An investigation of the concurrent and longitudinal associations between narrative coherence and mental health mediated by social support

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Abstract
The coherence of autobiographical narratives is thought to be reflective of individuals’ psychological adjustment. However, results are not always replicable, the longitudinal nature of the relation has remained largely unaddressed, and there is limited research on mechanisms that may explain the relation between coherence and mental health. Therefore, in a large longitudinal study, we investigated the concurrent and prospective associations of narrative coherence with mental health, as well as mediational effects of perceived social support. Concurrently, correlations showed that total narrative coherence was associated with higher psychological well-being, fewer symptoms of depression and anxiety, and fewer negative social interactions. Cross-sectional regressions showed that total narrative coherence was predictive for better psychological well-being and fewer symptoms of depression and anxiety, and that chronological coherence predicted depressive symptomatology. These relations were all mediated by perceived negative social interactions. Prospectively, over a 5-month time interval, higher coherence of positive narratives predicted relative decreases in depressive and anxious symptoms. These relations were also mediated by the amount of perceived negative social interactions. Individuals who were more coherent about their past positive life events experienced a relative decrease in depressive and anxious symptoms over a 5-month time interval because they experienced fewer negative interactions with their social network over time.

Keywords
Autobiographical memory, narrative coherence, psychopathology, psychological well-being, social support

Introduction
We go through life day by day, collecting experiences, becoming walking libraries full of stories to tell (Bruner, 1990). As our autobiographical memories are encoded, reflected on, and shared in social interactions, they take on a

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narrative form that provides organization and evaluation to our lived experience (Fivush, 2011). Several characteristics of autobiographical narratives have been investigated over the years (Palombo et al., 2018; Sutin & Robins, 2007). One of these characteristics is narrative coherence, which is the extent to which a narrative makes sense to a naïve listener and is thus able to convey the content and meaning of the described events in a structurally and thematically cohesive manner (Baerger & McAdams, 1999; Habermas & Bluck, 2000; Lysaker et al., 2002; Reese et al., 2011). Narrative coherence is suggested to be a multidimensional construct, consisting of a contextual (i.e. the time and place of the events), a chronological (i.e. the logical and chronological order of the events) and a thematic dimension (i.e. affective and evaluative elaboration around the central theme of the event, inclusion of a high point and a resolution), according to Reese and colleagues (2011).

It has been suggested that the ability to narrate in a coherent manner about past personal experiences is reflective of individuals’ mental health. Generally, higher autobiographical narrative coherence has shown to be related to fewer symptoms of psychopathology (e.g. Adler, 2012; Adler et al., 2013; Booker et al., 2020; Lysaker et al., 2002; Müller et al., 2014; Stadelmann et al., 2015; Vanden Poel & Hermans, 2019; Vanderveren et al., 2019) and higher levels of psychological well-being (e.g. Adler et al., 2016; Baerger & McAdams, 1999; Mitchell et al., 2020; Waters & Fivush, 2015). However, there are some inconsistencies in empirical evidence (e.g. Chen et al., 2012). Sometimes, relations between coherence and psychopathology are found in the opposite direction of what is expected. For instance, it has been observed that higher levels of coherence can be associated with more depressive symptoms, higher levels of rumination or more symptoms of PTSD (Sales et al., 2013; Vanderveren, et al., 2020; Waters et al., 2013).

One of the possible reasons for observed inconsistencies in the relation between coherence and mental health may be the specific operationalization of coherence as well as mental health. First, most studies look at either the composite measure of coherence or only the thematic dimension of coherence. This is because thematic coherence, or related concepts like meaning-making, are generally thought to be the most relevant with regards to mental health (Adler et al., 2016; Boals et al., 2011; Cox & McAdams, 2014; Graci & Fivush, 2017; Habermas, 2011; McLean et al., 2010; Mitchell et al., 2020; Reese et al., 2017). This idea has some merit, since the ability to integrate life events and make meaning of emotional experiences is critical to identity development (McAdams & McLean, 2013). However, this narrow approach has the disadvantage of overlooking possibly important structural elements of narrative coherence. Indeed, other structural aspects such as chronological coherence have also been found to be important (Vanaken & Hermans, 2020). Second, in multiple studies, a distinction has been made between the coherence of narratives of important positive life events (high points) and the coherence of narratives of important negative life events (high points) (Baker-Ward et al., 2005; Bohanek et al., 2009; Fivush et al., 2002, 2003, 2008; Rasmussen & Berntsen, 2009; Vanaken & Hermans, 2020; Vanderveren et al., 2019). Previous work has shown mean-level differences in coherence between positive and negative narratives, with negative narratives being more coherent than positive narratives, and negative narratives being more relevant for mental health (Baker-Ward et al., 2005; Fivush et al., 2002, 2003, 2008; Vanderveren et al., 2019). However, there is also mixed evidence on the moderating role of event valence in the relation between coherence and mental health (Bohanek et al., 2009; Rasmussen & Berntsen, 2009; Vanaken & Hermans, 2020; Waters et al., 2013).

Examining coherence at the global level may obscure important differences by event valence. Third, many different mental health related outcomes, including forms of eudaimonic (high levels psychological well-being) and hedonic well-being (low levels of psychopathology), have been investigated with regards to narrative coherence, and studies have found conflicting results (Keyes & Magyar-Moe, 2003; Ryff & Keyes, 1995). For instance, both Vanderveren et al. (2019) and Mitchell et al. (2020) found coherence to be associated with depressive symptoms, but not with anxiety, whereas Vanden Poel and Hermans (2019) found the opposite pattern. Given these inconsistencies, the first aim of this study is to investigate the associations between coherence and mental health in a more detailed manner. We will focus on both total coherence as well as the separate three dimensions of coherence and analyse the coherence of positive and negative narratives separately. Also, we will examine multiple mental health outcomes.

