



Research paper

Triggered by worry: A dynamic network analysis of COVID-19 pandemic-related anxiety and parental stress

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ABSTRACT

Background: Major disruptions to daily life routines made families and parents particularly vulnerable to psychological distress during the COVID-19 lockdowns. However, the specific psychopathological processes related to within-person variation and maintenance of anxiety symptomatology and parental distress components in the parental population have been largely unexplored in the literature. **Methods:** In this preregistered intensive longitudinal study, a multilevel dynamic network was used to model within-person interactions between anxiety symptomatology, psychopathological processes, parental distress, and protective lifestyle components in a sample of 495 parents—each responding to daily assessments over a 40-day period. A total of 30,195 observations were collected across the subjects.

Results: Extensive worry, threat monitoring, and uncontrollability of worry were identified as overarching psychopathological processes related to the aggravation of other symptoms of anxiety and parental distress. A strong association was found between parental stress and parental burnout. Anger toward one's child was associated with both parental stress and parental burnout. Protective factors showed the lowest strength centrality, with few and weak connections to other symptoms and processes in the network.

Limitations: Associations may exist between the study variables on a different time scale; hence, different time lags should be used in future research. **Conclusions:** Accessible, low-cost interventions that address worry, threat monitoring, and the uncontrollability of worry could serve as potential targets for reducing the symptom burden of anxiety and distress in the parental population.

1. Introduction

The coronavirus disease (COVID-19) outbreak has led to significant disruptions across different aspects of human life, due to its scale and severity (e.g., Ebrahimi et al., 2021; Ettman et al., 2020). Home isolation, loss of social support, and combining work from home while facilitating home schooling and childcare made parents particularly vulnerable to elevated parental stress and anxiety (Achterberg et al., 2021; Brown et al., 2020; Freisthler et al., 2021) compared to pre-pandemic levels (Racine et al., 2022; Westrupp et al., 2023). However, while research efforts have centered on identifying mean-level changes in symptom levels and associated risk factors (e.g., Johnson et al., 2022; Marchetti et al., 2020; Spinelli et al., 2020), other aspects of mental

health disruptions are of particular interest for obtaining a broader understanding of how psychological processes vary within individuals (Curran and Bauer, 2011). For this purpose, two areas are of specific interest: unveiling within-person processes and recognizing more granular cross-domain interactions between mental health symptoms.

Most of the pandemic literature has been conducted on cross-sectional samples (e.g., Johnson et al., 2022; Marchetti et al., 2020; Spinelli et al., 2020). However, most psychological phenomena operate on a within-person scale (Curran and Bauer, 2011) and require investigations of fluctuations in processes that occur *within* an individual rather than studying mean-level differences in traits *across* participants. For example, this would involve analyzing what happens when a parent is more attentive toward threats and feels more anxious than their own

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average, rather than investigating these individuals by connecting them across participants (i.e., a *between*-subject approach). The separation of effects that occur at the within and between levels is crucial, and warrant appropriate analytic techniques and data collection procedures, such as longitudinal designs with repeated measures (Hamaker et al., 2015; Hoffman and Stawski, 2009). In addition, the preponderance of studies on parental mental health generally, and on parental anxiety specifically, has focused on global levels of mental health constructs. While these investigations provide important information on elevations in specific disorder domains, they may conceal important associations between processes and their relationships to specific aspects of anxious symptomatology and parental stress. Identifying how theorized psychopathological processes are related to parents' anxious symptoms and distress over time can provide information about processes that can be targeted by treatment modalities aimed at reducing specific symptoms of anxiety and levels of distress.

Existing evidence indicates that numerous behavioral and cognitive processes, along with parent-specific components and vulnerable variables, can contribute significantly to the development and maintenance of anxiety. For instance, maladaptive cognitive processes, such as worry, which involves persistent awareness and thinking about possible future threats, are considered to play a prominent role in the etiology and maintenance of anxiety (Borkovec, 1985, 1994; Borkovec et al., 2004). Moreover, the phenomenon of worry is further related to the cognitive functioning of anxiety, including the enduring tendency toward disproportionate allocation of attention to threat-related stimuli rather than neutral or positive stimuli, and a resulting maintenance of high levels of vigilance for possible danger (Bar-Haim et al., 2007; Beck and Clark, 1997).

