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# The Causal Systems Approach to Prolonged Grief: Recent Developments and Future Directions

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## Abstract

The network theory of prolonged grief posits that causal interactions among symptoms of prolonged grief play a significant role in their coherence and persistence as a syndrome. Drawing on recent developments in the broader network approach to psychopathology, we argue that advancing our understanding of the causal system that gives rise to prolonged grief will require that we: (a) strengthen our assessment of each component of the grief syndrome, (b) investigate intra-individual relationships among grief components as they evolve over time within individuals, (c) incorporate biological and social components into network studies of grief, and (d) generate formal theories that posit precisely how these biological, psychological, and social components interact with one another to give rise to prolonged grief disorder.

### Keywords

Prolonged grief disorder; Network approach; Causal system; Formal theory; Idiographic models

## 1 Introduction

Grief is the psychological response to bereavement: a collection of thoughts, emotions, and behaviors that commonly arise together following the death of a loved one. This response includes preoccupying thoughts about the deceased, intense yearning for their presence, waves of emotional pain, feelings of emptiness, and efforts to avoid the reality of the loss. For many, the frequency and intensity of these experiences subsides in the weeks and

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months following bereavement. However, for some, grief persists: thoughts remain intrusive and preoccupying, emotions remain frequent and distressing, and avoidance is extensive. This persistent and impairing grief has been referred to as traumatic grief, complicated grief, persistent complex bereavement disorder, and is now included in both the International Classification of Disease and in the upcoming edition of the Diagnostic and Statistical Manual under the name prolonged grief disorder [1].

The central question in prolonged grief research is straightforward: why does grief persist for some individuals but not for others? One possibility is that grief persists, at least in part, because of causal relationships among the thoughts, emotions, and behaviors that constitute the grief syndrome (see Figure 1) [2–4]. From this perspective, bereavement gives rise to specific experiences (e.g., thoughts about the death) and those experiences, in turn, lead to other components of the syndrome (e.g., emotional pain). For most individuals, as the loss becomes less proximal, these grief-related thoughts, emotions, and behaviors subside. However, for some, the network of causal relationships among components is sufficiently strong that the system is capable of sustaining itself. For these individuals, as time passes, the system falls into a new stable state in which grief-related thoughts, emotions, and behaviors are frequent, intrusive, and distressing. From a systems perspective, it is this harmful equilibrium of frequent and severe grief that we refer to as prolonged grief disorder.

The notion that grief may persist because of causal interactions among the components of grief is rooted in the “network theory” of psychopathology, which posits that causal interactions among symptoms play a significant etiological role in many mental disorders [6]. Over the past decade, network theory has stimulated the development of a nascent methodology for investigating the structure of relationships among symptoms and led to a rapidly growing body of empirical research applying these “network psychometric” methods across a range of disorders (for recent reviews, see [7–12]). In this paper, we provide a brief overview of recent developments in this literature with the aim of informing future research on prolonged grief.

## 2 The Measurement of Psychological Networks

The network approach to psychopathology emphasizes the importance of understanding the components of syndromes (i.e., symptoms) and the relationships among them. Most network studies have investigated symptom networks by treating the individual items of existing measures as components in the network [7, 13]. Although a valuable starting point, these measures were not designed to rigorously assess individual symptoms. Consequently, they typically include only a single item per symptom, leaving them vulnerable to the effects of measurement error [14]. Where multiple items per symptom are included, those items are often incorporated in the network without an effort to account for this overlap, biasing the analysis [15].

Exacerbating this problem, different measures are often used across studies. For example, in the four network studies of prolonged grief from the past two years, researchers used four distinct measures, producing networks with four different sets of components [16–19]. Indeed, only three of thirty-four components covered by these studies appeared in all

four networks. Even when the same components are present, they are often assessed with sufficiently distinct items that it is unclear if they are indeed assessing the same experience. This issue is not unique to network studies. The broader grief literature lacks consensus regarding which components constitute the prolonged grief syndrome and many components of grief are ill-defined (e.g., emotional pain is commonly identified as a symptom, yet there is little clarity regarding the precise nature of this affective experience [20]). However, because of their emphasis on individual components of grief, network studies are especially impacted by this lack of clarity.