Furthermore, the prospective association between coherence and mental health has remained largely underresearched. More recently, however, a couple of studies did use a longitudinal research design (e.g. Booker et al., 2020; Mason et al., 2019; Mitchell et al., 2020), but, again, findings are inconsistent. For instance, Adler (2012) found that themes of agency in patients’ narratives, but not coherence, related to improvements of their mental health over the course of psychotherapy. In contrast, Mason and colleagues (2019) showed that narratives of chronically stressed caregivers that reflected coherent integration predicted biological and psychological stress resilience over an 18-month time period. Similarly, Booker et al. (2020) found that the coherence of trauma narratives predicted less passive or avoidant coping strategies; however, this effect decreased over time. Recently, Mitchell et al. (2020) showed, in a mid-adolescent sample, that causal coherence, a part of thematic coherence in the Reese et al. (2011) system, predicted higher life satisfaction 1 year later; in the
same study, however, no associations with depressive symptoms were found. Clearly, more longitudinal evidence is needed, given the importance of discovering the direction of the relation between coherence and mental health. Hence, the second aim of this study is to investigate the associations between coherence and mental health longitudinally, over a 5-month interval. Again, we will analyse the three dimensions of coherence, the coherence of positive and negative narratives, and examine multiple mental health outcomes.

Finally, little is known about why coherence is related to mental health, or in other words; what the mechanisms are that would explain the relation between narrative coherence and mental health. A couple of studies have noted that the coherence of personally significant experiences is considered a critical feature of psychological adjustment, with attention to different aspects and valences of narrative coherence and multiple indicators of mental health. We will examine the contextual, chronological, thematic and total narrative coherence of written narratives about significant positive and negative memories, in line with the cognitive approach of Reese and colleagues (2011; see Supplemental Material 1). All aspects of coherence will be investigated in relations to multiple outcomes of mental health, operationalized as psychological well-being and internalizing symptoms of psychopathology (depression, anxiety and stress). We hypothesize that the relations between different aspects of coherence and psychological well-being will be positive, and the relations between different aspects of coherence and internalizing symptoms will be negative.

The second aim of this study involves investigating the relations between different aspects of coherence and different outcomes of mental health prospectively, over a 5-month interval. We hypothesize to see positive prospective associations between coherence and well-being, and negative prospective associations with internalizing symptoms. The third and final aim of this study involves investigating to what extent receiving social support mediates the associations between coherence and mental health. Again, we will examine if perceived social support mediates the cross-sectional and prospective relations between different aspects of narrative coherence and different outcomes of mental health. We hypothesize that there will be a mediation, in which a part of the relation between coherence and mental health will be explained by perceived social support.

**Methods**

**Participants**

At the first timepoint (T1), a total of 635 individuals took part in the study, 554 (87.24%) were women and 81 (12.76%) were men. Their average age was $M = 18.38, SD = .99, range = 17–26$. All participants were contacted 5 months later for a follow-up measurement at T2 through the recruiting system of the university (Experiment Management System). At T2, the total sample consisted of 232 individuals, 204 (87.93%) women and 28 (12.07%) men. At T2, the sample averaged at an age of $M = 18.32, SD = .88, range = 17–23$. The gender and age distributions of the group that took part at T1 were not significantly different from the one at T2, $p < .001$. Recruitment occurred via the Experiment Management System (EMS) of the KU Leuven (Belgium) through which psychology students can participate in return for course credit. Therefore, the sample consisted of mostly white, female, Flemish psychology students. Besides the sample being rather homogeneous, the choice for this age group was consciously made because the coherence of personally significant experiences is considered a critical feature of psychological adjustment.

**Present study**

In the present study, the first aim is to investigate the association between narrative coherence and mental health,
especially when identity construction is a prominent developmental task (i.e. emerging adulthood) (Waters & Fivush, 2015). We conducted a post hoc power analysis using G*Power (Faul et al., 2007), based on the mean magnitude of our correlational results ($r = .12$) as an effect size estimate, with a critical alpha of .05, and showed that our sample at T1 ($N = 635$) was sufficiently large to detect cross-sectional associations, reaching a very good power of .92. For the longitudinal results, we used the mean observed $R^2$ ($R^2 = .40$), which gave us excellent power of .95 to detect predictive relations.

Procedure

Prior to the start of this online study, participants were collectively informed about the aims and procedure of the study via the online platform of the university. Participants were first year psychology students who could participate in research in exchange for research credits. They were told that they would be asked to do a writing task that concerned their personal memories, as well as filling out questionnaires concerning their well-being and their social interactions. After signing agreement to the informed consent, they could individually and online complete the writing task and questionnaires, which were randomized. Instructions were given to do this in a quiet space with no distractions and to respond to all questions as honestly possible. After completion, participants were given contact details of the research team and professional help instances. The second measurement (T2) was conducted 5 months later. Individuals who participated at T1 were invited again through the Experiment Management System to participate in a follow-up measurement. All procedural elements and instructions were kept identical to T1, which means the same online writing task and questionnaires were conducted, again in randomized order.

The study was conducted in accordance with ethical guidelines and approved by the Social and Societal Ethics Committee of the KU Leuven (G-2018 01 1067).

Material and measures

Narrative coherence. Writing tasks. Participants were asked to write about a highly significant positive and negative autobiographical memory (in counterbalanced order across participants) using the following instructions: ‘I would like for you to write about your most positive/negative experience of your life. This should be an extremely emotional event that has affected you and your life. You may include the facts of the event, as well as your deepest thoughts and feelings. All of your writing will be kept confidential. Do not worry about spelling, sentence structure, or grammar. There is no time limit on your writing; you may write about this event for as long as needed’.

