoughts and actions reducing threat. This may be involved in uncompassionate self-responding (Muris & Otgaar, 2020). It is also argued that compassionate and uncompassionate self-responding reflect different processes (Khoury, 2019; Klimecki & Singer, 2017), though evidence exists showing that self-compassion and self-coldness may share the same neural circuitry (Shirtcliff et al., 2009).

Another key argument of those proposing these two components of self-compassion (or leaving out the negative components) is the empirical evidence for such a two-factor model (using factor analyses) and the consistent evidence showing that the negative components are stronger linked to indicators of negative affect and psychopathology than the positive components (Brenner et al., 2017; Costa et al., 2016; Gilbert et al., 2011; Kumlander et al., 2018; López et al., 2015, 2018; Muris & Petrocchi, 2017; Muris et al., 2018, 2019). Also in cancer patients, negative self-compassion was found to be more strongly related to symptoms of depression and anxiety than positive self-compassion (Zhu et al., 2020).

According to the theory of self-compassion, more self-compassion can lead to an increase of adaptive psychological functions (such as self-care behavior) and a reduction of maladaptive coping strategies, which can exert benefits for psychological functioning (Ewert et al., 2021; Neff et al., 2005). Previous research indeed found that the overall construct of self-compassion is positively related to psychological well-being, in a range of populations including people from the general population and college students (MacBeth & Gumley, 2012; Marsh et al., 2018) as well as cancer patients (Gillanders et al., 2015; Pinto-Gouveia et al., 2014; Przezdziecki et al., 2013; Schellekens et al., 2017; Todorov et al., 2019; van der Donk et al., 2020). Up until now, however, only a handful of longitudinal studies have examined the predictive role of self-compassion in psychological symptoms in the general population (Krieger et al., 2016; López et al., 2018) and in cancer patients (Zhu et al., 2019). These studies found that people with higher levels of self-compassion reported lower future levels of psychological symptoms, in the general population (López et al., 2018), college students (Stutts et al., 2018), depressed people (Krieger et al., 2016), adolescents after trauma (Zeller et al., 2015), and cancer patients (Zhu et al., 2019).

Although valuable, suggesting a protective role of self-compassion for psychological functioning, an important limitation of these existing longitudinal studies is that few studies examined the course of self-compassion over time. So far, only one study examined changes in self-compassion over time. It was shown that adolescents experienced an undermined self-compassion after experiencing trauma (i.e., forest fire), which was associated with deteriorated panic and post-traumatic stress symptoms (Zeller et al., 2015). These findings suggest that traumatic life events can undermine self-compassion. Such changes in the level of self-compassion over time have not been verified, neither been tested in other stressful circumstances, like the confrontation with severe health problems. It is important to know more about the extent to which self-compassion is affected by stressful events, even more so, as self-compassion is assumed to be beneficial especially in difficult life circumstances.

In the context of cancer, patients are likely to encounter a range of stressful life events over the course of illness and treatment (Kangas et al., 2002; Nielsen & Grønbæk, 2006; Todd et al., 2014), which can cause psychological symptoms (Izci et al., 2016; Wong-Kim & Bloom, 2005). Following the finding that such events can undermine self-compassion, it can be assumed that some cancer patients may experience a decrease in their self-compassion due to the confrontation with the diagnosis and the intense cancer treatment. Yet, this might not be true for all cancer patients. It is of clinical relevance to clarify to what extent cancer patients experience

a decrease in self-compassion and whether some even experience an increase in their self-compassion as a result of coping with the illness. Research on other protective personal resources such as benefit finding and post-traumatic growth in cancer patients has found that some patients experience more personal strength due to the cancer experience (Marziliano et al., 2020; Shand et al., 2015). As such, it can be hypothesized that distinct subgroups of cancer patients exist that show a different course of self-compassion over time.

To verify the adaptive value of distinct trajectories of self-compassion over time, it is important to examine to what extent the trajectories of self-compassion over time are related to levels of psychological symptoms over time. More insight into this association of self-compassion with psychological symptoms over time may help to identify a subgroup(s) of patients at risk for low or diminishing levels of self-compassion over time and elevated levels of psychological symptoms. This knowledge can be used to plan and design compassion-based therapy for cancer patients.

The present longitudinal study examined levels of self-compassion and psychological symptoms over time in a heterogeneous sample of cancer, from cancer diagnosis (T1), to the start of medical treatment (T2), until the end of medical treatment (T3). The first aim was to identify subgroups of cancer patients with distinct trajectories of self-compassion over time (hereby distinguishing total self-compassion and positive and negative self-compassion). Following previous findings (Zeller et al., 2015), it was hypothesized that at least a subgroup of cancer patients will report a decrease in self-compassion. The second aim was to examine the associations of the trajectories of self-compassion with the course of psychological symptoms. We hypothesized that trajectories characterized by a decreased self-compassion would be associated with increases in psychological symptoms over time.

Methods

Participants

The study was conducted in a sample of 153 cancer patients who filled in the questionnaires after diagnosis and at the start and end of treatment. The mean age was 51 years. Most patients were women, having a high school level of education, and diagnosed with breast cancer (see Table 1). Participants were recruited from Shaanxi Provincial Tumor Hospital in Xi'an, China, from August 2016 to May 2018. The inclusion criteria were as follows: (1) diagnosed with cancer for the first time; (2) aged between 18 and 75 years old; and (3) comprehension of Chinese. The exclusion criteria were as follows: (1) having a psychiatric disorder diagnosed by professional psychiatrists, (2) having a cancer recurrence, and (3) already started medical treatment.

Procedures

The ethical review was approved by the medical ethical committee of Shaanxi Provincial Tumor Hospital (approval number: 2017–2). Eligible participants were screened by trained research nurses. After signing the informed consent form, eligible participants were asked to complete a self-reported questionnaire at three time points: 1 week after the first cancer diagnosis (T1), 1 week after starting medical treatment (T2), and 1 week after completing the medical treatment (T3). Of the 435 screened patients, 308 patients were eligible, and 127 patients were excluded (75 patients had a benign tumor, and 52 patients had recurrent cancer). Of the 308 eligible patients, 243 patients completed the T1 assessment (response rate = 79%), 209 patients completed the T2 assessment, and 153 patients completed the T3 assessments. Figure 1 presents the study flow chart. Compared with the 153 patients who completed all three assessments, patients who dropped out after the T1 assessment reported more severe cancer ($p < 0.05$) and lower levels of education ($p < 0.01$).

Measures

Socio-demographic and Medical Variables Participants' socio-demographic variables (including age, gender, education level, marriage status, and salary) were collected through a self-reported questionnaire. Participants' medical variables (including the time of diagnosis, type and stage of cancer, and receipt of medical treatment) were tracked from the hospital.