To more rigorously assess mental disorder networks, it will be necessary to develop measures specifically intended for network analysis. For prolonged grief, this effort will require researchers to (a) arrive at a consensus around which components constitute the prolonged grief syndrome, (b) clarify the nature of those components, and (c) construct an assessment intended to robustly measure each individual component of the syndrome, almost certainly by including multiple items per component. Using recently developed latent network models, the structure of prolonged grief can then be estimated with each component treated as a latent construct with multiple indicators, thereby providing more robust measurement of the prolonged grief disorder network [21, 22].

## 3 Intra-individual Analyses and the Building Blocks of Psychopathology

Most network studies, and all network studies of prolonged grief, have used cross-sectional analyses to investigate inter-individual relationships among symptoms (e.g., examining whether people with frequent emotional pain also tend to be those with intrusive grief-related thoughts) [7]. Yet, researchers and clinicians are often more interested in *intra-individual* relationships among symptoms (e.g., whether a specific patient experiences emotional pain when thinking of their loved one). This discrepancy is problematic because findings based on *inter*-individual variation can only be assumed to correspond to those based on *intra*-individual variation under conditions rarely observed in psychological research [23]. To address this challenge, a growing number of network studies have used ecological momentary assessments, often in combination with vector autoregressive modeling, to investigate how components of psychopathology relate to one another over time within individuals [7, 24]. Indeed, idiographic models of psychopathology have become an area of considerable interest in recent years, leading to significant methodological advances and efforts to illuminate and address the challenges faced in carrying out this research [22, 25–31].

In addition to modeling the relationships at the level of most interest, intra-individual prolonged grief networks would allow for an assessment of individual differences in the structure and strength of inter-component relationships. As depicted in Figure 1, individual differences in the strength of the causal system are posited to play a key role in explaining why grief persists for some but not others. In addition, intra-individual analyses provide a more granular look at the components of prolonged grief. As network theory has developed, some researchers have argued that it is not symptoms (e.g., reporting frequent intrusive thoughts over the past several weeks) but momentary experiences (e.g., a single intrusive thought) that constitute the true building blocks of psychopathology [32]. With an emphasis

on processes that unfold over minutes or hours rather than weeks or months, intra-individual networks may better capture the interactions among components of grief that lead them to cohere and persist together over time. Given these advantages, our understanding of prolonged grief will be substantially advanced if grief researchers are able to investigate intra-individual relationships among components of grief.

## 4 Formalizing Network Theories of Psychopathology

In the network literature, there has recently been an emphasis on the importance of distinguishing between theories and data models [33–36]. **Theories** aim to explain phenomena by representing the real-world system that give rise to those phenomena [37]. For example, the network theory of prolonged grief posits that the phenomenon of prolonged elevations in components of the grief syndrome can be explained by causal relationships among the components of grief. **Data models** are representations of one's data (e.g., a mean or correlation). Network analyses produce data models that capture statistical associations among variables. However, the fact that we can conduct network analyses on our data, does not mean that the data indeed arose from a system of interacting components [34]. Further, even if we assume the data were generated by a causal system, the complexity of the systems we are likely to see in mental health research makes it prohibitively difficult to deductively infer the structure of those systems from network data models alone [35]. Given these challenges, there has been a growing focus in the network literature on determining how we can best use the growing body of empirical network studies to make advances in our theories about how specific mental disorders operate as causal systems.

