

Mapping the Stress Generation Hypothesis in Anxiety: A Scoping Review

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The Honours Bachelor Thesis (PSB3E-BTHO)

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June 2023

Abstract

The components and mechanisms underlying the development and maintenance of psychopathology are crucial to our understanding of psychology and to treatment of disorders, such as anxiety. The stress-diathesis model and its subparts are crucial to this understanding. To map already existing research on stress generation—a specific subpart of the stress-diathesis model—a scoping review will be conducted. This scoping review will specifically focus on stress generation in anxiety, due to less research being conducted for this disorder, as compared to stress generation in depression. English, peer-reviewed, and quantitative journal articles which were published on PsychInfo, PsychArticles, or the RUG Psychology and Behavioural and Social Sciences Collection databases between 1991 and 2023 will be reviewed. This will result in the inclusion of 16 studies in the analysis of the scoping review. Results will include a timeline of published articles; two tables summarising important details of each article; and a thematic analysis resulting in four main themes. The results of this scoping review seek to act as a foundation for the creation of systematic reviews or meta-analyses to accurately explore the concept of stress generation in anxiety.

Mapping the Stress Generation Hypothesis in Anxiety: A Scoping Review

Introduction

Stress occurs when a person anticipates or encounters adversity during goal-related activities (Carver & Connor-Smith, 2010). Research has suggested that stress consists of two main components: stress exposure and stress response (Dohrenwend & Dohrenwend, 1974 and Selye, 1955). Stress exposure refers to the environmental challenges that an individual faces. These challenges can be acute or chronic, as well as range from minor to traumatic events. Stress response is different from stress exposure in that it does not focus on the external stressful events, but rather the internal manifestations of these stressors. These can manifest in anything from HP-axis activation to states of fear or depression.

According to Sapolsky (1996), the stress response is not only negative, it is an evolutionary mechanism that improves physiological and psychological functioning to increase survival and fulfil urgent needs. Stress that activates these positive responses is referred to as eustress (Lazarus, 1974 and Le Fevre et al., 2003). Stress exposure leads to increased physiological arousal, wherein attention is narrowed, and focus is given to resources that are required to complete the imminent goal (Hancock & Weaver, 2005). This leads to positive outcomes such as increased performance at work (Fay & Sonnentag, 2002) and at cognitive tasks (Cahill et al., 2003). However, in both negative and positive stress responses two components are reliably linked with one another: after stress exposure, stress response follows.

Nonetheless, there are a myriad of individual difference factors that influence a person's response to stressors, including: cognitive style, genetic vulnerability, and personality. The individual factors cause individual variation in stress response to a similar stress exposure. This poses a challenge for researchers and clinicians alike. Stress is identified as one of the most

prominent contributing factors to the development of mental disorders, as well as to the maintenance of these disorders. Consequently, unravelling the impact of the individual factors present in the stress exposure-stress response system is essential to promoting mental wellbeing.

One of the individual factors that contribute to the negative effects of stress on mental health is stress generation. The topic of stress generation has been heavily researched since 1991, specifically in relation to the development of various internalising disorders such as depression. The stress generation hypothesis was proposed by Hammen (1991) as one of the key maintaining factors of depression. Their paper was a longitudinal study which sought to answer the question of the directionality of stress on psychopathology: Is it only stress that influences psychopathology, or can psychopathology influence stress as well? Hammen's research indicated that depressed women are more likely to experience stressful dependent life events. Dependent life events are those to which the women themselves contributed, rather than those over which they had no influence. These dependent events tended to be negative interpersonal interactions, such as fights with loved ones. Compared to a control group the difference in negative dependent life events was significant for depressed women. This study supported the idea that psychopathology can generate some of the stress that a client experiences.

Accordingly, the stress generation hypothesis takes the prevalent stress-diathesis model and expands upon it. The stress-diathesis model states that the relationship between stress and resultant distress are essential in the cause and maintenance of psychopathology (Zuckerman, 1999). Before 1991 this relationship was mainly seen as one-directional: increased stress can lead to increased symptomatology. The stress generation hypothesis then expanded this theory by adding bidirectionality to the stress-psychopathology relationship.

More specifically, this scoping review seeks to focus on a lesser studied aspect of the stress generation process, namely stress generation in anxiety disorders. Depressive and anxiety

disorders are highly comorbid and have several commonalities such as similar etiological factors, symptomatology, and components of negative affectivity (Kessler et al., 2005).

Therefore, it can be hypothesised that anxiety disorders and anxiety symptoms could potentially increase the probability for negative life events (i.e. stress generation) in the same way as depression. Several studies (Jenness et al., 2019; Judah et al., 2013; Uhrlas & Gibb, 2007; and Joiner et al., 2005) have indicated that this may not be the case and that stress generation only takes place in depression and no other internalising disorders. There are also studies that find that stress generation occurs specifically if comorbid depression and anxiety are present, while others indicate that stress generation most definitively occurs in participants higher in anxiety symptoms. These contradictory findings sparked the need for the current scoping review.

There are three main aims of this scoping review. The first aim is to map the general research conducted regarding the stress generation hypothesis in anxiety. The second aim is to determine whether the stress generation hypothesis in anxiety is still accepted as valid. The third and final aim of this scoping review is to temporally map stress generation in anxiety research production from 1991-2023.