Coding system. The written narratives were coded manually according to the Narrative Coherence Coding Scheme (NCCS; Reese et al., 2011). Using this coding scheme, each narrative was assigned a total score from 0 to 9, consisting of the sum of the scores on the three dimensions that the scheme entails, namely, context (0–3), chronology (0–3), theme (0–3). Context is scored on how specifically the narrator can orient the event in time and place. Chronology refers to whether the narrator describes the components of the events along a (chrono)logical timeline, and if so, if he/she uses time words to indicate the order of events. Theme is assessed based on whether the narrator can emotionally elaborate on the topic, interpret and evaluate the events, on whether he/she makes causal or autobiographical links with other events and if he/she can come to a resolution or is able to reach closure. Specific scoring details can be found in Supplemental Material 1 (adopted from Reese et al., 2011, p. 436). Total narrative coherence (0–9) at each time point was calculated by taking the mean of the scores for positive (0–9) and negative (0–9) narratives. To make sure the data were coded reliably, multiple meetings with experienced colleagues to discuss specific coding judgements were held. All narratives at the first timepoint were scored independently by three researchers, who afterwards decided on the final scores by coming to a consensus. All narratives of the second time-point were coded by the first author according to the established system.

Psychological well-being and internalizing symptoms. Psychological well-being was investigated using the Flourishing Scale (FS: Diener et al., 2009; Dutch translation: Van Eegmond & Hanke, n.d.). This instrument consists of eight items to assess the respondent’s self-perceived psychosocial prosperity and has shown to be related to the full version of the psychological well-being scales that Ryff (1989) developed. It is a brief measurement that provides a single score of well-being, which has shown to be reliable, Cronbach’s $\alpha = .86$, and highly temporally stable, $r = .71$ (Diener et al., 2009). Example items are, for instance: ‘I lead a purposeful and meaningful life’, or ‘I am optimistic about my future’.

To assess internalizing symptoms, we used the Dutch version of the Depression (D), Anxiety (A) and Stress (S) Scales (DASS-21: Lovibond & Lovibond, 1995; Dutch translation: De Beurs et al., 2001). This instrument assesses self-reported symptoms of depression, anxiety and stress, and has shown to be internally consistent, $\alpha \leq .91$, test–retest reliable, $.74 \leq r \leq .85$, and valid in a Dutch sample of first year university students, $N = 289$, which is similar to our sample (De Beurs et al., 2001). Example items include ‘I couldn’t seem to experience any positive feeling at all’ (D), I felt scared without any good reason (A), and ‘I found it difficult to relax’ (S).
Perceived social support. We assessed social interactions with the Social Support List – Interactions (SSL-I) and – Negative Interactions (SSL-N), which have also proven to have good construct validity, high internal reliability, SSL-I: $\alpha = .90 \leq$ Cronbach’s $\alpha \leq .93$; SSL-N: $\alpha = .69 \leq$ Cronbach’s $\alpha \leq .81$, and test–retest stability, SSL-I: $r = .77$; SSL-N: $r = .56$ (Van Sonderen, 2012). Research has demonstrated that negative interactions (e.g. giving one disapproving comments, treating one unfairly), are not at the other end of the spectrum of positive interactions. Negative social interactions are considered an independent aspect of interpersonal functioning and are related to psychological non-well-being (Van Sonderen & Ormel, 1997). Example items for the positive interactions are: ‘People confide in you’, ‘People are affectionate towards you’, ‘People treat you unjustly’, and ‘People react coolly’.

Results

Descriptive statistics

In Table 1, the descriptive statistics of all variables at T1 and T2 are presented. Paired-samples t-tests pointed out that positive narratives were generally less coherent than negative narratives, both at T1, $t(634) = -4.23, p < .001$, and at T2, $t(231) = -1.96, p = .05$.

In Table 2, cross-sectional correlations at T1 between narrative coherence, mental health and social support are presented. At T1, all measures of coherence were significantly positively associated with psychological well-being and negatively with symptoms of depression. Total coherence, coherence of positive narratives and chronological coherence were negatively associated with symptoms of anxiety and negative social interactions. No significant associations were observed with regards to stress or positive social interactions, no further analyses were run for these concepts.

In Table 3, stability correlations between T1 and T2 can be found. Cross-sectional correlations at T2 are presented in Supplemental Material 2.

Cross-sectional analyses

In Table 4, the results of cross-sectional regressions are presented. Three different series of regression analyses were conducted (series 1a, 2a, 3a). In the first series, total coherence was inserted as predictor, whereas in the second and third series, respectively, positive and negative narrative coherence were predictors, and the three dimensions (context, chronology, theme) were predictors. If the coherence measure was a significant predictor of a mental health outcome in series 1a, 2a or 3a, extra regressions (1b, 2b, 3b) were run in which social interactions were added to the model. This was done in order to test the hypothesized cross-sectional mediations. In the regression with psychological well-being as an outcome and total coherence as predictor (series 1a), higher total coherence was predictive for higher well-being. The addition of negative social interactions in series 1b caused an improvement in the total explained variance ($R^2$); negative social interactions were observed to be a significant predictor of psychological well-being, but also total coherence remained a significant predictor (to a lesser degree). This