Both within and beyond the network literature, a number of researchers have recently argued that formalizing theories as mathematical and computational models may play a critical role in advancing those theories [33, 34, 37–40]. Expressing theories as mathematical or computational models requires that each aspect of the theory be precisely specified. Consequently, formalization often uncovers many hidden unknowns or contradictions in the theory that can be difficult to detect when relying on verbal articulations of the theory alone [39]. More importantly, computational and mathematical models have the significant advantage of equipping theorists to simulate or analytically derive the behavior implied by the model. In other words, it provides a tool for deducing what the theory predicts, thereby equipping theorists to evaluate whether the theory can indeed account for the phenomena it purports to explain [35, 37]. For example, any theory of prolonged grief must be able to explain why grief subsides for most but persists for some. Formalizing a network theory of prolonged grief as a computational model would equip theorists to evaluate whether the theory can indeed produce these distinct trajectories. If so, the theory is corroborated. If not, this failure can inform how the theory may be improved and brought into line with empirical research [35]. In this way, robust empirical findings observed across multiple network studies can be used to inform, constrain, and evaluate formalized network theories (for recent developments in network meta-analysis, see [41]). Given these advantages, a critical next step in the network approach to prolonged grief will be to integrate the broad conceptual framework of network theory with extent theories of prolonged grief [42–45] and produce a formal theory of the causal system that gives rise to prolonged grief disorder.

## 5 Prolonged Grief as a Biopsychosocial System

The impact of bereavement is not constrained to one's psychology. Bereavement disrupts biological regulation [46, 47] and permanently alters one's social world. These biological and social changes both effect and are affected by grief [46, 48–52]. Perhaps not surprisingly then, recent network studies have broadened their scope and investigated how components of grief relate to the social environment. Djelantik and colleagues found that, relative to other types of loss, experiencing the death of a spouse or child was especially associated with having difficulty moving on with life [16]. Maccallum and Bryant found that difficulty trusting others was the symptom most directly associated with impaired social functioning [17]. Stelzer and colleagues compared the network structure of prolonged grief across different cultures, observing both similarities (e.g., emotional pain was highly central to networks in both German-speaking and Chinese samples) as well as differences (e.g., a strong association was observed between searching for the deceased and a wish to die to be with the deceased in a Chinese sample but not in a German-speaking sample)[18]. Together, these studies provide an early look at how familial relationships, social functioning, and culture are related to the network of grief components and provide a first step toward studying grief as a biopsychosocial system (see Figure 2).

Notably, broadening our scope to a biopsychosocial system suggests a nuanced but important shift in the framework detailed in Figure 1. Within the psychological system alone, resilience and recovery can be conceptualized as a return to an equilibrium in which grief is low. However, in the broader biopsychosocial system, a return to equilibrium may not be possible as the death of a loved one will have permanently disrupted the social network and the psychological functions that network serves [50, 51]. Indeed, sociologists have long argued that we define and understand ourselves in relation to others, especially our close relationships [53, 54]. The death of a loved one thus restricts not only our access to that person, but also to parts of ourselves that existed prior to the death [55, 56]. In this framework, adaptive coping with loss is not merely about a return to an equilibrium of low symptoms, but about rebuilding one's social network and the sense of self it supports [55, 56]. Resilience and recovery in this broader biopsychosocial framework may thus be better understood in a *complex adaptive system* framework: a system whose structure and dynamics evolve over time and one that, when disrupted, may need to adapt its structure and dynamics to allow for the continued functioning of the system [57].

## 6 Conclusion

The network (or causal systems) theory of prolonged grief has provided a new lens for conceptualizing prolonged grief. Recent empirical studies applying network psychometric tools have provided valuable initial steps toward understanding prolonged grief from this causal system perspective. However, considerable work is yet to be done. In this article, we have argued that developing measures specifically intended for network studies, broadening our scope to include biological and social components in our network studies, and gathering intensive time-series data on grief components are critical next steps that will strengthen the empirical foundations of this literature. We further argued that generating formal theories of the causal system that gives to prolonged grief will equip us to better leverage this empirical

literature. Together, we believe these steps will allow the field to make cumulative advances in our understanding of the biopsychosocial system that gives rise to prolonged grief.