Self-compassion The Self-Compassion Scale-Short Form (SCS-SF) was used to measure self-compassion (Raes et al., 2011). The SCS-SF consists of 12 items measuring the six facets of self-compassion: self-kindness, common humanity, mindfulness, self-judgment, isolation, and over-identification. Participants were asked to answer each item on a 5-point Likert scale from 1 (*almost never*) to 5 (*almost always*). A total score of self-compassion was calculated by summing the scores of self-kindness, common humanity, and mindfulness and the reversed scores of self-judgment, isolation, and over-identification, with a higher total score indicating a higher level of self-compassion (possible range 12–60). A score for positive self-compassion was calculated by summing the six positive items (possible range from 6 to 30), with a higher score indicating a higher level of positive self-compassion. A score for negative self-compassion was calculated by summing the scores of the six negative items (possible

Table 1 Demographical and medical characteristics of participants

		Percentage (*N*)
Age (in years)	Mean (SD)	50.78 (11.61)
	Range	18–79
Gender	Male	34.2% (52)
	Female	65.8% (100)
Education level	Low (elementary school)	10.5% (16)
	Middle (middle or high school)	67.8% (103)
	High (college/university or above)	19.7% (30)
	Missing	2% (3)
Marital status	Unmarried	1.3% (2)
	Married	92.1% (140)
	Divorced	1.3% (2)
	Widowed	3.9% (6)
	Missing	1.3% (2)
Salary	<¥3000	58.6% (89)
	¥3000–5000	29.6% (45)
	¥5000–10,000	7.2% (11)
	>¥10,000	0.7% (1)
	Missing	3.9% (6)
Cancer type	Breast cancer	28.4% (43)
	Lung cancer	15.1% (23)
	Gastric cancer	3.3% (5)
	Gynecological cancer	22.4% (34)
	Colorectal cancer	5.9% (9)
	Lymph cancer	3.9% (6)
	Others	14.5% (22)
	Missing	6.6% (10)
Cancer stage at T1	Stage I	18.4% (28)
	Stage II	39.5% (60)
	Stage III	23.7% (36)
	Stage VI	11.8% (18)
	Missing	6.6% (10)
Types of medical treatment at T3	Chemotherapy	42.1% (64)
	Operation	14.5% (22)
	Radiotherapy	15.1% (23)
	Traditional Chinese medicine	7.9% (12)
	Chemotherapy + operation + radiotherapy	2% (3)
	Others	2.6% (4)
	Missing	15.8% (24)

range from 6 to 30). Thus, a higher score of negative self-compassion implied higher levels of negative self-compassion (e.g., *more* self-criticism about oneself). Previous studies confirmed the SCS-SF had good reliability and validity in general population (Raes et al., 2011) and in cancer patients (Todorov et al., 2019). In this study, the ωs (McDonald's omega) of self-compassion total, positive self-compassion, and negative self-compassion were 0.67–0.72, 0.84–0.88, and 0.76–0.80 from T1 to T3, respectively (Hayes & Coutts, 2020; Peters, 2014).

Depressive Symptoms Depressive symptoms were measured by the Patient Health Questionnaire (PHQ-9). The PHQ-9 contained nine items. Participants were asked to answer each item on a 4-point Likert scale from 0 (*never*) to 3 (*nearly everyday*). High scores of PHQ-9 indicated severe depressive symptoms (total scores may range from 0 to 27). People with a score of 10 or higher are considered to have clinically significant levels of depression (Manea et al., 2012). Previous studies proved that PHQ-9 had good reliability and validity in cancer patients (Hinz

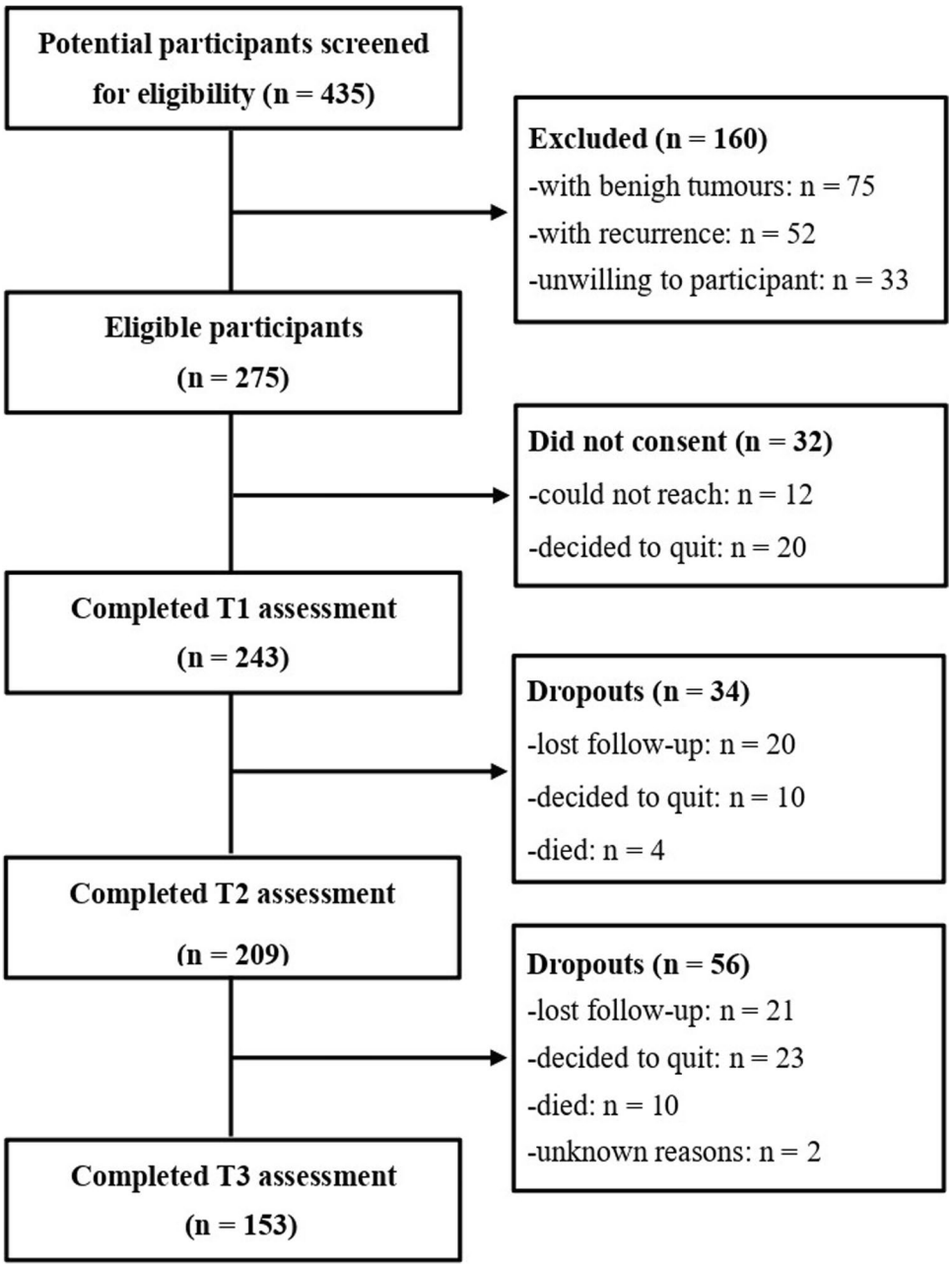

Fig. 1 The flow chart of the study

et al., 2016). In this study, the ωs from T1 to T3 were 0.88 to 0.91 over time.