The process of threat monitoring, as another hallmark correlated with anxiety, may be further affected by negative metacognitive beliefs, which include individuals' subjective appraisals of their own worry processes (Wells and Carter, 2001; Wells and Papageorgiou, 1998). For instance, according to the meta-cognitive model of generalized anxiety disorder, sustained worry is reinforced by negative metacognitive beliefs about worry, such as beliefs about uncontrollability and danger, and by counterproductive strategies of mental control that, in turn, maintain anxiety (Wells, 1995). Another maintenance mechanism considered a core element in the persistence of anxiety is rumination, which involves repetitively thinking about the causes, consequences, and symptoms of one's negative affect (Martin and Tesser, 1989, 1996; Nolen-Hoeksema, 2000; Segerstrom et al., 2000). The sequence of this recurrent, repetitive thinking is often initiated by unwanted and intrusive thoughts about aversive outcomes that spontaneously come into the individual's mind (Langlois et al., 2000).

Of particular interest to the parental population is how these maintaining and vulnerability factors interfere with parental distress factors. Tendencies in the literature point toward patterns by which anxiety symptomatology contributes to increased experiences of parental distress (Prupp et al., 2010). Parents who experience high levels of distress generally report more negative affective states, poorer psychological well-being, and negative parenting behaviors (Deater-Deckard et al., 2016; McMahon and Meins, 2012; Pinquart, 2017; Venta et al., 2016). Moreover, persistent negative affective states, such as the irritability and anger that are present components of parental distress, have been further associated with affective states in anxiety symptomatology (Clark and Watson, 1991; Cornacchio et al., 2016). By contrast, protective factors and coping strategies, such as perceived social and emotional support and specific lifestyle components, generally exhibit a potential buffering effect (Ahrens et al., 2021; Brown et al., 2020; Magson et al., 2021).

Taken together, the available research indicates that parent-specific vulnerability and protective variables may play a potential predisposing role in anxiety symptomatology among parents. What remains less known in the literature concerns the interactions through which vulnerability and protective factors interfere with parental distress

factors and potentially contribute to the development and persistence of anxiety in parents over time. During the COVID-19 pandemic, the strict distancing measures placed major stressors into the daily lives of parents. Therefore, various vulnerability factors have quite possibly exacerbated the impact on parents' mental well-being (Brown et al., 2020). Moreover, the impact of vulnerability and protective factors may also have manifested differently in the context of adverse life events, such as the stressors stemming from the COVID-19 pandemic.

Here, a dynamic network approach (Bringmann et al., 2013) is proposed to study the within-person interactions among key anxiety symptoms, psychopathological processes, protective lifestyle components, and parent-specific stress brought on by the COVID-19 Pandemic. This approach focuses on the deviations from an individual's usual level in one component and how these deviations are related to intra-individual changes in other symptoms and mechanisms (Borsboom, 2017; Bringmann et al., 2013). The identification of central components and psychopathological processes that, conversely, alleviate psychopathological states can serve as potential targets for clinical interventions (Beard et al., 2016; Hoffart and Johnson, 2020).

1.1. The present study

The present longitudinal daily diary study investigated the within-person temporal and contemporaneous interactions of anxiety symptoms, parental distress components, theorized psychopathological processes, and protective lifestyle components in a large sample of parents during the COVID-19 pandemic.

2. Methods

The aims and analyses of the present study were preregistered and made publicly available in the Open Science Framework (<https://osf.io/f4zug>). The data were drawn from an ongoing longitudinal investigation of psychiatric symptomatology in the general population during the COVID-19 pandemic and has included nine measurement waves to date (Ebrahimi et al., 2021). The present intensive longitudinal daily diary study began during the fourth measurement wave of the study (i.e., February to April 2021). The research protocols for the study were approved by the Norwegian Regional Committee for Medical and Health Research Ethics (Reference: 125510) and were conducted in accordance with the Declaration of Helsinki.

2.1. Participants and procedure

The initial sample consisted of 1036 parents who gave written informed consent to participate in the study. The present study was limited to participants who completed all daily questionnaire during the data collection periods ($n = 514$). In addition, 19 individuals were excluded from the analyses because they were over the age over 65 years, resulting in a final sample of 495 individuals who ranged in age from 19 to 65 years ($M = 37.83$, $SD = 10.74$). Across these 495 participants, a total of 30,195 observations were collected. Missing data were handled with listwise deletion in instances where participants were missing some or all items from at least one data collection period. Table 1 displays the demographic characteristics of the participants.

The participants completed a daily questionnaire during two separate data collection periods over a 60-day period; both collections encompassed a 40-day measurement schedule proximal in time. The data collection period lasted from February 17th to March 28th and from March 10th to April 18th (2021). The participants received the questionnaire at a fixed time point (6:30 p.m.) with a link to an online questionnaire, which included 12 questions related to the participants' current psychological and affective states. The participants were instructed to complete the questionnaire within 3.5 h after they received the prompt and were encouraged to do so as quickly as possible after a beep.

Table 1
Demographic characteristics of the sample.