Methods

The scoping review was conducted according to the guidelines published in the Arksey & O'Malley (2005) article. The methodology of the review was pre-registered on the OSF in accordance with the PRISMA-ScR guide. To fully map the use of the stress generation hypothesis in relation to anxiety, literature was reviewed using the following databases: APA PsycInfo, APA PsycArticles, and the RUG Psychology and Behavioural and Social Sciences Collection. The search intended to identify empirical, quantitative studies that used the stress generation hypothesis. Studies that were included were published in English peer-reviewed journals between 01.01.1991 and 10.05.2023, search words included (stress generation

hypothesis) OR (stress generation) OR (stress generation theory) OR (negative life events generation) NOT (animals). Thereafter all studies that included “stress generation” or “generation of negative life events” and “anxiety” in their title or abstract were selected. No books or dissertations were included in the selection because they are not peer-reviewed. No foreign language articles were included due to the limited scope of this thesis. No qualitative articles were included, to ease comparisons between articles. Articles without a focus on anxiety were also excluded. Finally, no studies conducted before 1991 were included because the first article mentioning the stress generation hypothesis was published in 1991 (Hammen).

The last search was conducted on the 10th of May 2023. Data was charted on article characteristics (authors, year of publication); research aims; sample size and sample characteristics; methodology; results; limitations; how the stress generation hypothesis was included into the study; how the study examined the stress - anxiety link; as well as key findings that relate to the stress generation hypothesis in anxiety. The data charting resulted in Table 1 and Table 2 (see Appendix A and B) which summarise the most important aspects of each article. The charting was developed in reference to the JBI Manual for Evidence Synthesis (Aromataris & Munn, 2019). Consequently, studies were grouped according to the types of psychological mechanisms analysed in them, as well as the settings, populations, and study designs investigated. After the data charting thematic analysis of the literature took place, and the most notable themes were delineated.

Results

The literature search resulted in 713 references. After discarding all duplicates, the remaining 596 studies were screened, and 403 studies were excluded after reading the title and abstract. Because of the focus on anxiety, around 168 articles that did not contain the word “anxiety” in their title or abstract were excluded. The 25 remaining studies were read and

thereafter ten articles were excluded while one cross-referenced article was included. The description of this process is visually represented in Figure 1.

In total 16 studies were included in this scoping review (Table 1). Although the search for publications spanned from 1991 to 2023, the oldest study included in this review was from 2001 (Harkness & Luther). Most articles included were published in 2012 and 2015, respectively, as can be seen in the complete overview of the dates when studies have been published (Figure 2).

The thematic analysis of the following 16 studies resulted in four major themes being identified, each containing several sub-themes. Those themes are discussed further, while Table 1 contains a summary of each publication's research aims, samples, study designs, results regarding stress generation in anxiety, and limitations. Moreover, the table is divided into two parts, separating the articles that are against the stress generation hypothesis in anxiety from those articles that support the stress generation in anxiety hypothesis. Additionally, Table 2 outlines the measures used in studies to assess the variables of "Anxiety" and "Life Events" in relation to the results on pp. 9-12.

Figure 1

Study Selection Flow Diagram adapted from Pietras & Briken (2021)