Anxiety Symptoms Anxiety symptoms were measured by the 6-item State-Trait Anxiety Inventory (STAI-6). Participants answered each item on a 4-point Likert scale from 1 (*not at all*) to 4 (*very much*). A higher score indicates more severe symptoms of anxiety (total scores may range from 4 to 24). A cutoff point of 12 is generally used to define patients with clinically elevated anxiety (Luttik et al., 2011). Previous studies showed that STAI-6 had good reliability and validity in cancer patients (Venderbos et al., 2015). In this study, the ωs were 0.71–0.79 across the three measurements.

Data Analyses

To examine the course of self-compassion as well as psychological symptoms over time in the whole group, for descriptive purposes, we conducted repeated measures ANOVA using SPSS 22.0. Cohen's *d*s were calculated to indicate the extent of change, with $d < 0.20$ indicating small-sized changes, $d > 0.20$ meaning moderate changes, and $d > 0.80$ denoting large changes (Chen et al., 2010).

In order to identify subgroups of patients with distinct trajectories of self-compassion, Latent Class Growth Modelling (LCGM) was performed. We performed separate analyses for the self-compassion total score, positive self-compassion, and negative self-compassion in M*plus* 8.3 (Muthén & Muthén, 2012). Of the 153 participants, 2 participants only missed T2 measurement on self-compassion, 3 participants merely missed T3 measurement, and 1 participant missed both T2 and T3 measurements on self-compassion. This one participant was excluded from the following trajectory analyses. The following analyses were performed on a total of 152 participants. For self-compassion total score, positive self-compassion, and negative self-compassion, Little's MCAR tests were non-significant, indicating that the data were missing completely at random (for self-compassion total score: $\chi^2 = 5.709$, $df = 7$, $p = 0.574$; for positive self-compassion: $\chi^2 = 4.223$, $df = 7$, $p = 0.754$; for negative self-compassion: $\chi^2 = 4.916$, $df = 7$, $p = 0.670$).

The LCGMs were built with an increasing number of trajectories. The best-fitting model was selected by the following five statistical criterions: aBIC, AIC, entropy, the Bootstrapped Likelihood Ratio Test (BLRT), and the Vuong-Lo-Mendell-Rubin (VLMR). The aBIC and AIC examined the model fit, and lower BIC and AIC indicated a better model fit. The entropy value was used to check the model separation: an entropy value closer to one indicated a better separation of trajectories and a more accurate classification of individuals in each trajectory. The BLRT and VLMR examined whether the model with K classes was significantly better than the model with K-1 classes (Lo et al., 2001; McLachlan et al., 2019). Thus, the model with lower AIC and aBIC, higher entropy, and significant BLRT and LMR should be selected. Except for the above five statistical criterions, the model was also checked on whether the trajectories were conceptually distinct from each other and whether each trajectory consisted of a substantial number of patients (> 5%) (Nylund et al., 2007).

After selecting the best-fitting model for trajectories of self-compassion, each participant was given a membership for their highly possible trajectory. This membership was exported into SPSS 22.0 and used as a group variable to represent each participant's trajectory of self-compassion. Repeated measures ANOVAs were then performed to examine the associations of trajectories of overall self-compassion, positive self-compassion, and negative self-compassion with symptoms of depression and anxiety.

Results

Mean Levels of Self-compassion and Psychological Symptoms over Time

The level of total self-compassion was relatively stable across three time points (see Table 2), with no significant change over time (F (2,286) = 1.072, $p > 0.05$). Positive self-compassion showed a gradual and significant decrease between T1 and T3 (F (2,286) = 3.344, $p < 0.05$), although the effect size was small. Negative self-compassion also showed a significant decrease (F (2,286) = 3.269, $p < 0.05$), mainly between T2 and T3, again with a small effect size. The level of depressive symptoms remained relatively stable from T1 to T3 (F (2,300) = 2.020, $p > 0.05$), with only a small-sized increase between T1 and T2. Anxiety symptoms significantly decreased over time (F (2,294) = 5.147, $p < 0.01$), mainly due to a small-sized decrease between T2 and T3. Thus, at group level, both self-compassion and levels of symptoms of depression and anxiety were rather stable.

Identifying Trajectories of Self-compassion

Self-compassion Total Score

The first block of Table 3 presents the fit indices of the 2-class LCGM model until the 5-class LCGM model for the self-compassion total score. The 5-class model had the lowest AIC and aBIC, and a significant VLMR, but the smallest class of this model did not contain a sufficient number of patients (i.e., < 5%). We therefore rejected this model and compared the 3-class and the 4-class LCGM models. Of these two models, the AIC, aBIC, and entropy were comparable, but the added class in 4-class LCGM model did not represent a conceptual meaningful trajectory of self-compassion. Therefore, the 3-class LCGM model was selected as the best model for the trajectories of total self-compassion. The parameter estimates of this model are shown in Table 4.

As shown in Fig. 2, class 1 consisted of the largest number of patients ($n = 125$, 82.2%). These patients showed rather stable and low levels of total self-compassion from T1 to T3 (F (2,238) = 2.079, $p > 0.05$), with only a small-sized decrease in self-compassion from T1 to T2 ($d = -0.23$, $p < 0.05$). This trajectory was labeled as the "stable low" trajectory. Patients in class 2 and class 3 reported moderate to high levels of total self-compassion at T1, with a significant overall change in their level of self-compassion over time (class 2: F (2,28) = 3.581, $p < 0.05$; and class 3: F (2,16) = 13.048, $p < 0.01$). While patients in both classes remained stable in their level of total self-compassion from T1 to T2, patients in class 2 ($n = 18$, 11.8%) experienced a large-sized improvement in total self-compassion from T2 to T3 ($d = 0.72$, $p < 0.05$), whereas the small group of patients in class 3 ($n = 9$, 6.0%) reported a large-sized decrease in total self-compassion from T2 to T3 ($d = -2.60$, $p < 0.01$). Therefore, class 2 and class 3 were labeled as "late increase" and "late decrease," respectively.