Total sample N = 495	
Variable	n (%)
Gender	
Female	322 (65.05)
Male	172 (34.75)
Not available information	1 (0.20)
Current civil status	
Married or living together	357 (72.12)
Single	136 (27.47)
Not available information	2 (0.40)
Highest education level	
Not completed high school	9 (1.82)
Completed high school	91 (18.38)
Completed higher education	315 (63.64)
Student	79 (15.96)
Not identified	1 (0.20)
Prior psychiatric diagnosis	
Yes	72 (14.55)
No	421 (85.05)
Not identified	2 (0.78)

2.2. Measures

Demographical data included each participant's age, gender, current civil status, education, and prior psychiatric diagnoses. All of the participants in the sample confirmed that they were living with one or more children under the age of 18 years.

2.2.1. Anxiety symptomatology

Anxiety was measured using items from the Generalized Anxiety Disorder (GAD-7) scale (Spitzer et al., 2006). The GAD-7 has shown adequate internal consistency reliability and validity for assessing anxiety across a wide range of samples and settings (e.g., Johnson et al., 2019). The four included items from GAD-7 were anxiety ("Today I have been feeling nervous, anxious, or on edge"), extensive worry ("Today I worried about a lot of different things"), uncontrollability of worry ("Today I was not able to stop or control worrying"), and irritability ("Today I was easily annoyed or irritable"). The participants were asked to report the extent to which they experienced each psychological state at the moment of assessment on a 5-point Likert scale (1 = not at all, 5 = extremely).

One item from the Posttraumatic Stress Disorder checklist for the DSM-5 (PCL-5) (Blevins et al., 2015) was used to measure the participants' intrusions: ("Today I had repeated, disturbing, and unwanted memories of stressful experiences").

2.2.2. Parental distress components

Parental distress components, including different negative parental experiences ranging from parental stress and burnout to anger and frustration toward their child(ren). Parental stress was measured using one item from the Danish Parental Stress Scale (DPSS; Pontoppidan et al., 2018) ("Today, I felt overwhelmed by the responsibility of being a parent"). Parental burnout was measured using one item from the Parental Burnout Inventory (PBI) (Roskam et al., 2017) ("Today, I felt emotionally drained by my parental role"). Parents' anger and frustration toward their child(ren) were added to measure the extent to which parents experienced anger or frustration toward their child ("Today I was angry or frustrated with my child"). The participants were asked to report the extent to which they experienced each mental state at the

moment of assessment on a 5-point Likert scale (1 = not at all, 5 = extremely).

2.2.3. Psychopathological processes

Rumination was assessed using a specific item: ("Today, I thought negatively about things that have happened in the past"). Threat monitoring was assessed using one item from the Cognitive Attentional Syndrome scale (CAS): "Today I focused my attention on things I find threatening, such as bodily sensations, negative thoughts, possible infection, or danger" (Wells, 2009).

2.2.4. Protective lifestyle components

One item from the Short Warwick–Edinburgh Mental Well-being scale (Stewart-Brown et al., 2009) was used to measure the participants' relatedness ("Today, I felt close to other people"). Physical activity was measured by asking the participants to respond to the following statement: "Today I spent __ minutes/hours physically exercising to the extent that it led to increased pulse or at least light sweating."

2.3. Data preparation

Prior to analyzing the data, the number of participants required was estimated based on the model's requirements. Generally, including individuals with fewer than 20 observations is not recommended (Epskamp et al., 2018; Jordan et al., 2020). To ensure that as many participants as possible were included in the analysis and to simultaneously ensure that missingness was minimized, the number of completed daily measures was visualized as a function of the cumulative number of participants (see Supplementary Fig. S1). The plot suggested that a cut-off of 31 daily diaries would be appropriate, as a more lenient cut-off would not lead to a substantially larger number of included parents. Therefore, data from 495 of 1036 parents were sufficient for inclusion in the study.

Additionally, detrending procedures were applied to mitigate the influence of specific trends on the resulting analyses (Epskamp et al., 2018). A cumulative linear trend and weekend trend were inspected and removed by regressing these out of the item scores. The items were theoretically chosen to avoid topological overlap, with additional empirical inspections of possible overlap conducted using the goldbricker function in the network tools of the R package (Jones, 2018). The results suggested that no redundant variables were present.

2.4. Statistical analysis

All analyses were carried out in R (version 4.2.2). The multilevel vector autoregression model implemented in the mlVAR package in R (Epskamp et al., 2019) was applied to investigate the temporal and contemporaneous associations among all selected variables. The model allows for the extraction of three different sets of effects, specifically temporal within-person, contemporaneous within-person, and between-person effects. Using the mlVAR function, the model first extracts temporal within- and between-person effects based on a node-wise multi-level regression. The contemporaneous effects are then computed based on the residuals from the previous step. The between-person effects are attached in Fig. 1 for the interested reader, given that the research questions of interest in the present study concern the within-person level. Finally, in line with recommendations in the literature (Epskamp et al., 2018), the orthogonal estimation procedure was chosen for the analysis in networks since the study embodies more than six variables.