| Table 1. Descriptive Statistics at T1 and T2. |
|---------------------------------------------|
| T1 | T2 |
| Min | Max | M | SD | Min | Max | M | SD |
| TOT | 0 | 9.0 | 5.50 | 2.05 | 0 | 9.0 | 5.24 | 2.12 |
| POS | 0 | 9 | 5.24 | 2.31 | 0 | 9 | 5.09 | 2.39 |
| NEG | 0 | 9 | 5.76 | 2.31 | 0 | 9 | 5.39 | 2.48 |
| CON | 0 | 3.0 | 1.52 | 0.86 | 0 | 3.0 | 1.48 | 0.91 |
| CHR | 0 | 3.0 | 1.97 | 0.85 | 0 | 3.0 | 1.89 | 0.85 |
| THE | 0 | 3.0 | 2.01 | 0.78 | 0 | 3.0 | 1.87 | 0.79 |
| PWB | 16 | 56 | 44.06 | 7.26 | 15 | 56 | 43.37 | 7.67 |
| DEP | 0 | 42 | 10.14 | 9.98 | 0 | 40 | 9.02 | 8.65 |
| ANX | 0 | 42 | 9.62 | 8.44 | 0 | 42 | 8.79 | 8.64 |
| STR | 0 | 40 | 14.94 | 9.59 | 0 | 42 | 14.05 | 8.82 |
| SSP | 50 | 136 | 92.82 | 17.33 | 34 | 136 | 90.08 | 16.81 |
| SSN | 7 | 28 | 11.75 | 3.73 | 7 | 28 | 11.70 | 3.70 |

| Note. Abbreviations are total narrative coherence (TOT), coherence for positive narratives (POS), coherence for negative narratives (NEG), contextual coherence (CON), chronological coherence (CHR), thematic coherence (THE), psychological well-being (PWB), symptoms of depression (DEP), anxiety (ANX), stress (STR), perceived social support: positive interactions (SSP), and perceived social support: negative interactions (SSN). |

| Table 2. Table of Pearson Correlations between Narrative Coherence, Mental Health and Perceived Social Support at T1. |
|---------------------------------------------|
| T1 | PWB | DEP | ANX | STR | SSP | SSN |
| TOT | .13** | -.13** | -.09* | -.00 | .05 | -.09* |
| POS | .12** | -.11** | -.08* | .02 | .02 | -.10** |
| NEG | .11*** | -.12** | -.08 | .02 | .06 | -.05 |
| CON | .10* | -.08* | -.08 | .01 | .05 | -.07 |
| CHR | .11** | -.15** | -.09* | -.03 | .04 | -.08* |
| THE | .13*** | -.10** | -.06 | .02 | .03 | -.07 |
| SSP | .49** | -.26** | -.07 | -.07 |
| SSN | -.31** | .38** | .40** | .36** |

| Note. Abbreviations are total narrative coherence (TOT), coherence for positive narratives (POS), coherence for negative narratives (NEG), contextual coherence (CON), chronological coherence (CHR), thematic coherence (THE), psychological well-being (PWB), symptoms of depression (DEP), anxiety (ANX), stress (STR), perceived social support: positive social interactions (SSP), perceived social support: negative social interactions (SSN). * p < .05** p < .01. |
indicates that negative social interactions partially mediated the association between total coherence and psychological well-being. The regression with psychological well-being as outcome and either positive and negative coherence or the three dimensions of coherence as predictors were both not significant.

In the regression with symptoms of depression as an outcome and total coherence as predictor (series 1a), total coherence was again a significant predictor, with higher levels of coherence being predictive for fewer depressive symptoms. The addition of negative social interactions in series 1b caused an improvement in the total explained variance ($R^2$); negative social interactions were observed to be a significant predictor of depressive symptoms, but also total coherence remained a significant predictor (to a lesser degree). This shows that negative social interactions partially mediated the association between total coherence and depressive symptoms. The regression with symptoms of depression as outcome and positive and negative coherence as predictors was not significant. In the regression with symptoms of depression as an outcome and the three dimensions as predictors (series 3a), chronological coherence was a significant predictor, with higher chronological coherence being predictive for fewer depressive symptoms. The addition of negative social interactions in series 3b caused an improvement in the total explained variance ($R^2$); negative social interactions were observed to be a significant predictor of depressive symptoms, but also chronological coherence remained a significant predictor (to a lesser degree). This shows that negative social interactions

Table 3. Table of Stability Scores over Time (Pearson Correlations).

|         | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PWB     | .67*| .63*| .58**| .74**| .61**| .48**| .43**| .35**| .38**| .35**| .40**|

Note: Abbreviations are total narrative coherence (TOT), coherence for positive narratives (POS), coherence for negative narratives (NEG), contextual coherence (CON), chronological coherence (CHR), thematic coherence (THE), psychological well-being (PWB), symptoms of depression (DEP), anxiety (ANX), stress (STR), perceived social support: positive interactions (SSP), and perceived social support: negative interactions (SSN). * p < .05 ** p < .01.

Table 4. Table of Cross-Sectional Regressions and Mediations at T1.

Series 1a

|         | T1 | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ct      | .13| .51**| .02| .13| .32**| .14| .13| .32**| .02| .09| .22| .16| .16|
| TOT     | .11| 4.05**| .11| .56| 2.78**| -.10| .56| 2.62**| .16| .22| .16| .16| .16|
| SSNEG   | -.30| -7.95**| .37| 10.08**| -.37| .37| 10.08**| .39| .10| .10| .10| .10|

Series 1b

|         | T1 | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ct      | .08| 1.73| .07| .07| .13| .07| .07| .13| .07| .07| .07| .07| .07|
| TOT     | .06| 2.78**| .06| .06| .13| .06| .06| .13| .06| .06| .06| .06| .06|
| SSNEG   | -.30| -7.95**| .37| 10.08**| -.30| .37| 10.08**| .39| .10| .10| .10| .10| .10|

Series 2a

|         | T1 | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ct      | .04| .94| .00| .00| .00| .00| .00| .00| .00| .00| .00| .00| .00|
| TOT     | .03| .49| .14| .14| .49| .14| .14| .49| .14| .14| .14| .14| .14|
| SSNEG   | .09| 1.66| .09| .12| .12| .09| .12| .12| .09| .12| .12| .12| .12|