Table 2 Mean levels of self-compassion and psychological symptoms in the total sample and for patients with the distinct trajectories of self-compassion

	Mean (SD)			Cohen's *d*		
	T1	T2	T3	T1–T2	T2–T3	T1–T3
Total self-compassion	39.31 (6.47)	38.61 (6.18)	38.73 (5.90)	−0.11	0.02	−0.09
Positive self-compassion	19.22 (5.49)	18.99 (5.50)	17.97 (5.19)	−0.04	−0.19	−0.23*
Negative self-compassion	15.91 (4.22)	16.38 (4.86)	15.24 (4.56)	0.10	−0.24*	−0.15
Depression	7.19 (5.67)	8.20 (6.42)	7.23 (5.72)	0.17*	−0.16	0.01
Anxiety	14.33 (4.13)	14.37 (3.97)	13.40 (3.62)	0.01	−0.25**	−0.24*
Trajectories of total self-compassion						
Stable low (82%)						
Self-compassion	37.49 (4.86)	36.49 (3.80)	37.01 (3.58)	−0.23*	0.14	−0.11
Depression	7.92 (5.57)	9.06 (6.36)	7.96 (5.63)	0.19*	−0.18	0.01
Anxiety	14.93 (3.89)	15.10 (3.41)	14.16 (3.11)	0.05	−0.29*	−0.22*
Late increase (12%)						
Self-compassion	47.67 (5.95)	48.60 (4.97)	52.07 (4.68)	0.17	0.72*	0.82*
Depression	3.50 (5.72)	4.56 (5.94)	2.22 (3.15)	0.18	−0.50*	−0.28
Anxiety	11.61 (4.29)	10.33 (4.86)	8.67 (2.66)	−0.28	−0.42*	−0.82*
Late decrease (6%)						
Self-compassion	49.67 (5.87)	50.22 (4.26)	39.44 (3.81)	0.11	−2.60**	−2.06**
Depression	4.56 (2.70)	3.56 (3.13)	7.22 (6.36)	−0.34	0.73*	0.54
Anxiety	11.25 (3.99)	12.25 (4.06)	12.50 (4.75)	0.25*	0.06	0.28*
Trajectories of positive self-compassion						
Late decline						
Positive self-compassion	18.23 (2.43)	18.63 (4.07)	17.12 (3.34)	0.12	−0.40*	−0.38*
Depression	8.64 (5.68)	8.95 (5.54)	8.16 (5.77)	0.06	−0.14	−0.08
Anxiety	15.13 (3.98)	14.92 (3.68)	13.84 (3.18)	−0.05	−0.31**	−0.36**
Early decline						
Positive self-compassion	26.52 (2.68)	24.07 (4.22)	23.42 (4.84)	−0.70**	−0.14	−0.56**
Depression	4.44 (4.72)	5.56 (5.73)	4.12 (3.97)	0.21	−0.29	−0.08
Anxiety	12.12 (4.31)	11.73 (4.12)	10.91 (3.96)	−0.09	−0.20	−0.29
Large increase						
Positive self-compassion	11.17 (2.39)	13.61 (6.48)	16.39 (5.09)	0.50	0.48	1.31**
Depression	6.26 (6.04)	8.57 (9.67)	7.96 (6.63)	0.29	−0.07	0.27
Anxiety	14.59 (3.61)	15.55 (3.73)	14.86 (3.30)	0.26	−0.20	0.08

Table 2 (continued)

	Mean (SD)			Cohen's *d*		
	T1	T2	T3	T1–T2	T2–T3	T1–T3
Large decline						
Positive self-compassion	25.14 (1.46)	18.43 (2.23)	9.14 (3.76)	−3.56**	−3.01**	−5.51**
Depression	6.00 (2.98)	10.25 (3.88)	8.38 (4.75)	1.23**	−0.43	0.60
Anxiety	14.25 (3.69)	16.25 (1.98)	15.00 (2.83)	0.68	−0.51	0.23
Trajectories of negative self-compassion						
Late decline						
Negative self-compassion	17.93 (3.08)	18.63 (1.98)	17.00 (3.89)	−0.27	−0.53**	−0.27
Depression	7.98 (5.80)	9.08 (6.43)	6.95 (5.21)	0.18	−0.36*	−0.17
Anxiety	14.82 (3.72)	14.47 (3.71)	13.47 (3.03)	−0.09	−0.30*	−0.40*
Stable negative self-compassion						
Negative self-compassion	14.05 (2.96)	13.56 (2.04)	13.49 (4.29)	−0.19	−0.02	−0.15
Depression	6.22 (5.01)	7.45 (5.63)	7.17 (5.90)	0.23*	−0.05	0.21
Anxiety	13.58 (4.33)	14.05 (3.80)	13.01(4.09)	0.12	−0.26	−0.13
Large fluctuation						
Negative self-compassion	20.07 (3.69)	25.50 (2.56)	16.50 (4.88)	1.71**	−2.30**	−0.82*
Depression	11.00 (6.07)	12.33 (7.37)	8.60 (6.32)	0.20	−0.54	−0.39
Anxiety	16.93 (4.13)	17.67 (3.56)	15.33 (2.97)	0.19	−0.71*	−0.44
Large increase						
Negative self-compassion	9.55 (4.01)	7.55 (1.57)	13.46 (5.26)	−0.66	1.52**	0.84
Depression	2.90 (4.11)	1.72 (3.55)	7.36 (7.09)	−0.31	1.00*	0.77*
Anxiety	12.09 (3.33)	11.09 (4.01)	12.45 (4.23)	−0.27	0.33	0.10

*$p < 0.05$, **$p < 0.01$

Table 3 Latent class growth modeling selection criteria of self-compassion

No. of classes	AIC	aBIC	Entropy	VLMR	BLRT	Class prevalence				
						1	2	3	4	5
Self-compassion total score										
1	2907.33	2906.49	n/a	n/a	n/a	100%				
2	2754.17	2752.90	0.94	− 1446.67***	− 1446.67***	17.8%	82.2%			
3	2736.58	2734.88	0.92	− 1368.08	− 1368.08***	6.0%	82.2%	11.8%		
4	2723.20	2721.08	0.92	− 1340.39	− 1340.39***	78.9%	8.6%	6.6%	5.9%	
5	2720.38	2717.84	0.87	− 1323.72	− 1323.72***	71.7%	6.6%	3.3%	8.6%	9.9%
Positive self-compassion										
1	2780.81	2779.96	n/a	n/a	n/a	100%				
2	2736.60	2735.33	0.76	− 1384.40***	− 1384.40***	77.6%	22.4%			
3	2719.05	2717.36	0.79	− 1359.79	− 1359.79***	10.5%	67.8%	21.7%		
4	2717.04	2714.92	0.80	− 1354.15	− 1354.15***	15.1%	22.4%	5.3%	57.2%	
5	2699.21	2696.67	0.88	− 1341.07*	− 1341.07***	67.1%	5.3%	8.6%	3.2%	15.8%
Negative self-compassion										
1	2629.23	2628.38	n/a	n/a	n/a	100%				
2	2587.70	2586.43	0.57	− 1308.61*	− 1308.61***	43.4%	56.6%			
3	2576.87	2575.17	0.75	− 1286.66	− 1286.66***	65.8%	14.5%	19.7%		
4	2574.98	2572.86	0.72	− 1276.46	− 1276.46	40.8%	42.1%	9.9%	7.2%	
5	2571.64	2569.10	0.80	− 1272.48	− 1272.48	45.4%	4.6%	27.6%	15.8%	6.6%