The effects of interests (within-person temporal and within-person contemporaneous effects), were examined using the qgraph package (Epskamp et al., 2012). All inspected variables were represented as nodes in each network, and the associations between the variables were visualized as either directed (for the temporal network) or undirected

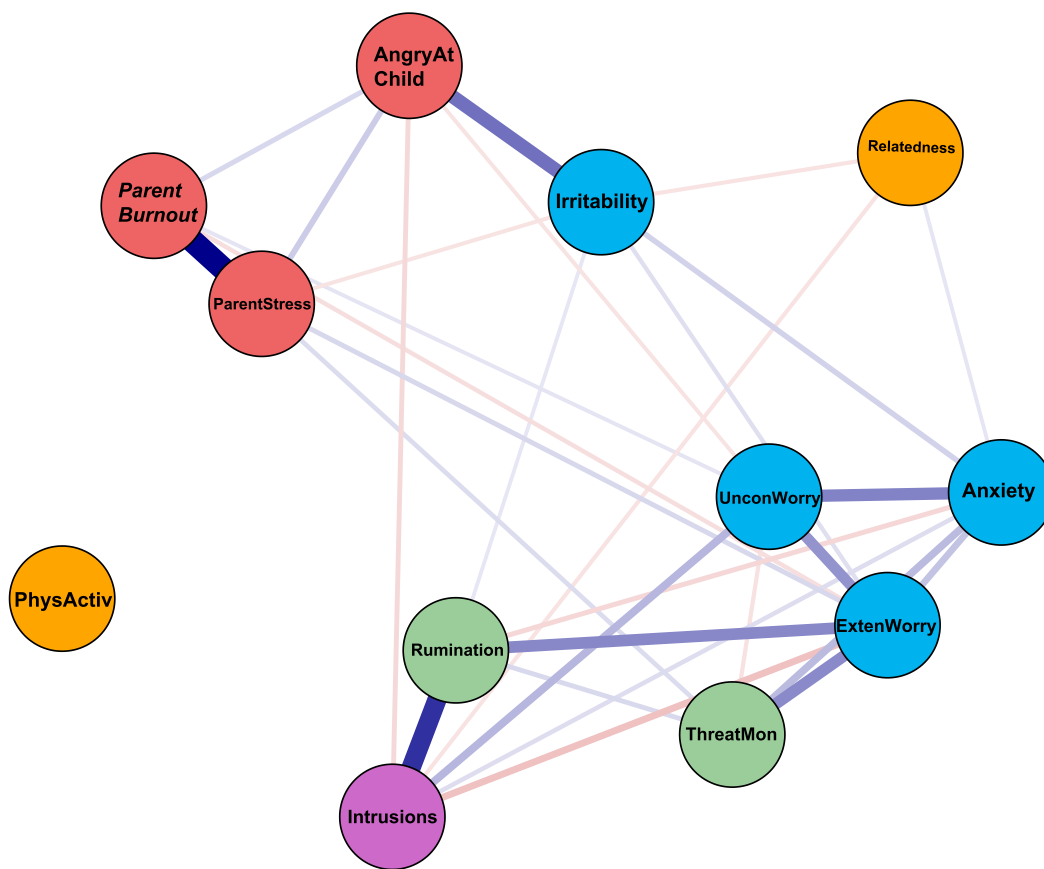


Fig. 1. Between-person network.

(for the contemporaneous network) edges. In the present study, edges in the temporal network captured the potential day-to-day (lag-1) predictive effect of variables at the within-person level. The directed edges (shown as arrows) are interpreted as Granger (1969) causal effects, carrying information about which variables temporally precede one another. The direction edges indicate that a node at time point t predicts another node at the subsequent time while controlling for all other nodes in the network. These edges are interpreted as deviations from the individual's own average (e.g., more-than-average anxiety) and predict within-person changes in another variable (e.g., more-than-average parental stress). Importantly, the effects represent averaged within-person effects, reflecting that these processes represent general within-person trends across individuals, thereby facilitating common processes and generalizability.