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## Highlights

1. Prolonged grief may arise from causal relations among its constituent symptoms.
2. Robust assessments of individual prolonged grief symptoms are needed.
3. Idiographic models can advance our understanding of the grief syndrome.
4. Formalizing theories of grief will equip us to better evaluate those theories.
5. The network theory of grief should adopt a biopsychosocial systems perspective.

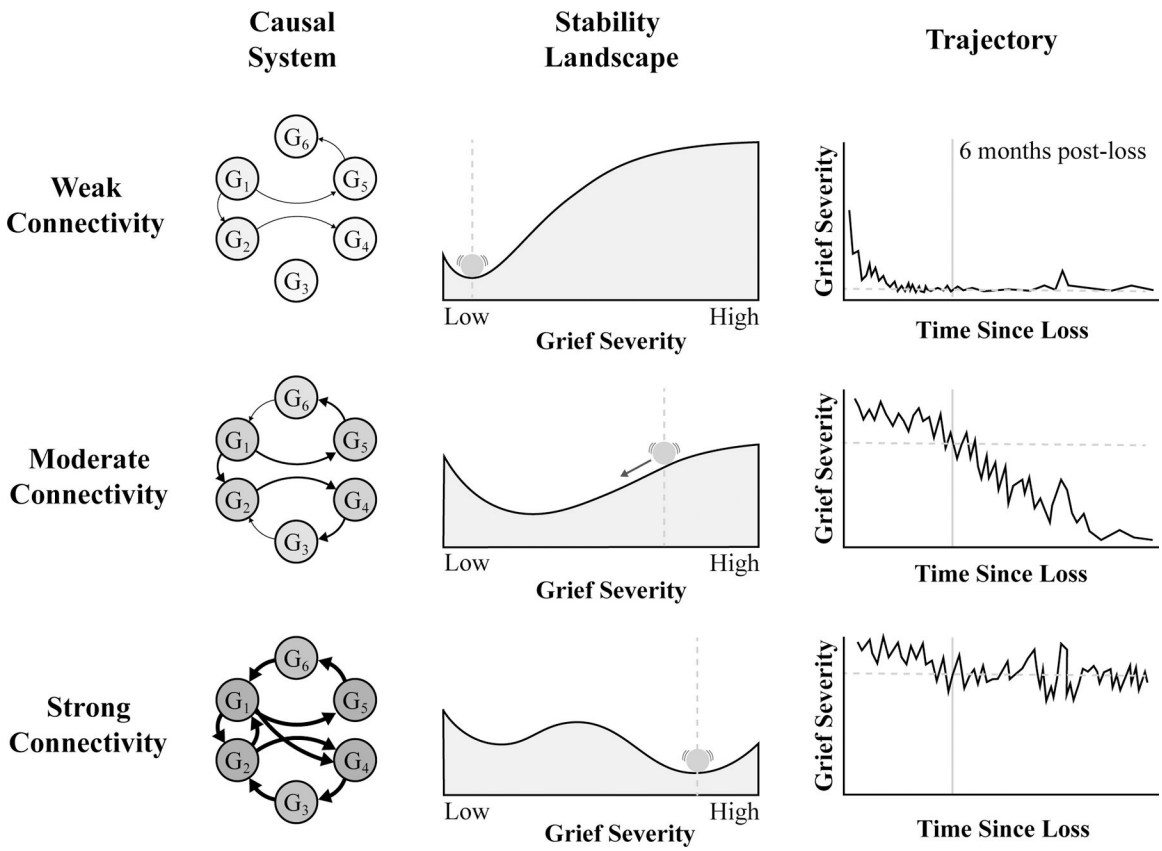


**Figure 1. The Network (or Causal Systems) Theory of Prolonged Grief**

*Note*. The network theory of prolonged grief posits that causal interactions among the components of grief (G) lead them to persist over time. This figure depicts the structure of three different causal systems (left column) and the stability landscapes (middle column) and trajectories of response (right column) that follow from those systems. In each causal system, grief components are represented as nodes and the causal effects between them are represented as arrows between the nodes. Darker nodes signify greater severity of that component of grief at 6-months post-loss. Thicker arrows signify stronger causal effects. The stability landscapes provide a visualization of the system's dynamics. In each landscape, the x-axis represents grief severity. The ball on top of the landscape indicates the current level of grief severity (in this case, at 6 months post-loss). The further along the x-axis, the greater one's grief severity. The topography of the landscape along the y-axis describes the rate of change in grief severity over time. The steeper the landscape, the greater the rate of change. Where the landscape is flat (e.g., in the basins of the landscape) the rate of change is zero. In the absence of perturbations, the ball will always move 'downhill' into the nearest basin, where it will remain. For that reason, the basins in the landscape are also referred to as 'stable