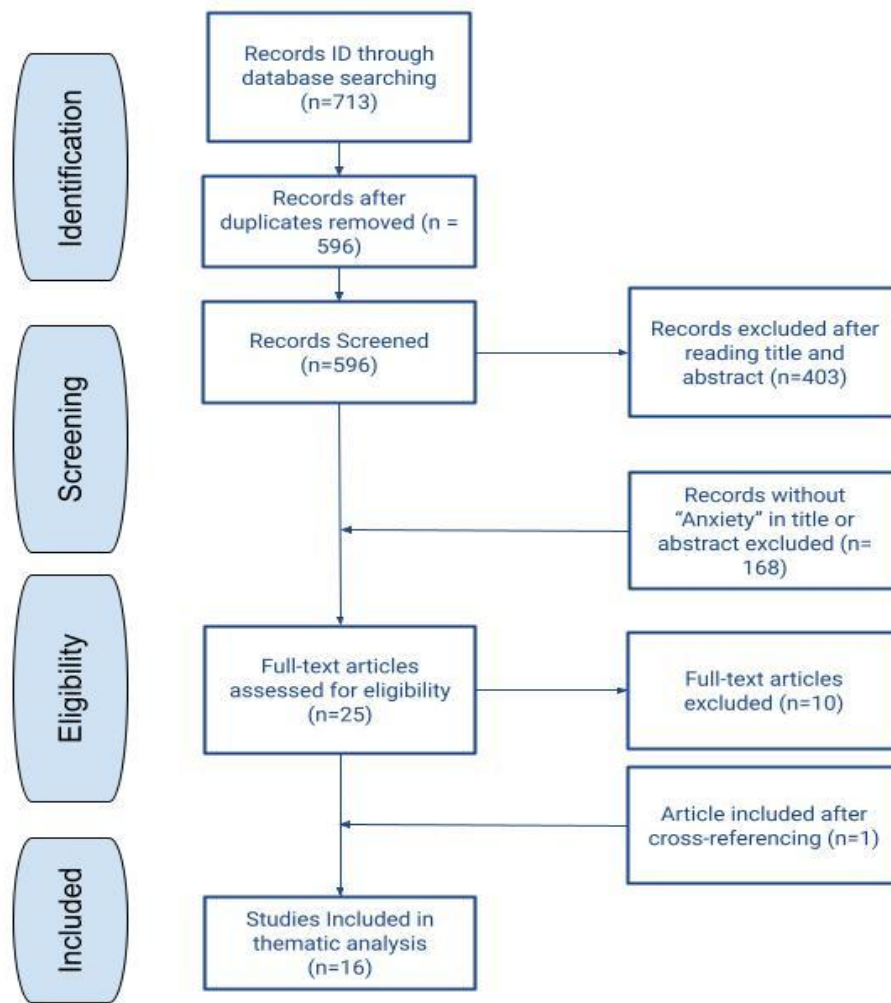


Figure 2

Number of Publications over Time

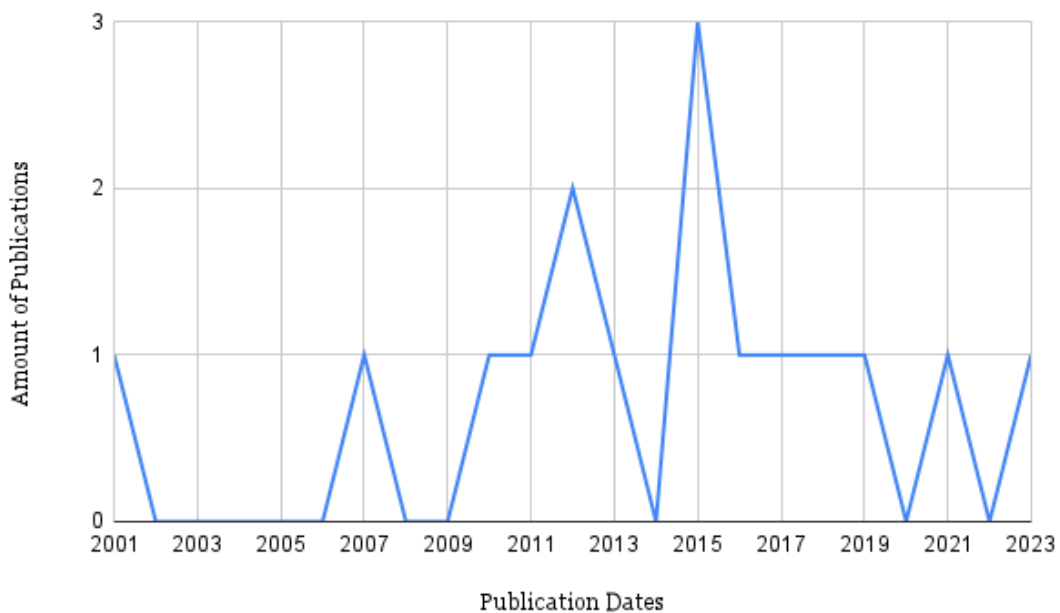


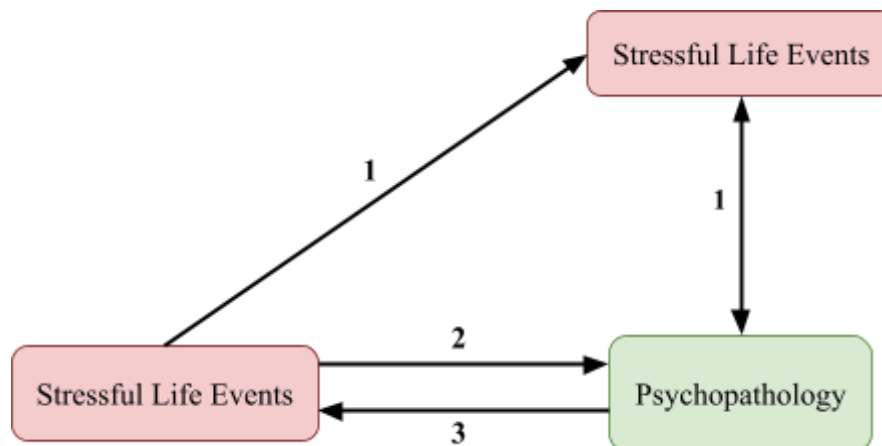
Table 1. Summary of publications included in scoping review (n=16) (see Appendix A).

Stress Continuation vs Stress Causation vs Stress Generation

There is an abundance of evidence supporting stress generation in various internalising disorders when this construct is defined broadly. However, while reviewing the literature, it was seen that various studies use the words “stress generation” to describe different processes. There are at least three distinct processes that are used in publications to describe the so-called “stress generation” phenomenon. These are: stress continuation, stress causation and finally “stress generation”.

Figure 3

Stress Continuation, Stress Causation, and Stress Generation



Note. 1 depicts stress continuation; 2 indicates stress causation; 3 depicts stress generation.

1) Stress Continuation. One concept which some publications refer to as stress generation, may in fact be better explained as stress continuation. Specifically, the study by Uliaszek et al. (2012) explained the difference between stress continuation and stress causation. The former explains that the depression-stress relationship is due to the continuity of stressors over time (Uliaszek et al., 2012). Thus, there is no causal relation where internalising disorders

lead to life stress. This process posits that there is only a cross-sectional link between psychopathology and stress at baseline, however stressful life events remain stable over time (Uliaszek et al., 2012). Ergo if stressful events at baseline are factored in, all relations between it and psychopathology will be included. (Rudolph et al., 2000; Uliaszek et al., 2010).

2) Stress Causation. The second concept that studies might refer to as stress generation is the concept of “stress causation”. This refers to the process where negative life events lead to an increase in internalising disorders. Three out of the 16 reviewed studies mention stress causation: Uliaszek et al. (2012); Phillips et al. (2015); and Schneider et al. (2021). In Uliaszek and colleagues’ publication they refer to stress causation as stress generation, while at the same time distinguishing it from stress continuation. The two other studies distinguish stress causation from stress generation in the same way as done in this scoping review. These differences in defining stress causation and stress generation indicates that there is still some uncertainty about what exactly true stress generation is. This report has not included various other publications that have used the name stress generation to describe the link between stressful life events and the following psychopathology (stress causation). However, all studies that analyse the directional link of anxiety leading to an increase in stressful life events have been included, no matter the title given to this link.