Series 3a

|         | T1 | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ct      | .04| .94| .00| .00| .00| .00| .00| .00| .00| .00| .00| .00| .00|
| TOT     | .03| .49| .14| .14| .49| .14| .14| .49| .14| .14| .14| .14| .14|
| SSNEG   | .09| 1.66| .09| .12| .12| .09| .12| .12| .09| .12| .12| .12| .12|

Series 3b

|         | T1 | PWB | DEP | ANX | STR | SSP | SSN | TOT | POS | NEG | CON | CHR | THE |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ct      | .01| .34| .01| .34| .01| .34| .01| .34| .01| .34| .01| .34| .01|
| TOT     | .03| .49| .14| .14| .49| .14| .14| .49| .14| .14| .14| .14| .14|
| SSNEG   | .09| 1.66| .09| .12| .12| .09| .12| .12| .09| .12| .12| .12| .12|

Note: Abbreviations are total narrative coherence (TOT), coherence for positive narratives (POS), coherence for negative narratives (NEG), contextual coherence (CON), chronological coherence (CHR), thematic coherence (THE), psychological well-being (PWB), symptoms of depression (DEP), anxiety (ANX), perceived social support: negative social interactions (SSN), constant (Ct). * p < .05 ** p < .01.
partially mediated the association between chronological coherence and depressive symptoms.

In the regression with symptoms of anxiety as an outcome and total coherence as predictor (series 1a), total coherence was again a significant predictor, with higher levels of coherence being predictive for fewer anxious symptoms. The inclusion of negative social interactions in series 1b caused an improvement in the total explained variance ($R^2$); negative social interactions were observed to be a significant predictor of anxious symptoms, whereas total coherence became no significant predictor anymore. This shows that negative social interactions fully mediated the association between total coherence and anxiety symptoms. The regressions with anxiety symptoms as outcome and either positive and negative coherence or the three dimensions of coherence as predictors were both not significant.

In addition, direct mediation analyses were run for the variables that were significantly related in Table 4, using the PROCESS macro 3.5 in SPSS, to investigate whether the association between aspects of narrative coherence (predictor) and measures of mental health (outcome) were mediated by negative social interactions (mediator). Cross-sectionally, in accordance with regression series 1b, total narrative coherence was investigated as predictor, and psychological well-being, depressive symptoms and anxiety symptoms were consecutively investigated as outcome, with negative social interactions as a mediator each time. There was a positive significant relation between total narrative coherence and psychological well-being, when controlling for negative social interactions, $b = .37, t(628) = 2.78, p < .001$. The effect of narrative coherence on negative social interactions was also significant but negative, $b = -.15, t(628) = -2.18, p = .03$. The effect of negative social interactions on psychological well-being was also significant and negative, $b = -.60, t(628) = -7.95, p < .001$. In other words, there was a total effect of total narrative coherence on psychological well-being, of which 19.89% was mediated through negative social interactions (IE = .09). Using non-parametric bootstrapping procedures, the indirect effect showed to be statistically significant between the 2.5th and 97.5th percentile, 95% CI [−.009 to -.015]. Using non-parametric bootstrapping procedures, the indirect effect showed to be statistically significant between the 2.5th and 97.5th percentile, 95% CI [−.007 to -.018].

Summarized, there was a total effect of total narrative coherence on anxiety symptoms, via a full mediation (38.39%) of negative social interactions, of which 25.18% was mediated through negative social interactions (IE = −.15). Using non-parametric bootstrapping procedures, the indirect effect showed to be statistically significant between the 2.5th and 97.5th percentile, 95% CI [−.009 to -.015].

Prospective analyses

In Table 5, the prospective regressions are presented with different measures of coherence at T1 as predictors and the mental health variables at T2 as criteria. The predictive value for mental health was assessed over a 5-month time interval, after control for the respective mental health variable at T1. Here again, three different series of regression were conducted (1a, 2a, 3a). In the first series, total coherence was inserted as predictor, whereas in the second and third series, respectively, positive and negative narrative coherence were predictors, and the three dimensions (context, chronology, theme) were predictors. Similar to the analyses above, we conducted follow-up prospective regression analyses if the coherence measure was a significant
predictor of a mental health outcome over time in series 1a, 2a or 3a. The extra regressions (1b, 2b, 3b) in which social interactions were added to the model, were run in order to test the hypothesized prospective mediations.

For psychological well-being, no significant results were observed.

In the regression with total coherence as a predictor or the three dimensions as predictors and depression as outcome (series 2a), no significant results were observed. However, in the regressions with positive and negative narratives as predictors and anxiety as outcome, positive coherence was a significant predictor of fewer depressive symptoms over time. The addition of negative social interactions in series 2b caused a significant improvement in the total explained variance ($R^2$); negative social interactions were observed to be a significant predictor of anxious symptoms, but also positive narrative coherence remained a significant predictor (to a lesser degree). This shows that negative social interactions partially mediated the prospective association between positive coherence and anxious symptoms.

Prospectively, direct mediation analyses were run for the variables that were significantly related in Table 5, using the PROCESS macro 3.5 in SPSS, to investigate whether the association between aspects of narrative coherence at T1 (predictor) and measures of mental health at T2 (outcome) were mediated by negative social interactions at T2 (mediator). In accordance with regression series 2b (Table 4), positive coherence at T1 was investigated as a predictor, negative social interactions at T2 as a mediator and depressive or anxious symptoms at T2 as an outcome. There was no direct effect between positive narrative coherence and depressive symptoms, after controlling for negative social interactions, $b = -.29$, $t(229) = -1.56$, $p = .12$. The