Next, the contemporaneous effects are those that are not captured by either the across-day temporal relationships or the between-person effects. Contemporaneous associations have been interpreted as dynamics that potentially occur on a faster timescale than those captured in the temporal lag-1 model (Epskamp et al., 2018). In this study, these contemporaneous effects represent relationships occurring within the same day. For comparison purposes, the arrangement of nodes was based on the average layout of the temporal and contemporaneous network, initially established using the Fruchterman–Reingold algorithm (Fruchterman and Reingold, 1991). The significance level was set to $\alpha = 0.05$, with the networks visualizing all significant edges according to level.

The connectedness of each respective node in the overall network structure was quantified by obtaining regular centrality metrics. For the temporal network, two centrality metrics were computed: 1) in-strength centrality, which represents the sum of all incoming absolute edge weights to a node, representing the extent to which a node is influenced

by other nodes in the network, and 2) out-strength centrality, the sum of all outgoing absolute edge weights from a node, which identifies the nodes' overall predictive effect on other nodes in the network. Thus, the in-strength and out-strength estimates reflect whether nodes play a more receiving or predicting role in the network, respectively. For the contemporaneous networks, strength centrality was computed (Opsahl et al., 2010) by summing all the absolute edge weights connected to a node, thus reflecting the overall magnitude and extent of the connectivity of a node in the network. Following the reporting standards in the network literature, all centrality metrics were visualized as raw scores (Burger et al., 2022). Particularly for dynamic network models, the visualization of out-strength and in-strength using radar plots has been recommended to ease visual comparisons between the inward susceptibility and outward dominance of a node in a network (Ebrahimi et al., 2021).

3. Results

3.1. Temporal networks

The temporal network presented in Fig. 2 reflects how the average within-person increases in one variable predict increases in another variable at the consecutive time point (here, the next day). Several predictive effects and feedback loops were identified between the symptoms of anxiety and psychopathological processes. First, *extensive worry* and *threat monitoring* had several notable relationships with other nodes in the network, and a reinforcing temporal association was found between *extensive worry* and *threat monitoring*. *Extensive worry* predicted more *rumination* across days. Moreover, increased anxiety predicted lower *relatedness* across days and greater *parental stress*. *Parental stress* was also shown to predict *parental burnout*, and vice versa. Notably,

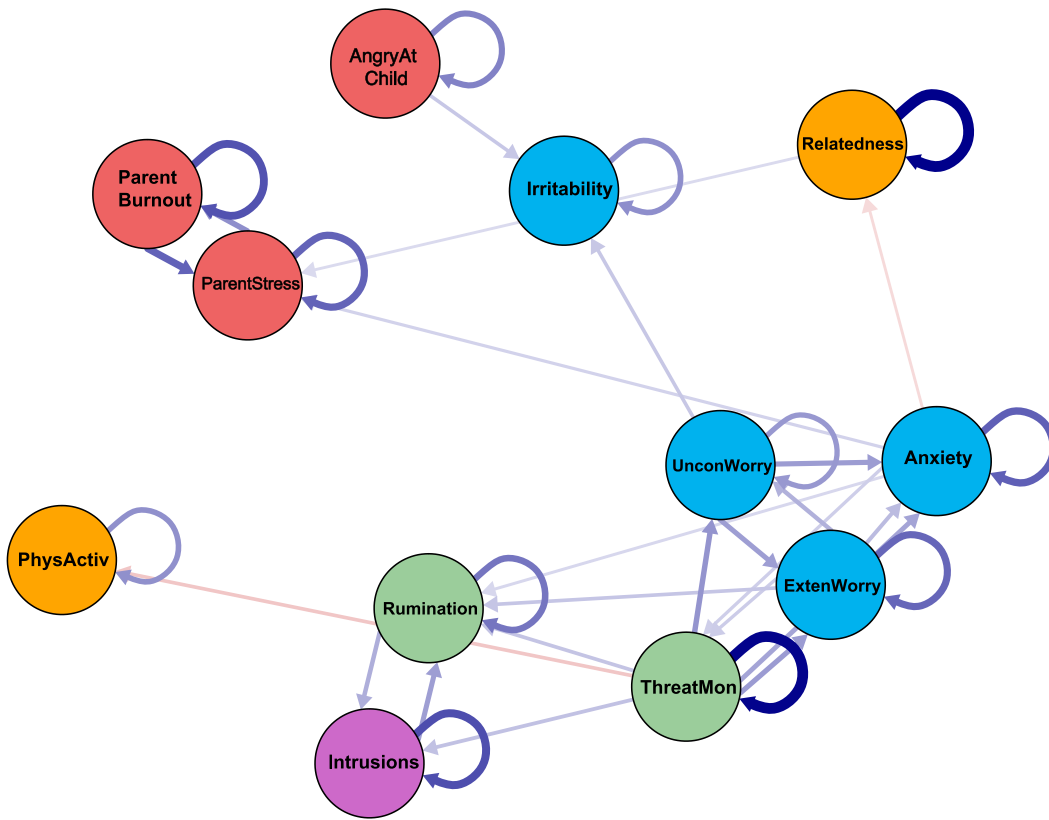


Fig. 2. Temporal network.

greater *relatedness* than average showed a positive temporal association with *parental stress* the next day.