3) Stress Generation. Finally, there is stress generation as it was originally conceptualised by Hammen (1991). This refers to the relationship that occurs when psychopathology leads to stressful life events. For example, stress generation occurs when depression, or anxiety, leads to a person generating stressful life events later in time. The stress generation process as a whole is bidirectional and thus consists of both stressful life events leading to psychopathology and then psychopathology leading to stressful life events (Hammen, 1991). However, the 16 studies reviewed in this thesis specifically analyse the lesser researched

link in this process: how anxiety leads to stressful life events. Accordingly, for the purposes of this paper, that direction of the relationship is what will be referred to as “stress generation”.

Another distinction found in the reviewed literature concerns how the stress generation process is measured and employed in research. Twelve studies look closer at the process of generating stress and try to unravel the mechanisms that may underlie this link (Schneider et al., 2021; Judah et al., 2013; Jenness et al., 2019; Bodell et al., 2012; Harrison et al., 2023; Goldstein et al., 2021; Phillips et al., 2015; Siegal et al., 2018; Connolly et al., 2010; Uliaszek et al., 2012; Farmer & Kashdan, 2012; Harkness & Luther, 2001). However, some studies use the stress generation process as a mediator that may help unlock the mechanisms of another process: how childhood emotional events relate to increases in psychopathology (Uhrlass & Gibb, 2007) or how poor cognitive control links to internalising symptoms (Snyder & Hankin, 2016). In total four studies use stress generation as a mediational factor (Uhrlass & Gibb, 2007; Howe et al., 2017; Snyder & Hankin, 2016; Flynn & Rudolph, 2011). Both types of publications were included in this analysis because there were no key differences in the method these studies employed to incorporate the various aspects of stress generation in their models. All specifically included analyses of how anxiety could induce stressful life events.

Table 2. Aspects of Anxiety and Life Events included in reviewed studies (n=16) (See Appendix B).

Stressful Life Events

Most publications regarding the stress generation hypothesis have made two major distinctions in measuring stressful life events or stressors: whether they are dependent or independent and whether they are interpersonal or non-interpersonal. Nonetheless there is another, less researched distinction: whether life stress is episodic or chronic. These three

distinctions are seen as essential to include in the analysis of the stress generation process, as each factor of stressful life events may affect the results of a study. This effect is seen in the article by Uliaszek et al. (2012), where specifically only dependent, interpersonal, and episodic stressful life events followed symptoms of anxiety. Hammen (2001) also expresses the crucial nature of discriminating between these aspects of life events to ascertain reliable results. The following distinctions will now be discussed in detail (these distinctions are also described in Table 2).

Dependency. Life events can be categorised based on whether the participant can create them or not. Independent stress refers to life events that are out of one's own control; these include death of a loved one, being a victim of crime, or natural disasters (Uliaszek et al., 2012). On the other hand, dependent stress occurs because of the person's own choices and actions (Hammen, 1991). Examples include romantic, peer, financial, or academic difficulties. The distinction between the independence and dependence of events was included in the analysis sections of eleven out of 16 of the articles reviewed.

Interpersonality. The second aspect of life events investigates the level of social interaction involved in a certain event. Interpersonal stress is defined as difficulties with family, peers, or significant others. Thus, interpersonal stressful life events consist of various difficult events surrounding relationships with others. Specifically, interpersonal stress and stressful life events are the events most linked with stress generation (Siegel et al., 2018). Non-interpersonal stress, however, refers to financial, medical, occupational, and educational problems (Uliaszek et al., 2012). These aspects are also evaluated in studies. Around ten of the 16 studies reviewed make the distinction between interpersonal and non-interpersonal stressors.

Chronicity. The last and most under-researched aspect of stressful life events is whether they are episodic or chronic. Most stress research has focused on episodic life stress, which

refers to events that take place within their own discrete, limited time periods. These can also be referred to as major life events. Examples of these are: losing one's job, breaking up with a loved one, or having to declare bankruptcy (Uliaszek et al., 2012). In contrast, chronic life stress is defined as continuous difficulties or "daily hassles" in life (Uliaszek et al., 2012). Chronic life stress has been shown to be cross-sectionally related to anxiety disorders in adolescents (Uliaszek et al., 2010). However, only one study in the current review has explicitly researched the relationship between chronicity, dependence, and interpersonality of stressful life events. This is Uliaszek and colleague's 2012 publication and the paper also explores the impact of these life event aspects on stress generation in anxiety. Another publication that made this distinction in chronicity, and solely focused on major life events, was the cohort study by Phillips et al. (2015). Studies that included the chronic nature of stressful life events, but did not knowingly distinguish the events as "chronic" in their analysis can be found in Table 2.

Anxiety

Symptoms. Even though depression is the disorder most frequently investigated in stress generation research (since Hammen's 1991 paper), anxiety is closely related to depression and is an interesting field for further research. Nine of the 16 studies reviewed measure anxiety symptoms in nonclinical populations (this can be seen in Table 2) and use that data when examining the link between "anxiety" and stressful life events. This is crucial research as most of the population have subclinical symptoms of certain psychiatric disorders (such as anxiety) (Judah et al., 2013). Therefore, to produce research that may benefit the most people, it is worthwhile to measure anxiety symptoms and not solely clinical populations.

Anxiety Disorders and Social Anxiety Disorder. Clinical populations however include most people treated by psychological interventions. Consequently, having a clear understanding of how processes that augment psychopathology work in these populations is critical. In total,

seven out of 16 articles reviewed used anxiety disorders as the psychopathological variable when investigating the stress generation process. Usually, the studies contained participants who were diagnosed with various types of anxiety disorders, the most prevalent disorder in this compilation however was social anxiety. Three out of the 16 articles looked at social anxiety disorder specifically as a disorder that may generate interpersonal dependent stress. Finally, six of the seven articles indicated support for the stress generation hypothesis in anxiety disorders (as can be seen in Table 2).