states:' states the system will move toward following perturbation. In a **weakly-connected system**, there is a single basin in the landscape located at a low level of grief severity. Bereavement may perturb the system, pushing it toward a higher level of grief. However, as bereavement becomes less proximal, its effect on the system dissipates and the system returns to a stable state of low grief severity. In a **moderately-connected system**, there are more and stronger causal relationships among components of grief. Here,

the stability landscape is shallower, signifying a slower rate of change. Consequently, the system takes longer to recover from bereavement (see trajectory plot). However, because there is still only a single stable state of low grief severity, the system will eventually return to that stable state. Finally, in a **strongly-connected system**, causal relationships are sufficiently strong that the system can become self-perpetuating. This is reflected in the stability landscape by the formation of a new basin: an alternative stable state of high grief severity in which the system can fall. If bereavement is sufficient to push the system beyond the tipping point in the landscape, the causal relationships among the symptoms of grief will lead the system to remain in a stable state of high grief symptoms that does not remit with time (see trajectory plot). In a precisely-defined system, the stability landscapes can be calculated and the presence and location of stable states in the system can be determined. Here, the stability landscapes are used simply as a metaphor to illustrate how the structure of a causal system shapes the systems dynamics and, in turn, the trajectory of its response to bereavement. For further discussion of the relationship between causal system structure and the trajectory of response to bereavement, see Malgaroli, Maccallum, and Bonano's work on computational approaches to grief in this issue [5].