|                  | PWB     |         | DEP     |         | ANX     |         |
|------------------|---------|---------|---------|---------|---------|---------|
|                  | $\beta$ | $t$     | $R^2$   | $\beta$ | $t$     | $R^2$   |
| Series 1a        |         |         |         |         |         |         |
| $Ct$             | 4.87**  | .45     | 3.61**  | .40     | 3.51**  | .38     |
| Crit T1          | .66     | 13.23   | .62     | 11.89   | .60     | 11.28   |
| TOT              | .03     | .69     | -.07    | -1.34   | -.10    | -1.83   |
| Series 2a        |         |         |         |         |         |         |
| $Ct$             | 4.88**  | .45     | 3.44**  | .41     | 3.33**  | .40     |
| Crit T1          | .66     | 13.25   | .62     | 11.97   | .60     | 11.41   |
| POS              | .07     | 1.22    | -.13    | -2.00*  | -.19    | -3.00***|
| NEG              | -.04    | -.58    | .05     | .75     | .08     | 1.28    |
| Series 2b        |         |         |         |         |         |         |
| $Ct$             |         |         |         |         |         |         |
| Crit T1          | .53     | 9.91**  | .48     | 9.23**  |
| POS              | -.08    | 1.37    | -.14    | -2.37*  |
| NEG              | .04     | .63     | .08     | 1.32    |
| SSN T2           | .27     | 5.03**  | .31     | 5.83**  |
| Series 3a        |         |         |         |         |         |         |
| $Ct$             | 4.81**  | .45     | 3.92**  | .41     | 3.32**  | .38     |
| Crit T1          | .66     | 13.17   | .62     | 11.95   | .59     | 11.13   |
| CON              | -.02    | -.32    | .05     | .83     | -.06    | -1.01   |
| CHR              | .04     | .58     | .00     | -.06    | -.05    | -.65    |
| THE              | .01     | .16     | -.13    | -1.79   | .00     | -.04    |

Note. Abbreviations are total narrative coherence (TOT), coherence for positive narratives (POS), coherence for negative narratives (NEG), contextual coherence (CON), chronological coherence (CHR), thematic coherence (THE), psychological well-being (PWB), symptoms of depression (DEP), anxiety (ANX), stress (STR), constant (ct), criterium (Crit). * $p < .05$ ** $p < .01$. 

Table 5. Table of Prospective Regressions and Mediations with Predictors (Coherence) at T1 and Criterium (Mental Health Variable) at T2, after Control for Criterium at T1.
effect of positive coherence on negative social interactions was significant and negative, $b = -0.30$, $t(229) = -2.86$, $p = .005$. The effect of negative social interactions on depressive symptoms was also significant but positive, $b = 1.07$, $t(229) = 7.77$, $p < .001$. In sum, there was a total effect of total narrative coherence on depressive symptoms, via a full mediation (48.23%) of negative social interactions (IE $= -0.32$). Using non-parametric bootstrapping procedures, the indirect effect showed to be statistically significant between the 2.5th and 97.5th percentile, 95% CI $[-.6027$ to $-0.0749]$.

A negative relation between positive narrative coherence and anxious symptoms was observed but this was not significant, when controlling for negative social interactions, $b = -0.41$, $t(229) = -1.91$, $p = .06$. The effect of positive narrative coherence on negative social interactions was significant and negative, $b = -0.29$, $t(229) = -2.86$, $p = .005$. The effect of negative social interactions on anxious symptoms was also significant but positive, $b = 1.13$, $t(229) = 8.45$, $p < .001$. In sum, there was a total effect of positive narrative coherence on anxious symptoms, via a full mediation (45.21%) through negative social interactions (IE $= -0.33$). Using non-parametric bootstrapping procedures, the indirect effect showed to be statistically significant between the 2.5th and 97.5th percentile, 95% CI $[-.6389$ to $-0.0824]$.

**Discussion**

In this longitudinal study, three research aims were examined. Our first aim was to assess the cross-sectional associations between narrative coherence and mental health in a comprehensive way, in which multiple different mental health outcomes and multiple aspects of coherence were taken into account. In line with our hypotheses, the cross-sectional zero-order correlations indicated that at T1, all measures of coherence were significantly positively associated with psychological well-being and negatively with symptoms of depression. Total coherence, coherence of positive narratives and chronological coherence were negatively associated with symptoms of anxiety and negative social interactions. No significant associations of any of the coherence measures with stress or positive social interactions were observed. In sum, this means that individuals who are better able to narrate coherently about their past personal experiences, show better psychological and social adjustment, in terms of higher well-being, fewer internalizing symptoms and fewer negative interactions with their social circle. This is consistent with much of the previous research that has also observed these relationships (e.g. Adler et al., 2016; Baerger & McAdams, 1999; Burnell et al., 2010; Chen et al., 2012; Mitchell et al., 2020; Vanderveren et al., 2019; Waters & Fivush, 2015). In addition, our data also extend previous research by showing that not only the composite measure, the thematic dimension or negatively valenced narratives are of importance in relation to mental health; rather, other measures, specifically thematic coherence and coherence of positive narratives, also significantly correlate to well-being and internalizing symptoms. Furthermore, the cross-sectional regression analyses showed that for psychological well-being and for symptoms of anxiety, only total coherence was a significant predictor, but neither valence of the narrative, nor any of the specific dimensions of coherence were significant predictors. For symptoms of depression, total coherence was again a significant predictor, as well as chronological coherence, but, again, not the specific valence of the event. Data in this study suggest thus that, on a cross-sectional level, overall narrative coherence is the best predictor of mental health. The differentiation between positive and negative narratives did not seem to offer any additional predictive value in this study; moreover, the predictive value disappeared when only taking into account either positive or negative narratives. Possibly, it could be important to take into account the retention interval and the emotional intensity of memories in order to uncover differences in negative and positive memories (Waters et al., 2013). When assessing the three dimensions of coherence, we did not observe thematic coherence, but rather chronological coherence to be the most significant predictor of mental health, here measured as depressive symptoms. This challenges the interpretation suggested by previous research that the importance of coherence lies in its relation to thematic coherence or meaning-making in relation to mental health (Adler et al., 2016; Boals et al., 2011; Cox & McAdams, 2014; Graci & Fivush, 2017; Habermas, 2011; McLean et al., 2010; Reese et al., 2017), and suggests that being able to construct a coherent chronological account that orders actions in time may be a critical component in how narratives relate to mental health.