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 4 Parameter estimates for the four-class model of positive self-compassion and negative self-compassion

		Intercept Mean (SE)	Slope Mean(SE)
Self-compassion total score	Class1	36.78 (0.34)**	0.01 (0.06)
	Class2	47.67 (3.57)**	0.05 (1.35)
	Class3	49.23 (3.18)**	− 0.11 (3.26)
Positive self-compassion	Class1	18.25 (0.53)**	− 0.32 (0.31)
	Class2	26.17 (0.78)**	− 1.42 (0.91)
	Class3	11.51 (1.04)**	2.14 (1.11)
	Class4	25.12 (0.83)**	− 6.52 (1.95)**
Negative self-compassion	Class1	17.53 (0.76)**	0.89 (0.45)*
	Class2	13.892 (0.65)**	− 0.10 (0.40)
	Class3	20.43 (1.06)**	4.77 (2.42)*
	Class4	10.69 (0.90)**	− 2.61 (0.86)**

*$p < 0.05$, **$p < 0.01$

Positive Self-compassion

The second block of Table 3 presents the fit indices of the 2-class LCGM model until the 5-class LCGM model for positive self-compassion. The 5-class model had the lowest AIC and aBIC, the highest entropy, and a significant VLMR, but the smallest class of this model did not contain a sufficient number of patients. We therefore rejected this model and compared the 3-class and the 4-class LCGM models. Of these two models, the AIC, aBIC, and entropy were comparable, but the added class in 4-class LCGM model represented a conceptual meaningful trajectory of positive self-compassion (i.e., showing a group of patients reported rapid decline in positive self-compassion). Therefore, the 4-class LCGM model was selected as the best model for the trajectories of positive self-compassion. The parameter estimates of this model are shown in Table 4.

As shown in Fig. 3, class 1 was the largest, including more than half of the patients ($n = 87$, 57.2%). These patients started out with a moderate level of positive self-compassion, with a significant decrease over time ($F(2,164) = 4.504$, $p < 0.05$). Their positive self-compassion remained stable from T1 to T2 ($d = 0.12$, $p > 0.05$), with a moderate decrease from T2 to T3 ($d = -0.40$, $p < 0.05$). This trajectory was labeled as "late decline." Class 2 contained 22.4% of the patients ($n = 34$), with the highest starting levels of positive self-compassion, and a significant decrease over time ($F(2, 60) = 4.661$, $p < 0.05$). They reported a moderate decrease in positive self-compassion from T1 to T2 ($d = -0.70$, $p < 0.01$) and remained stable from T2 to T3 ($d = -0.14$, $p > 0.05$). This trajectory was named "early decline."

Patients in class 3 ($n = 23$, 15.1%) started out with the lowest levels of positive self-compassion and reported a large increase from T1 to T3 ($F(2, 44) = 6.459$, $p < 0.01$),

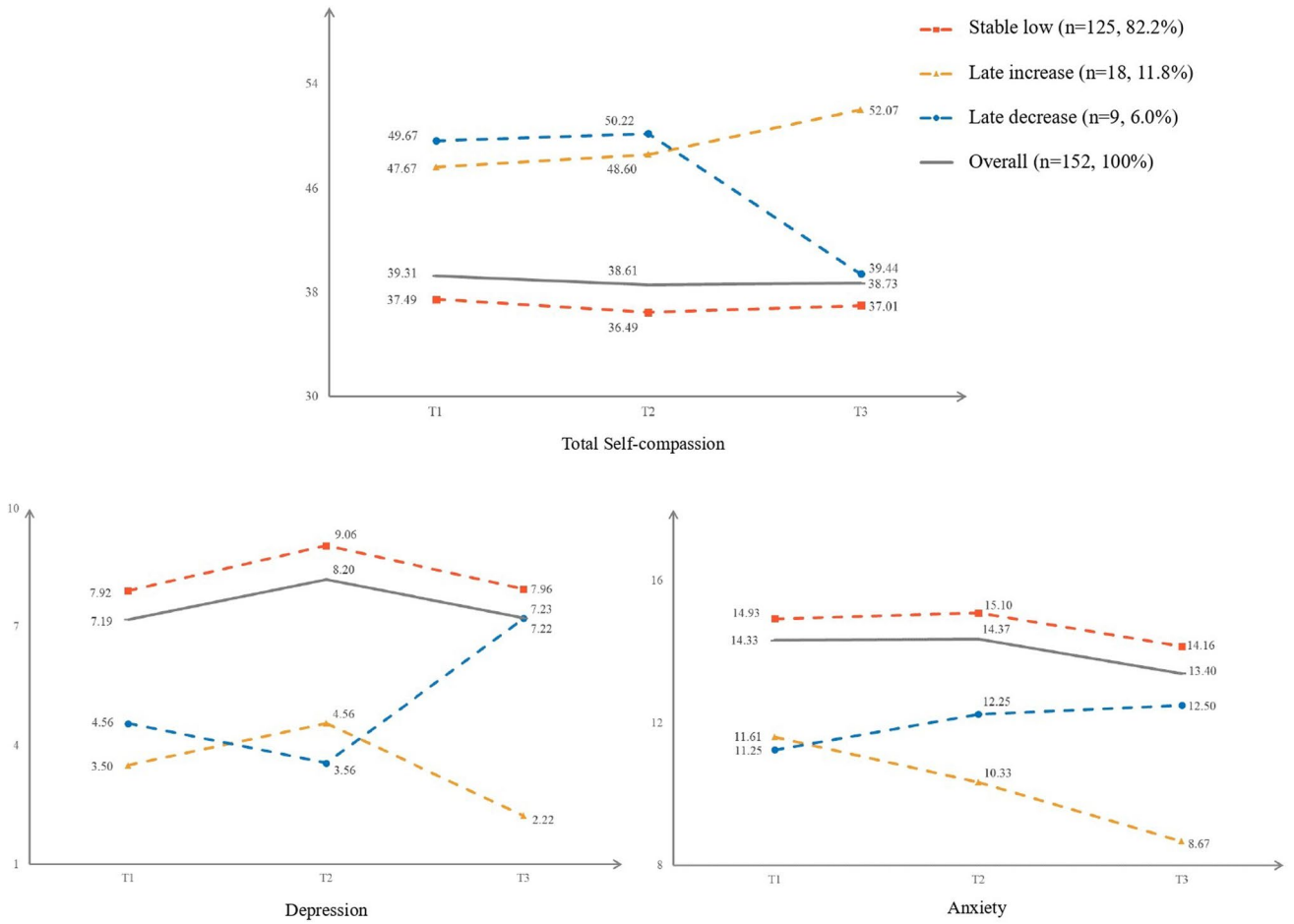

Fig. 2 Trajectories of total self-compassion in cancer patients from T1 to T3

with a moderate-sized increase from T1 to T2 ($d = 0.50$, $p > 0.05$) as well as from T2 to T3 ($d = 0.47$, $p > 0.05$). This trajectory was named "large increase." Class 4 contained a small group of patients ($n = 8$, 5.3%) who started out with high levels of positive self-compassion and reported a large decrease from diagnosis until the end of treatment (F (2,12) = 54.068, $p < 0.01$), from T1 to T2 ($d = -3.56$, $p < 0.01$) and from T2 to T3 ($d = -3.01$, $p < 0.01$). This trajectory was named "large decline."