A feedback loop between *extensive worry* and *uncontrollable worry* was identified. Furthermore, *threat monitoring* predicted *uncontrollable worry*, *anxiety*, and *extensive worry*. *Threat monitoring* also predicted increases in *rumination* and *intrusions* and less engagement in *physical activity*. All variables showed autoregressive effects, namely, a variable's

predictive carryover effect across days. The strongest autoregressive effects were found for *threat monitoring*, *relatedness*, and *intrusions*.

The radar plot (Fig. 3) for the temporal network revealed that *threat monitoring* had the highest outstrength. Moreover, *anxiety*, *rumination*, and *parental stress* showed high instrength, that is, a greater susceptibility to being predicted by other nodes. *Irritability* and *physical activity*, *being angry at one's children*, and *relatedness* showed low instrength.

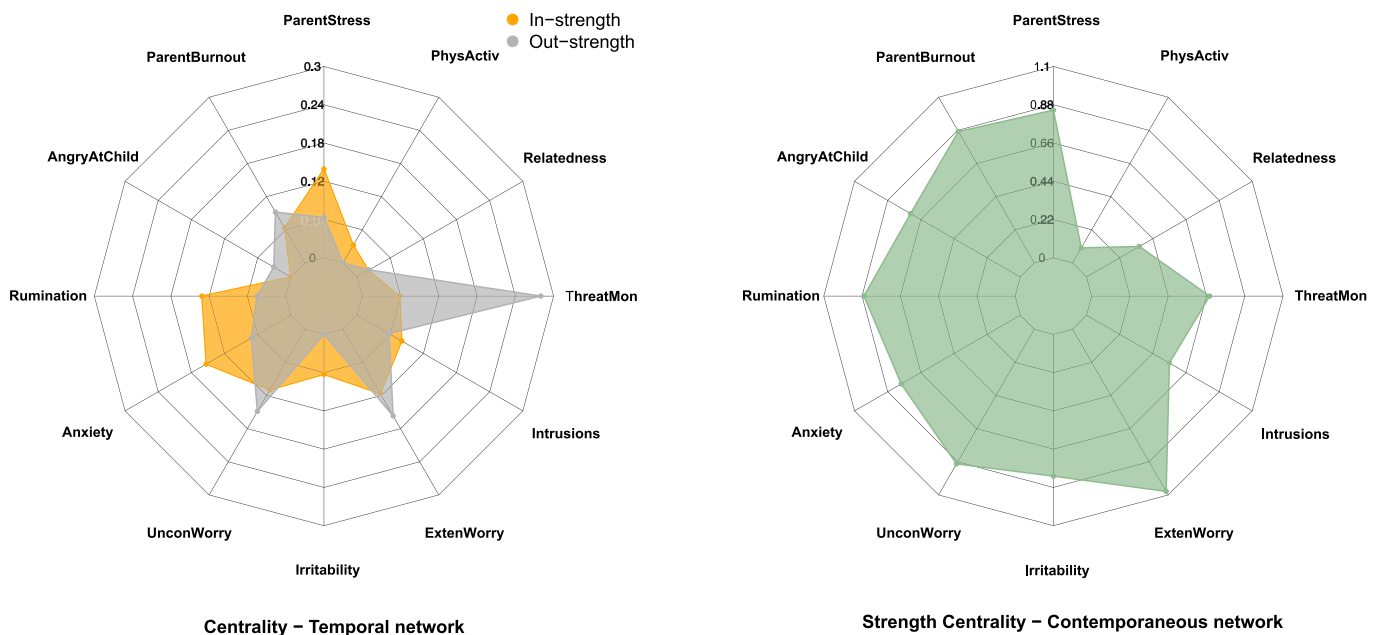


Fig. 3. Radar plots temporal and contemporaneous network.

3.2. Contemporaneous network

As can be seen in Fig. 4, the contemporaneous network reveals patterns of association between symptoms and processes that occur within the same day. *Extensive worry* showed the strongest overall connectivity in the contemporaneous network. Additionally, *physical activity* as a protective lifestyle component showed the lowest strength centrality (Fig. 3), with a few weak connections to other symptoms and processes.

The contemporaneous network showed that, on average, being more irritable than usual was associated with more than average rumination within the same day. A similar connection was also found between irritability, parental distress components, and symptoms of anxiety within the same day.