Our second aim concerned the investigation of the relation between coherence and mental health over a 5-month time interval. Longitudinal regressions indicated that the measures of coherence showed almost no predictive value for the mental health criteria at T2, after controlling for the mental health criteria at T1, probably because of high stability of mental health over this relatively short interval. Due to high correlations (see Supplemental Material 2) of the criterium measures at T1 versus T2, there was little room left for the coherence measures at T1 to predict additional variance in the criterium at T2. Nonetheless, coherence for positive narratives at T1 predicted relative decreases in depressive and anxious symptoms over a 5-month time period. Individuals who can construct more coherent narratives about their positive past experiences, will experience better mental health (i.e. fewer internalizing symptoms of depression and anxiety) over time. These results are in line with other findings showing that coherence is prospectively
predictive of mental health (Booker et al., 2020; Cox & McAdams, 2014; Fivush et al., 2004; Mason et al., 2019; Mitchell et al., 2020). However, the findings in this study contradict the often-suggested idea that the coherence of negative narratives, in particular, is most relevant with regards to mental health (Baker-Ward et al., 2005; Boals et al., 2011; Fivush et al., 2003; 2008; Vanderveren et al., 2019). In contrast, in our study, only the coherence of positive narratives predicted a relative decrease of depressive and anxious symptoms over time. Overall, the cross-sectional analyses revealed that narrative coherence was associated with both forms of eudaimonic (high levels psychological well-being) and hedonic well-being (low levels of psychopathology) (Keyes & Magyar-Moe, 2003; Ryff & Keyes, 1995). Nonetheless, in the prospective analyses, coherence indices only predicted forms of hedonic well-being. It may be the case that coming to a coherent account of (positive) past personal experiences protects against psychopathology, but not necessarily promotes living a flourishing life over time. Future research would benefit from including broader and more diverse assessments of mental health, as well as longitudinal studies with longer time intervals in an effort to better understand differences in relation to narrative coherence.

Our third research aim concerned testing the mediating effect of perceived negative social interactions in the relation between narrative coherence and mental health. We tested the mediations via regression analyses as well as via the PROCESS macro. Both types of analyses produced the same results. We can conclude that negative social interactions partially mediate the cross-sectional relations between total narrative coherence and psychological well-being. The same was found for depression, as negative social interactions partially mediated the cross-sectional relations between total narrative coherence and depressive symptoms. A further analysis showed that in particular chronological coherence was associated with depressive symptoms, and that this relation was also partially mediated through perceived negative social interactions. With regards to anxiety, negative social interactions fully mediated the cross-sectional relations between total narrative coherence and anxious symptoms. Thus, individuals who were more coherent experienced fewer negative social interactions and had better mental health. Although correlational, these results might suggest that coherent narrators garner more positive social interactions (e.g. Pasupathi & Billitteri, 2015; Vanaken et al., 2020; Vanaken & Hermans, 2020), which in turn facilitates better mental health. Prospectively, positive narrative coherence predicted a relative decrease in depressive symptoms and anxious symptoms over a 5-month time window, which was fully explained by the amount of perceived negative social interactions over time. This suggests that individuals who are more coherent, will experience fewer internalizing symptomatology 5 months later, again, perhaps because they will experience fewer negative social interactions over time. Given our provocative findings, future research should investigate the causal nature of these relations in more detail. It is important to note that due to the large number of correlations tested in this study, replication studies are needed to evaluate possible type-I errors as well as to demonstrate the robustness of current results.

Still, our results suggest that individuals who were able to narrate coherently about their life stories, are less likely to experience negative social interactions with the people in their social network, both at the same moment in time, and over a 5-month time span. Furthermore, these social interactions have proven to be of significant importance for mental health outcomes of well-being and internalizing psychopathology. In sum, we observed that the relation between narrative coherence and mental health may be explained by the extent to which individuals experience negative social interactions with the people around them. This is in line with previous research suggesting that characteristics of autobiographical memory and the functions of autobiographical memory (here: the social function) are related, and that studying their relation may help us to understand why memory and mental health are related (Barry et al., 2019; Beike et al., 2016; Waters, 2014). Our findings are also consistent with recent experimental work (Vanaken et al., 2020), which shows that the absence of narrative coherence has a detrimental impact on the social reactions we receive from listeners. As we share our experiences with others through narrative interactions, the ability to create more coherent narratives is related to social support, most likely in a bidirectional way. Coherence garners more positive social responses than incoherence, and as we narrate our experiences to interested and involved listeners, those experiences become more narratively coherent for ourselves (Pasupathi & Billitteri, 2015), and this whole process is related to higher levels of well-being. This is also in accordance with a broad domain of evidence supporting the relation between social support and mental health (e.g. Ozbay et al., 2007; Harandi et al., 2017) and with Coyne’s interactional theory of depression (1976a; 1976b), in which he stated the importance of social factors in maintaining depression.