Negative Self-compassion

The third block of Table 3 presents the fit indices of the 2-class LCGM model until the 5-class LCGM model for negative self-compassion. The AIC, aBIC, and entropy favored the 5-class LCGM model. However, the smallest class of this model did not consist of a substantial number of participants. We then compared the 3-class and the 4-class models. According to the AIC, aBIC, entropy, BLRT, and VLMR, the 3-class and the 4-class model were comparable. The added class in the 4-class model represented a meaningful trajectory of negative self-compassion (i.e., showing a group of patients reporting moderate levels of negative self-compassion at first and a significant decline from T2 to T3). Therefore, the 4-class model was selected. Table 4 presents the parameter estimates of this model.

As shown in Fig. 4, we identified two relatively large groups, showing small changes in levels of self-compassion over time. Class 1 ($n = 64$, 42.1%) showed a significant yet small change in self-compassion over time (F (2, 118) = 3.823, $p < 0.05$], with a rather stable level of negative self-compassion from T1 to T2 ($d = 0.27$, $p > 0.05$) and a moderate decrease from T2 to T3 ($d = -0.53$, $p < 0.01$). This trajectory was named "late decline." Patients in class 2 ($n = 62$, 40.8%), also starting with a moderate level of negative self-compassion at T1, showed rather stable levels of compassion until T3 (F (2,116) = 0.487, $p > 0.05$). We labeled this trajectory as "stable negative self-compassion."

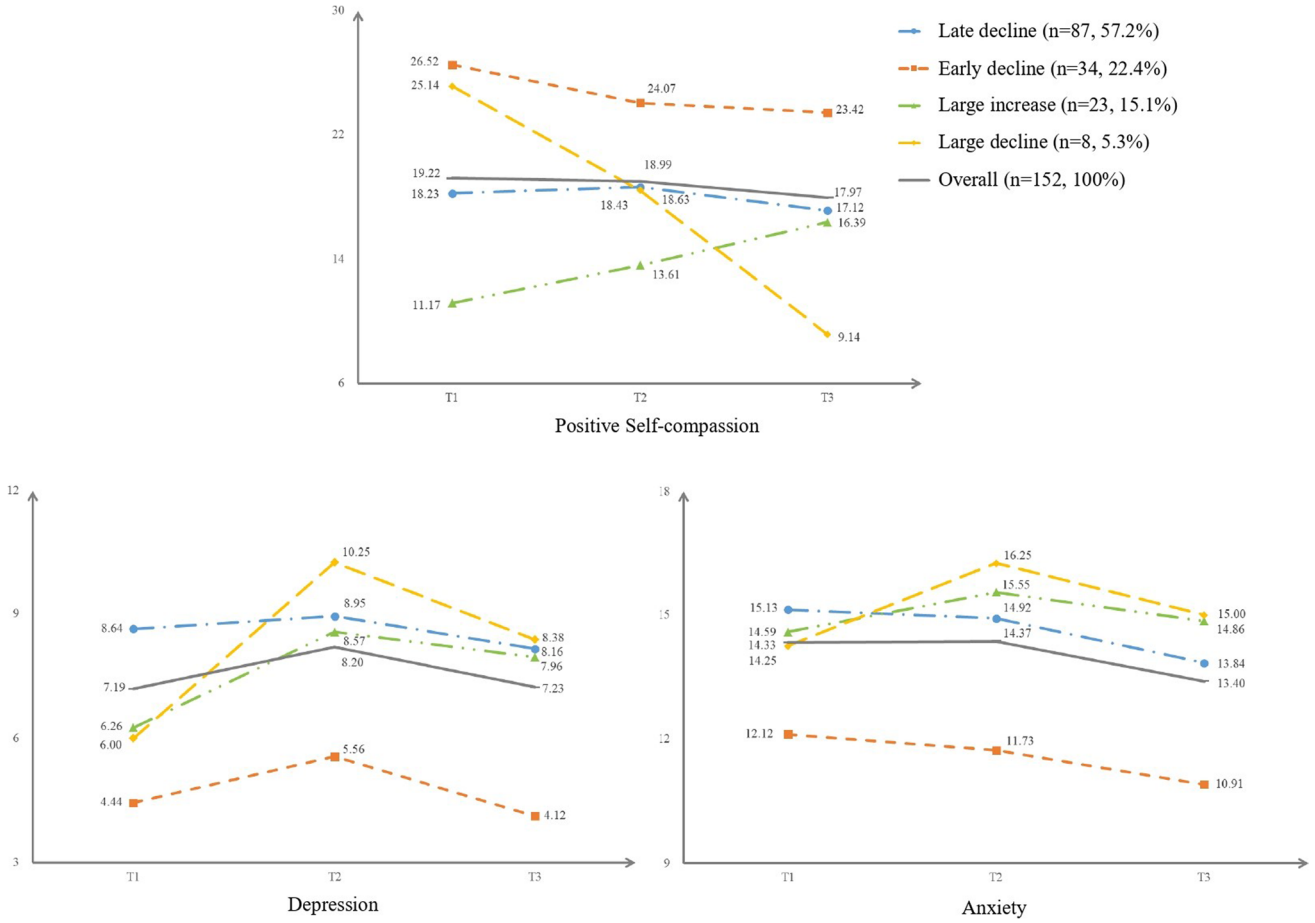

Fig. 3 Trajectories of positive self-compassion in cancer patients from T1 to T3

Additionally, we identified two smaller groups. Patients in class 3 ($n = 15$, 9.9%) reported a high level of negative self-compassion at T1, with a significant change over time (F (2,26) = 18.430, $p < 0.01$). These patients showed a large increase in negative self-compassion from T1 to T2 ($d = 1.71$, $p < 0.01$), followed by a large decline from T2 to T3 ($d = -2.30$, $p < 0.01$). This class was labeled "large fluctuation." Patients in class 4 ($n = 11$, 7.2%) reported the lowest level of negative self-compassion at T1, with a significant change over time (F (2,20) = 5.723, $p < 0.05$). Patients first reported a moderate-sized, yet non-significant, decrease in negative self-compassion from T1 to T2 ($d = -0.66$, $p > 0.05$), followed by a large-sized increase from T2 to T3 ($d = 1.52$, $p < 0.01$). This class was named "large increase."

Self-compassion Trajectories and Psychological Symptoms

We found no significant differences among the distinct trajectories of self-compassion (i.e., total self-compassion, positive and negative self-compassion) regarding any of patients' demographic and medical characteristics. We therefore did not control for these variables in the following analyses.