Comorbidity. The study of Farmer & Kashdan (2015) noted that “over half of our SAD group met the criteria for at least one secondary psychiatric diagnosis” (p. 110). This is the case with many clinical participants – that more than one diagnosis may be present. The topic of comorbidity, specifically of the comorbidity between anxiety and depression, was mentioned in 13 of the 16 articles reviewed and was included as a variable in the studies of Connolly et al. (2010) and Harkness & Luther (2001). The publication by Connolly et al. (2010) indicated that comorbid participants generate more dependent, interpersonal stressful life events than both persons with either depression or anxiety (and that persons with anxiety also generate dependent interpersonal stress). This brings up the question in ten out of the 16 articles of whether stress generation is unique to a feature of depression or anxiety; or whether it is a mechanism linked to general emotional distress that is found in various internalising disorders.

Moderators

Personality and Stress Generation. Personality traits have been considered a crucial variable in the stress generation process since Hammen’s article in 1991. The current reviewed studies focus on the traits of neuroticism and extraversion. In total seven of the surveyed articles mention neuroticism as a potential moderator in the link between anxiety and stressful life events, while three include neuroticism as a variable for analysis. The main conclusion drawn

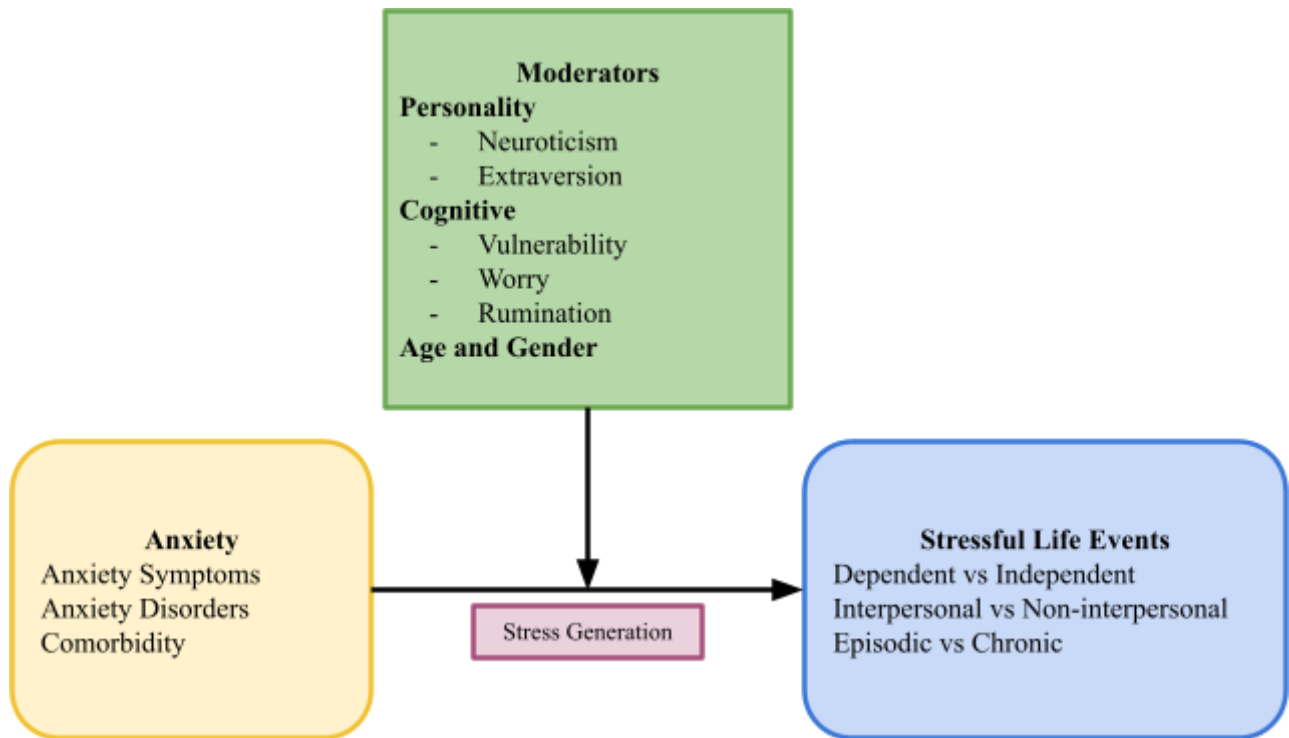
from these studies is that neuroticism cannot be ignored as a factor in stress generation, however its role is not entirely clear.

Cognitive Factors. Another moderator that is mentioned in twelve of the 16 publications is cognitive factors. This is an umbrella term that includes topics such as: cognitive vulnerabilities, negative cognitive style, worry, rumination, dysfunctional attitudes, and hopelessness. The idea that the way one thinks influences how psychopathology leads to increases in stressful life events also comes from the earliest article on stress generation (Hammen, 1991). Three of the twelve articles included in this review also look at specific cognitive factors and how they moderate stress generation in anxiety. Various cognitive factors thus allow for researchers to gain deeper insight into the mechanisms of stress generation.

Age and Gender. The final moderators that are mentioned in the collection of studies are age and gender of participants. Twelve studies included age in analysis, while fourteen studies included gender in analysis, either as covariates or to control for their effects. This is in line with (Rudolph & Hammen, 1999) study of age and gender as determinants of the stress generation hypothesis in anxiety. There they found that adolescents (compared with preadolescents) generate more dependent interpersonal stress, as well as females generating more of the same stress than males. Accordingly, it is essential for future studies to be aware of the possible effects these moderators may have on results.

Figure 4

Possible factors influencing stress generation in anxiety



Discussion

This thesis started by outlining three specific aims that it would focus on. The first goal was to map the general research conducted regarding the stress generation hypothesis in anxiety. Secondly, this thesis aimed to determine whether the stress generation hypothesis in anxiety is accepted as valid today. The third and final objective was to temporally map stress generation in anxiety research production from 1991 to 2023 (which can be seen in Figure 2). These aims will be discussed in the following paragraphs.