Furthermore, prospectively, coherence seemed particularly important in narratives about positive life events, in comparison to negative ones. Negative social interactions fully mediated the relation between positive coherence and both depressive and anxious symptoms over time. This is consistent with recent experimental work which also suggests that lower levels of coherence can negatively impact the social responses of listeners (i.e. in terms of willingness to interact, social support, attitude), but only when these narratives concern positive memories (Vanaken & Hermans, 2020).
listeners only diminished when the narratives were about positive topics, but not when they were about negative topics. Listeners are likely to be more tolerant towards incoherent individuals when they are narrating about a negative life event, since they assume that incoherence might be part of the cognitive-emotional processing of the event, or that the individual is still in the process of making meaning of the event. Some research is indeed in support of the idea that negative emotional content, and especially traumatic content, can disturb the coherence of autobiographical memories (Bisby et al., 2018; Brewin, 2001; Brewin et al., 1996). Furthermore, listeners could be more habituated towards incoherent negative stories, since the help of loved ones is often sought after going through a difficult event, for compassion reasons (Duprez et al., 2015) or in order to co-construct a chronologically ordered and emotionally regulated narrative (Fivush & Sales, 2006; Pasupathi et al., 1998). Hence, there might be fewer negative social reactions when coherence is lower in negative stories, compared to in positive stories. Relatedly, positive stories are more frequently used for entertaining purposes and hence possibly expected to be more coherent. Indeed, research proposes that positive autobiographical memories are, in comparison to negative ones, more frequently employed to bond with other people, as they are more adept at evoking feelings of interpersonal closeness and liking (Alea et al., 2013; McLean & Lilgendahl, 2008; Rasmussen & Berntsen, 2009). The absence of coherence in positive narratives might thus hinder the development or maintenance of a social support network. When social support is limited or absent, risks for mental and physical health problems are severely heightened (Coyne, 1976a; 1976b; Ozbay et al., 2007; Harandi et al., 2017). A great deal of memory and clinical research has focused on the importance of social support in the face of negative life events or trauma resilience (Sippel et al., 2015; Ozer et al., 2003; Southwick et al., 2014), but Frederickson’s ‘broaden and build’ model of positive emotions provides additional ways to think about the mental health benefits of sharing positive experiences with others (Fredrickson, 2013). Importantly, the innovativeness of our findings lies in the idea that social support might not only be important after experiencing a negative or traumatic event, but also after experiencing a positive event, and that the level of coherence may play a crucial role here.

Limitations

Inevitably, there are a couple of limitations to discuss. The amount of drop-out at the second timepoint was rather large. However, descriptive results showed that the sample at T2 was not significantly different from the one at T1 in terms of gender, age and narrative coherence scores. In addition, attrition analyses showed that none of the well-being or psychopathology measures predicted attrition. Thus, staying in versus dropping out occurred at random. Also, in comparison to recent similar research (Mitchell et al., 2020), our sample size at the second timepoint was still larger than average and sufficiently powered. Nonetheless, this research domain would benefit from future studies working with larger samples over longer periods of time. Another limitation concerns the fact that our sample was very homogeneous in terms of gender and culture, which limits the generalizability of our results. Narrative coherence has shown to differ over genders and cultures (Altunnar & Habermas, 2018; Fivush et al., 2003; 2017; Fivush & Nelson, 2004; Grysmann et al., 2016; Grysmann & Hudson, 2013; Han et al., 1998; Nelson, 1993; Reese et al., 2017). However, the number of men in our study was insufficiently large to examine gender differences. Due to this, our findings are in particular applicable to women, and follow-up studies in more gender-balanced samples are strongly recommended, as well as research on the relation between coherence and social interactions in culturally and ethnically diverse contexts. Furthermore, our correlational design does not allow to draw any causal conclusions. Future experimental research would be beneficial to investigate the causal impact of narrative coherence on mental health. Also, since this is only one of the first studies taking into account both valence and different dimensions of coherence, replication studies are highly recommended to examine the robustness and generalizability of the currently obtained results. Additionally, we only investigated indicators of the social function as mediator in this study. Possibly, there are other mediators of the relation between coherence and mental health, for instance, linked to the self or the directive function of autobiographical memory. Future attempts to integrate research on characteristics and functions of autobiographical narratives are thus recommended. In addition, other possible mediators of the relation between narrative coherence and mental health could be examined. Inspiration could be put from the work on schizophrenia in which disturbances in narrative are easier to detect ad more dramatic (Lysaker et al., 2002). For instance, there is the idea that the ability to successfully narrate challenges is linked to the ability of how to manage them (Allé et al., 2015). Finally, future community based research could pay more attention to examining possible covariates of narrative coherence, including the role of problems in metacognitive capacity and social isolation (Holm et al., 2020; Lysaker et al., 2021).
psychological well-being, fewer symptoms of depression and anxiety, and fewer negative social interactions. Cross-sectional regressions showed that total narrative coherence was significantly predictive for higher psychological well-being and fewer symptoms of depression and anxiety, and that chronological coherence was particularly significant in the prediction of depressive symptomatology. These relations were mediated by perceived negative social interactions, which indicate that individuals who were more narratively coherent showed better mental health, because they experienced fewer negative social interactions. Furthermore, over a 5-month time interval, higher coherence of positive narratives predicted relative decreases in depressive and anxious symptoms. These relations were fully mediated by the amount of perceived negative social interactions. Individuals who were more coherent about their past positive life events experienced a relative decrease in depressive and anxious symptoms over a 5-month time interval because they experienced fewer negative interactions with their social network over time.

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Data availability statement
The study was conducted in accordance with ethical guidelines and approved by the Social and Societal Ethics Committee of the KU Leuven (G-2018 01 1067) and was pre-registered on AsPredicted https://aspredicted.org/v62ri.pdf. The data that support the findings of this study are openly available in Open Science Framework (OSF): https://osf.io/8uknp/?view_only=c227e0731e4f49b4b2683b786e4537de

Supplemental material
Supplemental material for this article is available online.

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Notes
1. Note that the social function is not the only function that autobiographical memory is thought to serve. Most hypothesized functions fit the model that Pillemer (1992) proposed and later developed into Bluck’s model (2003). This model considers autobiographical memory to serve three main functions, which are a directive (guiding future behaviour), a self (creating a continuous sense of identity) and a social (developing and nurturing social bonds) function (Bluck et al., 2005). However, the directive and self-function fall outside the scope of this study.

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