We found significant differences in the course of depressive symptoms in cancer patients within the distinct trajectories of negative self-compassion ($F_{\text{trajectory} \times \text{time}}$ (6,294) = 2.824, $p < 0.05$). We observed a similar, although not significant, trend for symptoms of anxiety ($F_{\text{trajectory} \times \text{time}}$ (6, 288) = 1.099, $p > 0.05$). Patients in class 3 ("large fluctuation"), while remaining stable on depressive ($d = 0.20$, $p > 0.05$) and anxiety symptoms ($d = 0.19$, $p > 0.05$) from T1 to T2, showed a moderate-sized decline in symptoms of depression ($d = -0.54$, $p < 0.10$) and anxiety ($d = -0.71$, $p < 0.05$) from T2 to T3. These patients reported elevated levels of depressive symptoms (i.e., ≥ 10, indicating a moderate level of depressive symptoms) at both T1 and T2 (as the only group, compared to the other trajectories of negative self-compassion), with a level of depressive symptoms below this cutoff at T3.

In contrast, patients in class 4 ("large increase"), while also remaining stable on depressive ($d = -0.31$, $p > 0.05$) and anxiety symptoms ($d = -0.27$, $p > 0.05$) from T1 to T2, showed a large-sized increase in depressive symptoms

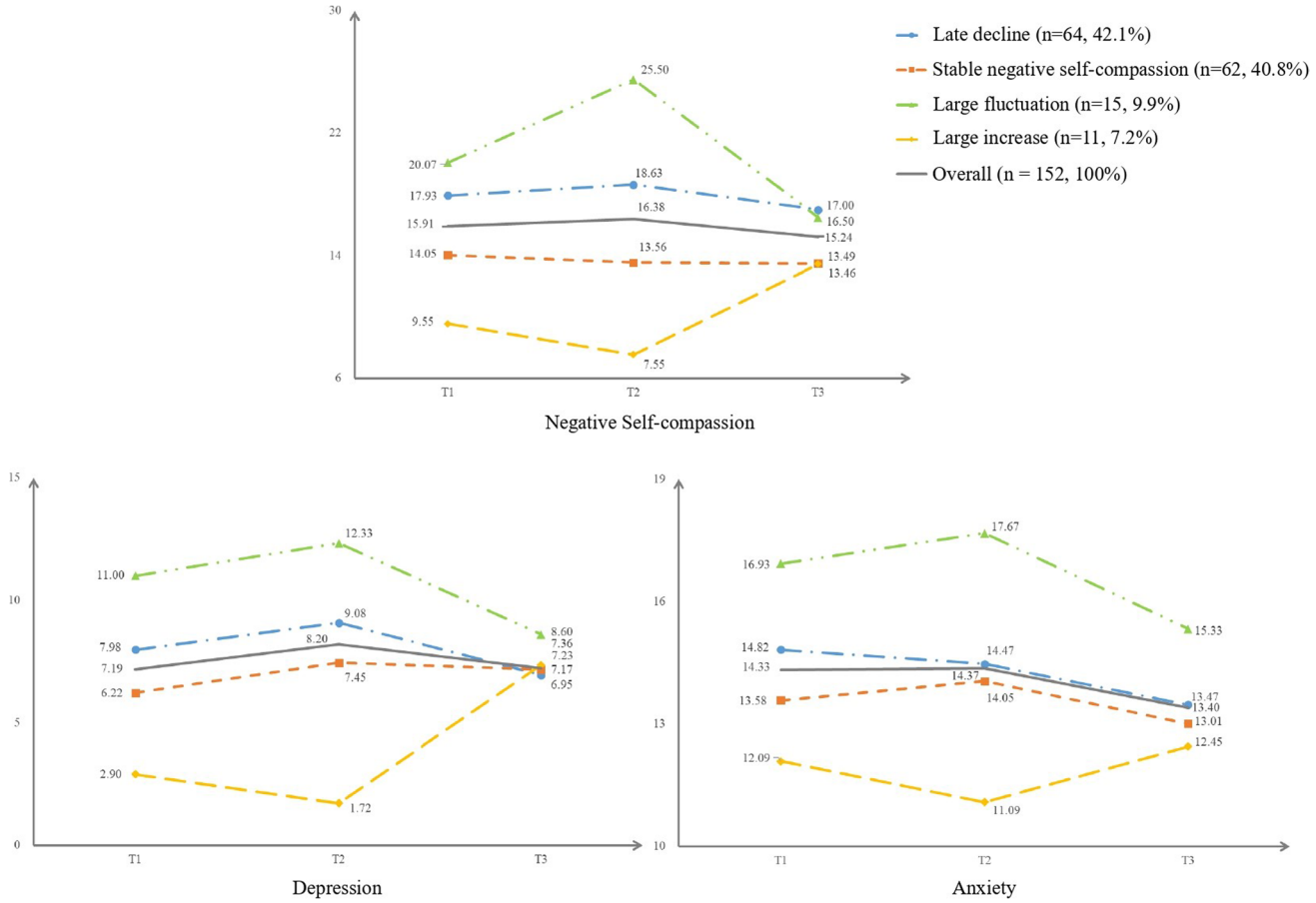

Fig. 4 Trajectories of negative self-compassion in cancer patients from T1 to T3

($d = 1.00$, $p < 0.05$) from T2 to T3. The level of depressive symptoms at T3 was still below the cutoff indicating a moderate level of depressive symptoms.

As for total self-compassion and positive self-compassion, the interaction effect between the trajectory group and time was not significant. This indicates that patients in the distinct trajectories of total self-compassion and positive self-compassion did not report a significant different course of depressive or anxiety symptoms over time (for total self-compassion, depressive symptoms: $F_{\text{trajectory} \times \text{time}}$ (4, 296) = 1.243, $p > 0.05$); anxiety symptoms: $F_{\text{trajectory} \times \text{time}}$ (4, 290) = 1.693, $p > 0.05$); for positive self-compassion, depressive symptoms: $F_{\text{trajectory} \times \text{time}}$ (6, 294) = 0.725, $p > 0.05$; anxiety symptoms: $F_{\text{trajectory} \times \text{time}}$ (6, 288) = 0.848, $p > 0.05$).

Discussion

This longitudinal study in newly diagnosed cancer patients, from shortly after diagnosis until the end of medical treatment, examined possible distinct trajectories of self-compassion over time and the association of these trajectories with the course of psychological symptoms. We found three distinct trajectories of overall self-compassion using the total score ("stable low" 82%, "late increase" 12%, and "late decrease" 6%). Moreover, we found four distinct trajectories of positive self-compassion ("late decline" 57%, "early decline" 23%, "large increase" 15%, "large decline" 5%) and four trajectories of negative self-compassion ("late decline" 42%, "stable negative self-compassion" 41%, "large fluctuation" 10%, and "large increase" 7%). Interestingly, we found no significant differences among the distinct trajectories of self-compassion (i.e., total self-compassion, positive and negative self-compassion) in patients' demographic and medical characteristics. This suggests that general demographic and medical characteristics do not play a key role in distinguishing the trajectories of self-compassion over time. Only among patients within the distinct trajectories of negative self-compassion, we found significant differences in the course of symptoms of depression and anxiety. We did not find such differences in symptoms for the trajectories of total self-compassion nor for positive self-compassion.