The issue of stress generation in anxiety was mapped by reviewing the 16 studies included in this thesis. All papers concluded that stress generation either occurs (ten papers) or does not occur (six papers) in anxiety. Specifically, the main conclusion that can be drawn from the research that supports stress generation in anxiety, is the following: it seems there is a consensus that adolescent females with anxious symptoms and who are high in neurotic traits

are likely to generate dependent interpersonal episodic stressful major events. Figure 3 attempts to encapsulate these main findings in a visual form. Another point of interest was that three studies also indicated that stress generation effect sizes in anxiety were small. This is contrasted with the stress generation effects in depression that have been indicated to have moderate or big effect sizes. A following finding was that three other publications indicated that stress generation effects of anxiety symptoms (specifically social anxiety) may be limited to a specific timeframe (such as one year) and that these stress generational effects may “decay” sooner than those of depression. In total these findings indicated that even though stress generation can be observed in certain instances in anxiety, the process seems to be more prevalent in depression than in anxiety.

When looking at the second aim of whether the stress generation hypothesis is supported in anxiety, it is important to note that there are two focus points regarding this question - stress generation and psychopathology. It is important, though, to first define the concept of “stress generation”. The conception of stress generation that is referred to in this analysis is visualised in Figure 5 of this scoping review. The results section also discussed the observation that many studies wrongly equate stress continuation and stress causation with “stress generation”. This misidentification is a crucial factor that future stress researchers need to take into consideration both when reviewing literature and testing hypotheses.

Regarding the psychopathology aspect of this second research aim, it is seen that stress generation is accepted as a theory, specifically for depression. The judgement however is still unclear on anxiety. It seems that stress generation in anxiety specifically occurs for dependent, interpersonal, and most importantly episodic stressful life events. The six studies which were identified as arguing against stress generation in anxiety neglect to focus on the chronicity of life events when analysing stress generation. Moreover, many studies included in this review (ten of

16) support anxious stress generation. It is still unclear why stress generation seems to be stronger or more prevalent in depression than in anxiety. Consequently, it is recommended that a thorough meta-analysis or systematic review be undertaken to truly assess whether stress generation truly occurs in anxiety; which situations this anxious stress generation occurs in; and why this process may have stronger links to depression.

There is much opportunity for future research in the topic of anxious stress generation. Specifically, this report would recommend researchers to conduct a study examining the episodic or chronic nature of stressful life events that are generated in people who tend to be more anxious. This recommendation is made after identifying a lack of research focusing on this aspect of stress generation. Thereafter, the moderators of this relationship can be investigated and empirically tested, once again to fill a gap in the existing literature. Finally, more studies focusing on the daily changes of stress generation in anxiety can be developed to assess how this process affects daily life.

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Appendix A

Table 1. Summary of publications included in scoping review (n=16).

Study	Research Aims	Sample	Study Design and Setting	Results	Possible Limitations	
Against Stress Generation in Anxiety						
1	The relationship between stressful events, emotion dysregulation, and anxiety symptoms among youth: Longitudinal support for stress causation but not stress generation. Schneider et al. (2011)	They hypothesized a bi-directional relationship between stressful events and anxiety symptoms consistent with stress causation and stress generation models. It was also hypothesized that this bi-directional relationship would be more pronounced for those high in emotion nonacceptance and difficulties with goal-directed behavior.	n = 528 (ages 8-17, 55% female)	Longitudinal (1.5 years) with Hierarchical linear modeling & Multilevel Modeling	Greater level of physical, social, and separation anxiety symptoms at previous time points did not predict greater number and frequency of stressors at subsequent time points, controlling for previous stressors and baseline depression. Specifically, anxiety symptoms did not predict independent or dependent stressors.	They wonder whether stressor impact, as opposed to stressor frequency, is more predictive of subsequent anxiety symptoms (measures of stressor chronicity should be included). Since anxiety symptoms were evaluated in a community sample using a self-report measure. Therefore, it is also necessary to examine a clinical sample of youth with anxiety disorders. No differentiation was made between chronic and discrete stressful life events.
2	Childhood emotional maltreatment and the stress generation model of depression. Uhrlass & Gibb (2007)	It is hypothesized that initial symptoms of depression, but not anxiety, would predict changes in negative events over the follow-up period.	n = 208, undergraduates (71% female, 58% caucasian)	Longitudinal (7 weeks) with Path Analysis	Only initial depressive symptoms, but not initial symptoms of anxiety, contributed to prospective changes in hassles	Only self-report measures are used for stressful life events; No indication is given of the dependency or (non)interpersonal nature of life events.
3	Combining stress exposure and stress generation: Does neuroticism alter the dynamic interplay of stress, depression, and	We hypothesize that common internalizing symptoms and unique depression will contribute to subsequent moderate and severe stressors in the period following job loss,	n = 426 adults (51% female)	Longitudinal with Latent Growth & Multilevel cross-lagged regression models	For unique general anxiety, we found no significant effects for “severity of job loss”. Autoregressive models for unique general worry	No specification of stressor dependency or interpersonal nature was made.