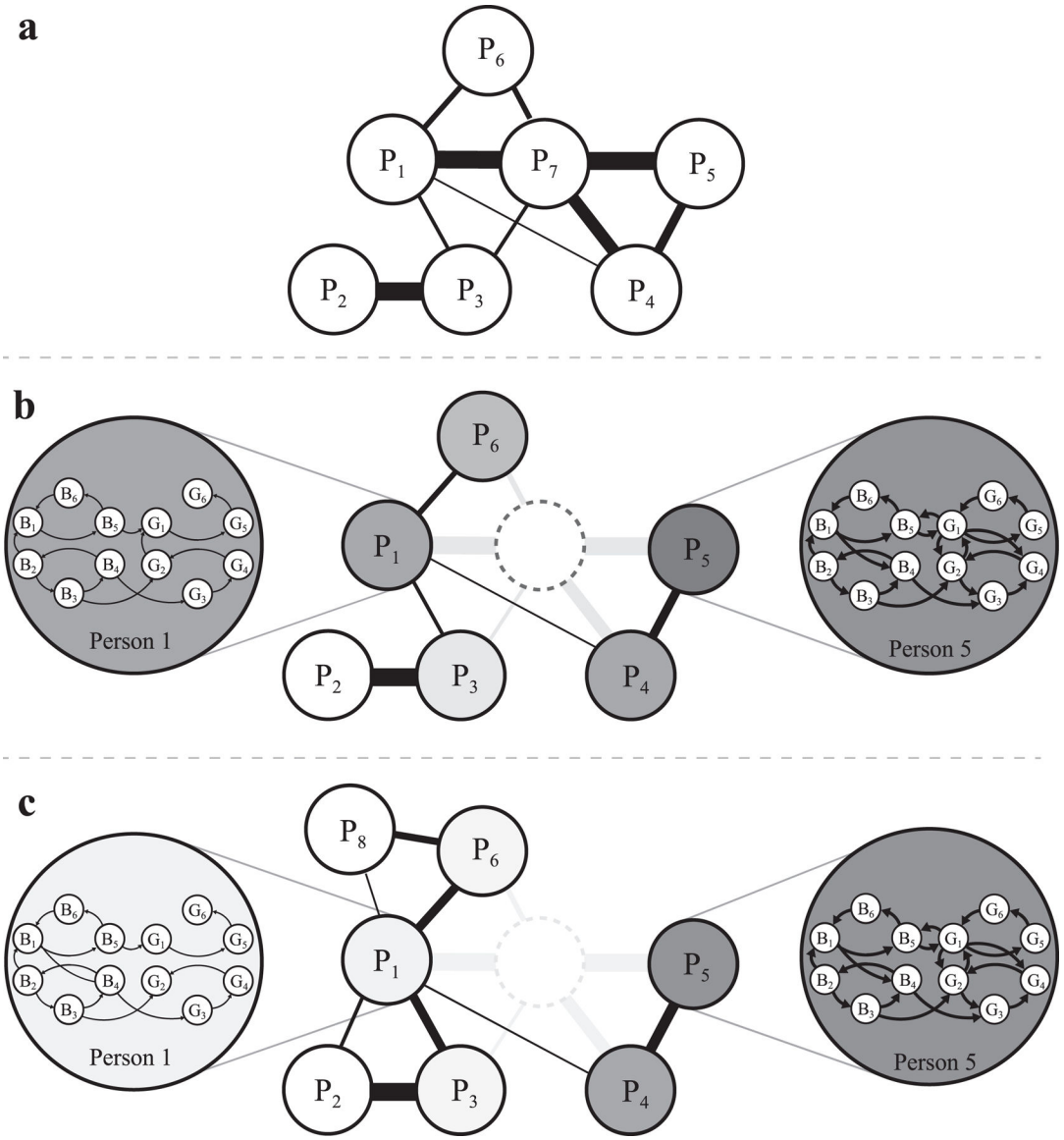


**Figure 2. A Biopsychosocial Framework for Prolonged Grief**

*Note*. This figure depicts the impact of bereavement on the social network and the interplay of that impact with the psychobiological response to bereavement for individuals within that social network. **Panel A** depicts a social network. Nodes represent people (P) and edges represent the social relationships between them, with thicker edges signifying stronger relationships. **Panel B** depicts the death of a member of this social network (P7); an individual who was strongly-connected within the social network and whose death significantly disrupts the structure of that network. As a result of the death, significant connections are lost (e.g., between P7 and P1) and some individuals (e.g., P5) become peripheral to the network. Within each individual is a network of biological (B) and psychological (i.e., grief; G) components. Overall severity of grief is indicated by the node color for each individual, with darker grey indicating greater grief severity. **Panel C** depicts the same social network one year following the death. For P1, there have

been significant changes to the network, with existing connections strengthened and new connections formed. Together with the low connectivity in their psychobiological system, this adapted social network structure has led to a decrease in the severity of their grief over time. In contrast, P5 remains socially disconnected, which both affects and is affected by the persistent activity in their strongly inter-connected network of grief-related thoughts, emotions, and behaviors. Accordingly, in this biopsychosocial framework, prolonged grief is affected not only by the causal relationships among components of grief, but also one's relationship to the deceased, one's position in the social network, and the grief experienced by those to whom one is connected. Adaption to loss is, thus, not only determined by the network of grief components, but also by the ability to adapt to the altered structure of the social network that arises from the death of a loved one. For a related discussion of the social consequences of bereavement, see Maciejewski, Falzarano, She, Lichtenthal & Prigerson's contribution to this issue [56].