A strong association was further found between *parental stress*, *parental burnout*, and *being angry or frustrated toward children*, indicating that parents tended to co-experience these states within the same day. While the results showed no relationship between being angry or frustrated toward one's children, on the one hand and parental stress and parental burnout, on the other hand, in the temporal network, being angry at one's child was contemporaneously associated with both parental stress and parental burnout. *Extensive worrying* and the perceiving of thoughts as uncontrollable displayed a similar association within the same day and across days.

4. Discussion

In this intensive longitudinal study, our aim was to investigate the within-person variations in anxiety symptoms, psychopathological processes, parental distress, and protective lifestyle components in a large sample of parents during COVID-19 lockdown periods. Overall, the findings highlight that several key associations between symptoms and

processes play a predisposing role in the maintenance of anxiety symptomatology in parents. First, extensive worry had the strongest outward predictive effects across days, highlighting the prominent role of worry in amplifying and maintaining symptoms of anxiety over time. A similar predictive effect across days also emerged for threat monitoring. As these variables were engaged in a reinforcing vicious cycle, these findings indicate that, on average, when parents worry more extensively one day, a relationship is seen with more threat monitoring on the next day, and vice versa. The extensive worrying and monitoring of threats thus mutually drive each other and might contribute to the aggravation of both over time. A strong association between these two components was also observed within the same day, highlighting how threat monitoring and worry may exacerbate each other on a more proximal time scale. Moreover, extensive worry had the highest overall connectivity in the network, followed by threat monitoring, further displaying their overall key roles in anxious experiences on a within-day basis.

Threat monitoring was also identified as the variable having the strongest cross-day impact on other variables in the network. Specifically, greater engagement in threat monitoring was predicted with increases in extensive worry, rumination, uncontrollable worry, intrusions, and anxiety across days. Overall, the observed patterns point to the key roles of worry and threat monitoring as particularly important contributors to the maintenance and aggravation of anxiety in parents. Moreover, the findings further support the assumption that threat-oriented attention and monitoring play prominent roles in the etiology and maintenance of anxiety (Bar-Haim et al., 2007; Beck, 1976).

This study adds to the literature by revealing this association on an across-day basis in parents specifically, and further shows the role that threat monitoring holds when controlling for a range of other key processes associated with anxiety. The results of this study also reflect

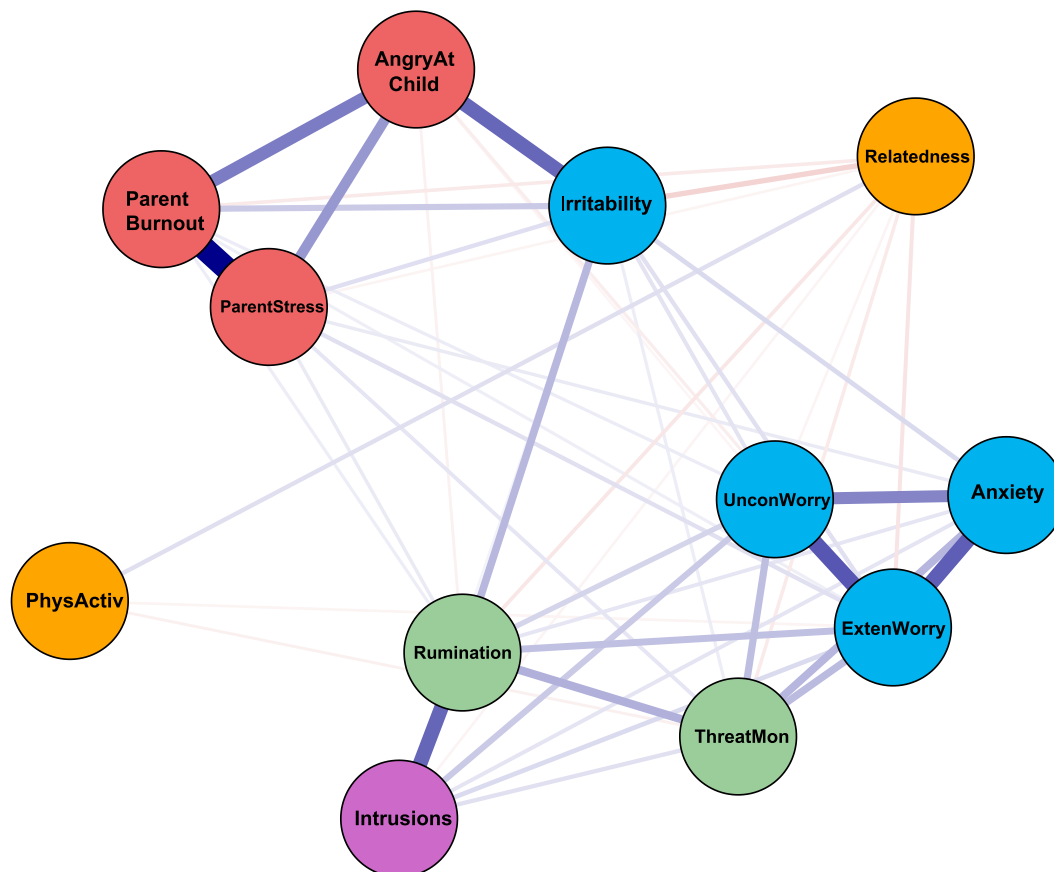


Fig. 4. Contemporaneous network.