A key finding is that our results suggest that the level of self-compassion can change over time, when people are

confronted with a life stressor such as cancer. So far, there is little known about the possible impact of events on levels of self-compassion, with one study also showing that self-compassion can change over time after a stressful event (Zeller et al., 2015). This study looked beyond changes at group level. We identified distinct subgroups of cancer patients who differed in their trajectories of self-compassion time.

Regarding positive self-compassion, the majority of cancer patients experienced a loss after cancer diagnosis, in terms of decreases in the experience of self-kindness, common humanity, and mindfulness. After diagnosis and over the course of medical treatment, these patients experience more problems over time with trying to be understanding, caring, and patient towards oneself, trying to see personal failures and inadequacy as part of being human, and trying to keep in balance. Only a small group of cancer patients reported an increase in these aspects of being self-compassionate toward themselves over the disease trajectory. Given the possible protective and adaptive role of self-compassion for adaptation and psychological well-being, this is a worrisome finding, especially the quarter of patients experiencing a significant reduction in the ability to be self-compassionate in the period following diagnosis.

As for negative self-compassion, the majority of cancer patients experienced rather stable levels or a small decline. In addition, we identified two small groups of patients reporting changes in this component of self-compassion over time. Some patients, after a small decrease in self-compassion after diagnosis, reported an increase in negative self-compassion during active treatment, with their level of negative self-compassion comparable to that of patients in the other trajectories. This result suggests that, in the period following diagnosis, these patients feel less alone and inadequate and become less disapproving, impatient, and judgmental about their personal flaws and inadequacy, yet they become more disapproving and self-critical again during medical treatment. Other patients first showed an increase in negative self-compassion after cancer diagnosis (e.g., more feelings of loneliness, inadequacy, and disapproval of oneself) and then a decrease during active treatment, with their level of negative self-compassion at the end of treatment also comparable to that of patients in the other trajectories.

Another key finding was that, only for the distinct trajectories of negative self-compassion, we found differences in levels of symptoms of depression and anxiety. Patients in the different trajectories of positive self-compassion did not show a significant different course of psychological symptoms. This is in line with previous studies showing that negative self-compassion is more strongly linked with psychological symptoms, than positive self-compassion (Körner et al., 2015; López et al., 2018; Muris & Petrocchi, 2017; Muris et al., 2018). Particularly the two small patient groups showing changes in negative self-compassion over time reported a change in the presence of symptoms. First, those patients showing an increase in negative self-compassion during medical treatment, that is, who become more disapproving and self-critical, also showed an increase in symptoms. Second, those patients showing an increase in negative self-compassion after diagnosis (e.g., more disapproving and self-critical) followed by a decrease during active treatment (e.g., less disapproving and self-critical) reported moderate to high levels of symptoms of depression and anxiety after diagnosis, with significant reductions in their symptoms during active treatment. In fact, their level of depressive symptoms at the end of treatment can be considered to be mild (below the cutoff). We do not know what made these patients less harsh towards themselves while receiving cancer treatment and for feeling less depressed. These findings also support findings of previous research stating that the negative component of self-compassion (also referred to as uncompassionate behaviors or self-responding) may simply reflect negative affect and psychopathological symptoms (Muris & Otgaar, 2020; Muris et al., 2021). With the current study design, our results cannot shed light to this and the temporal associations of self-compassion with psychological symptoms.

Our findings suggest that it is crucial for patients and health care professionals to be aware of the possible risk of losing a positive sense of self-compassion (e.g., being kind towards oneself) as well as becoming more self-critical and feeling isolated during the period of coping with cancer and cancer treatment. Clinicians and psychologists should consider how to assist patients to maintain their self-compassionate capacities over the disease trajectory. Several interventions have proven to be effective in cultivating self-compassion, such as the Mindful Self-compassion (MSC) intervention (Austin et al., 2021; Eriksson et al., 2018; Friis et al., 2016), the Yoga and Compassion Meditation program (Danucalov et al., 2017), and mindful self-compassion interventions (Campo et al., 2017). Also, other types of interventions may be used to reduce negative self-compassion, including cognitive-behavioral and dialectical behavior therapy (Wadsworth et al., 2018). Future intervention research in cancer patients is needed to test the feasibility, acceptability, and efficacy of these interventions in decreasing negative self-compassion and reducing psychological symptoms.

Limitations and Future Research Directions

Findings of this study should be interpreted with caution because of the following limitations. First, we used the short version of the SCS to measure self-compassion. This precluded us from also examining possible trajectories in the six aspects of self-compassion. Future research should use the

26-item SCS to examine the trajectories in these six facets. Second, the trajectories of self-compassion and the courses of psychological symptoms were examined over the same period. Therefore, we can only examine their associations, and not draw any conclusion about temporality and causality. Future longitudinal research with more assessments is needed to examine the causality between self-compassion and psychological symptoms. Third, the non-significant findings regarding differences in demographic and medical characteristics between trajectories of self-compassion may be due to the relatively small sample size and number of patients in some trajectories. Future research on predictors of trajectories of self-compassion may also include other characteristics, such as the presence and quality of social relationships, self-efficacy, and religion (Lathren et al., 2021; Liao et al., 2021). Forth, this study may suffer from common method bias, because all measurements were based on self-reported questionnaires (Podsakoff et al., 2012). More objective measures of self-compassion and psychological symptoms are supposed to be considered in future research. Lastly, as this study is performed under Chinese culture, it remains unclear to what extent our findings can be generalized into people under other cultures. In traditional Chinese culture, self-criticism (a core feature of negative self-compassion) is considered an important approach to growth (Wu et al., 2020). Also, previous research has pointed out cross-cultural differences in levels of self-compassion (Tóth-Király & Neff, 2021). Future research is needed to examine trajectories of self-compassion and their associations with psychological outcomes in other cultures.

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Author Contribution J.W. analyzed the data and wrote the manuscript. Y.H., L.W. and A.L. were involved with the study execution and data collection. J.Y., M.J.S. and L.Z. collaborated in the study design and final editing of the manuscript. All authors approved the final version of the current manuscript.

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Data Availability The data of the current study is available from the corresponding author upon reasonable request.

Declarations

Ethics Approval This study was approved by the medical ethical committee at the Shaanxi Provincial Tumor Hospital (approval number: 2017–2). All procedures were in accordance with the 1964 Helsinki Declaration and its later amendments.

Consent to Participate The written informed consent form was obtained from all cancer patients included in the study.

Conflict of Interest The authors declare no competing interests.

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