	anxiety following job loss? Howe et al. (2017)	but general anxiety and social anxiety will not.			failed to support the stress exposure thesis and were contrary to the stress generation thesis	
4	Spiraling out of control: Stress generation and subsequent rumination mediate the link between poorer cognitive control and internalizing psychopathology. Snyder & Hankin (2016)	Self-reported cognitive control (EC) predicted prospective change in symptoms of depression and anxiety, and these associations were longitudinally mediated by stress generation and rumination.	Study 1: n = 360 children (age 8-16, 57% female, 75% caucasian); Study 2: n =150 (subsample of study 1, age 11-20)	Study 1: Longitudinal (3 years) with Path modeling; Study 2: Cross-sectional	Anxiety was not bi-directional in its relationship with dependent stressors.	Only self-report measures are used for stressful life events.
5	The Prospective Role of Depression, Anxiety, and Worry in Stress Generation. Judah et al. (2013)	It was hypothesized that (1) depression, anxiety, and worry would independently predict increases in stress at subsequent time points; and (2) anxiety and worry would predict increases in depression, and thereby serve as distal predictors of stress generation.	n = 112, under-graduates (74% female, 88% caucasian)	Prospective (3 months) with Path and Cross-lagged analysis	Interestingly, Time 2 depression served as a mediator between Time 1 anxiety symptoms and Time 3 negative events.	It is also necessary to examine a clinical sample of youth with anxiety and depressive disorders as well as using interview measures to gauge stressful life events. The chronicity and interpersonal nature of the life events should also be examined.
6	Dynamic associations between stressful life events and adolescent internalizing psychopathology in a multiwave longitudinal study.	To examine the bidirectional association between internalizing symptoms and stress, we tested for stress generation effects positing that youths will be at greater risk for experiencing dependent-interpersonal	n = 382 adolescents, (age 11-15, 59% female)	Multiwave Longitudinal (2 years) with Multilevel modeling	The best fitting model included significant main effects of between-person, but not within-person differences in anxiety symptoms in predicting stressful life events.	No interview measures were used to gather information on stressful life events and no distinction between chronic and major life events are made.

Jenness et al. (2019) SLEs in months when they experience an increase in depression or anxiety symptoms relative to their own average levels of symptoms.

Supporting Stress Generation in Anxiety

7	<p>Does the stress generation hypothesis apply to eating disorders?: An examination of stress generation in eating, depressive, and anxiety symptoms. Bodell et al. (2012)</p>	<p>It was hypothesized that eating disorder symptoms at Time 1 would be positively associated with stress at Time 2. It was also hypothesized that eating disorder symptoms would predict stress above and beyond T1 depression and anxiety.</p>	<p>n = 290 female undergraduates (age 17-29)</p>	<p>Prospective (8 weeks) with Regression analysis</p>	<p>Depressive and anxiety symptoms were all independent, significant predictors of negative life events that occurred between T1 and T2.</p>	<p>No interview measures were used to gather information on stressful life events and no distinction between dependency, chronicity and the interpersonal nature of events are made.</p>
8	<p>Stress generation and adolescent depression: Contribution of interpersonal stress responses. Flynn & Rudolph (2011)</p>	<p>One of the goals of the present study was to examine whether self-generated interpersonal stress specifically mediates prospective associations between stress responses and depression, or whether this process model also provides explanatory power for the prediction of anxiety during adolescence.</p>	<p>n = 167 adolescents (52% female, 78% caucasian)</p>	<p>Longitudinal (3 year, 3 wave) with Structural Equation Modeling</p>	<p>The direct effect of W1 stress responses on W3 anxiety was significant. W1 depression significantly predicted W2-3 dependent interpersonal stress, and W1 anxiety marginally predicted W2-3 dependent interpersonal stress.</p>	<p>Effect sizes were small to minimum. Second, stress responses were assessed via self-report and thus do not contain a contextual threat assessment present in some interview methodologies. No distinction between chronicity of stressors is made.</p>
9	<p>Youth stress generation: An examination of the role of anxiety, anxiety symptoms</p>	<p>It is hypothesized that youth who developed anxiety disorders, had higher symptoms of anxiety, and higher</p>	<p>n = 136 (age 6-13, 55% female, 84% caucasian)</p>	<p>1 and 6 year Prospective (1 and 6 year) with Hierarchical multiple</p>	<p>Overall, anxiety diagnosis, anxiety symptoms, and to a lesser extent, cognitive distortions were significant predictors of</p>	<p>Age differences were not controlled for in analysis. Self-report measures instead of interviews were used to measure stressful life events. Finally, there</p>

	<p>and cognitive distortions. Harrison et al. (2023)</p>	<p>levels of cognitive distortions would experience a greater number of prospective total dependent, dependent interpersonal, and dependent non-interpersonal stressors at the one-and-six-year follow-ups.</p>	<p>regression analysis</p>	<p>stress generation at the one-year follow-up. However, no support was found for the hypothesis that an anxiety disorder, anxiety symptoms, or cognitive distortions are predictive of stress generation over a longer duration of time (i.e., over a six-year period).</p>	<p>are no chronicity measures for stressors.</p>	
10	<p>Patterns of stress generation differ depending on internalizing symptoms, alcohol use, and personality traits in early adulthood: A five year longitudinal study. Goldstein et al. (2015)</p>	<p>It was suspected that depression, anxiety, PTSD, neuroticism, and alcohol use would individually predict dependent interpersonal life events, but extraversion would not predict life events.</p>	<p>n = 917 under-graduates (age 19 and 24, 54% female, 87 % caucasian)</p>	<p>5 year Longitudinal (5 years) with Multiple regression analyses</p>	<p>In particular, evidence was found that interpersonal and behaviorally dependent stressful life events were predicted by internalizing symptoms.</p>	<p>No clinical populations were investigated, self report measures instead of interview measures were used for stressful life events. Small effect sizes were found. No distinction is made between episodic and chronic stressful life events in analysis</p>
11	<p>Negative life events and symptoms of depression and anxiety: Stress causation and/or stress generation. Phillips et al. (2015)</p>	<p>It was hypothesized that a stress generation effect would be observed and it would be of at least equal magnitude to the stress causation effect on symptomatology of stressful life events. Given their co-occurrence, it was further hypothesized that a stress generation effect would also be evident for</p>	<p>Cohort 1 n = 525 (aged 44, 44% male) and Cohort 2 n =483 aged 63, 44% male)</p>	<p>Longitudinal (five years) with cross-lagged panel analysis & ANOVA</p>	<p>Fully adjusted analyses controlling for life events burden at wave 3 showed that both depression and anxiety scores at wave 3 were positively associated with the life events burden five years later.</p>	<p>Only small effect sizes were found and only major life events were measured, therefore no chronic stressors were included. No differentiation was made between dependent and independent events nor between interpersonal and non-interpersonal events.</p>

<p>12 Social anxiety and interpersonal stress generation: The moderating role of interpersonal distress. Siegel et al. (2018)</p>	<p>those with elevated levels of anxiety symptoms.</p> <p>Thus, we hypothesized that (1) individuals with higher levels of social anxiety would experience more negative interpersonal dependent events, (2) individuals with higher levels of social anxiety would experience fewer positive interpersonal dependent events.</p>	<p>n = 243, under-graduates (83% female, 62% Caucasian)</p>	<p>Cross-sectional with Hierarchical Linear regressions</p>	<p>Higher levels of social anxiety were significantly associated with a higher number of negative interpersonal dependent events, even after accounting for the effects of concurrent depressive symptoms and all other covariates.</p>	<p>Cross-sectional study and no distinction is made in the level of chronicity for negative events.</p>
<p>13 Specificity of stress generation: A comparison of adolescents with depressive, anxiety, and comorbid diagnoses. Connolly et al. (2010)</p>	<p>It was hypothesized that adolescents with comorbid depression and anxiety diagnoses would experience more dependent stress than individuals with “pure” depression or anxiety alone.</p>	<p>n = 815 Australian adolescents (50% female, 89% Caucasian)</p>	<p>Longitudinal with Hierarchical Regression Analysis</p>	<p>The current study provides evidence that a tendency to contribute to dependent stressors may occur in comorbid anxiety without additional comorbid diagnoses.</p>	<p>Limitations are that the sample of adolescents was selected from a previous study that investigated a group of depressed mothers. Therefore, the sample is not very generalizable. Also, only episodic stress was measured.</p>
<p>14 A longitudinal examination of stress generation in depressive and anxiety disorders. Uliaszek et al. (2012)</p>	<p>A goal of this study was to expand on previous stress generation research by examining both interpersonal and non-interpersonal chronic life stress, as well as dependent episodic life stress. Only dependent events were examined because, based on the definition of independent life stress, we believe that a person’s direct actions</p>	<p>n = 497 (age 15-18, 69% female)</p>	<p>Prospective, Longitudinal (1 year) with Structural equation modeling</p>	<p>Only the relationship between T1 anxiety disorders and T2 episodic life stress remained significant.</p>	<p>Only adolescent participants were used in the sample.</p>

cannot cause these events. These relationships were examined for both depressive and anxiety disorders.

<p>15 Stress sensitivity and stress generation in social anxiety disorder: A temporal process approach. Farmer & Kashdan (2015)</p>	<p>Third— consistent with a stress generation model—we expected that participants with SAD would experience more frequent negative social events and less frequent positive social events.</p>	<p>n = 79; 40 SAD, 39 control (64% female, 54% Caucasian)</p>	<p>Daily Electronic Diary study with Multilevel modeling</p>	<p>Consistent with a stress generation model, we also found that participants with SAD reported more frequent negative social events, as well as less frequent and meaningful positive social events in their daily lives.</p>	<p>Only self-report measures were used to assess social events, and no distinction was made in the dependency of the events.</p>
<p>16 Clinical Risk Factors for the Generation of Life Events in Major Depression Harkness & Luther (2001)</p>	<p>Both the independent and additive effects of comorbid anxiety and dysthymia on dependent versus independent events are examined.</p>	<p>n = 74, all female and age 18</p>	<p>Cross-sectional With ANOVA and ANCOVA</p>	<p>Instead, those with both anxiety and dysthymia comorbidity had higher levels of dependent event threat than all other groups.</p>	<p>The (non)-interpersonal nature of events were not indicated nor the chronicity.</p>

Appendix B

Table 2.1. Aspects of Anxiety and Life Events included in reviewed studies

Measures of Variables	Against Stress Generation in Anxiety					
	Schneider et al. (2011)	Uhrlass & Gibb (2007)	Howe et al. (2017)	Snyder & Hankin (2016)	Judah et al. (2013)	Jenness et al. (2019)
<i>Anxiety</i>						
Anxiety Symptoms	X	X		X	X	X
Anxiety Disorders			X			
Comorbidity						
<i>Life Events</i>						
Dependent vs Independent	X			X	X	X
Interpersonal vs Non Interpersonal	X			X		X
Episodic vs Chronic			X	X		

Table 2. Aspects of Anxiety and Life Events included in reviewed studies

Measures of Variables	Supports Stress Generation in Anxiety									
	Bodell et al. (2012)	Flynn & Rudolph (2011)	Harrison et al. (2023)	Goldstein et al. (2015)	Phillips et al. (2015)	Siegel et al. (2018)	Connolly et al. (2010)	Uliaszek et al. (2012)	Farmer & Kashdan (2015)	Harkness & Luther (2001)
<i>Anxiety</i>										
Anxiety Symptoms	X		X	X	X					
Anxiety Disorders		X				X	X	X	X	X
Comorbidity							X			X
<i>Life Events</i>										
Dependent vs Independent		X	X	X		X	X	X		X
Interpersonal vs Non Interpersonal		X	X	X		X	X	X	X	
Episodic vs Chronic				X	X	X	X	X	X	