theories about the role of threat monitoring and extensive worry in anxious states in the general population and support the transferability of these theories to the parental population.

For instance, the strong amplifying association between extensive worry and threat monitoring is in line with the theoretical assumption that worry is linked to pervasive bias in threat detection (Borkovec et al., 2004). Worrying has also been found to facilitate responses to threat-related attention bias and to contribute to the hypervigilance of the threat that is present in information processing in anxiety (Oathes et al., 2010). The link between extensive worry and anxiety has also been addressed in early network theories on memory and mood. For instance, in accordance with Bower's influential network theory (Bower, 1981), individuals high in trait anxiety may have more tightly organized clusters of worry-related information in long term memory, and these clusters may be responsible for the uncontrollable and repetitious nature of excessive worry.

Another finding in the current study revealed a vicious cycle between extensive worrying and perceived uncontrollability of worry, reflecting that on average, parents who engage in more extensive worry on a given day also often, to a greater extent, perceive their thoughts as being uncontrollable the next day, and the other way around. This across-day reinforcing cycle points toward the functioning of negative meta-cognitive beliefs or meta-worry (worry about worrying), which can result in a downward spiral caused by a negative evaluation of worry, which, in turn, has an anxiety-provoking function (Purdon, 1999; Wells, 1995). Our results indicate that this negative maintenance process is present in parents and might contribute to detrimental mental health over time.

A similar reinforcing loop was also found between intrusions and rumination, indicating that rumination is one of the psychopathological processes that reinforces intrusions from day to day in parents, and vice versa. The observed patterns provide support for prior evidence suggesting that rumination may be a key vulnerability factor for the initial development and subsequent maintenance of intrusions (Ehlers and Clark, 2000). In addition, ruminative responses to anxious moods appear to contribute to intrusion development (Laposa and Rector, 2012).

Extensive worry was further found to predict increases in rumination across days. This pattern agrees well with evidence suggesting that worry and rumination are related types of negative repetitive thinking. These are both commonly investigated thought processes that share common processes that make significant contributions to anxiety (Muris et al., 2005), while also being equally elevated across multiple anxiety disorders (McEvoy et al., 2013).

The findings for parental distress components in the network showed that parental stress and burnout predicted each other. This finding suggests that parents who experience increases in feeling overwhelmed in their parental roles (parental stress) on one day also often experience increases in feeling emotionally drained (parental burnout) on the next day, and vice versa. This pattern points to a possible reciprocal relationship between parental stress and burnout, as high levels of parental stress can increase the risk of, and consequently escalate to parental burnout (Mikolajczak et al., 2018, 2019; Roskam et al., 2021). A chronic and enduring exposure to stress in the parental role, which includes imbalance between perceived demands in the parental role and availability of resources, is considered a risk factor for developing parental burnout (Mikolajczak et al., 2019).

On an across-day basis, parental stress and parental burnout were not associated with greater anger and frustration toward children, although this had been anticipated due to studies that have suggested an increase in the risk of neglectful and violent behavior toward one's child(ren) in response to parental burnout (Mikolajczak et al., 2018). Nevertheless, these negative parental experiences tended to co-occur within the same day, suggesting a more proximal relationship between parental stress and parental burnout on the one hand, and being more frustrated and angrier on their children on the other hand.

Of other notable patterns in the networks, greater anxiousness predicted less relatedness to others and increases in parental stress the next day, highlighting the negative role of anxiousness across different areas of parents' lives. Relatedness had fewer across-day associations compared to associations on a within-day basis, where this greater relatedness was associated with less experience of anxious symptoms, parental distress components, and other detrimental processes. These results suggest a role for closeness to peers as a protective factor against negative mental health symptoms, in agreement with studies indicating that perceived emotional support and access to a reliable support network may have a protective effect on health in adverse circumstances (Cohen and Wills, 1985; Freedman et al., 2015). Lastly, when controlling for all other variables in the network, physical activity, a putative protective lifestyle component, showed a limited protective relationship in parents across or within days, with few and weak connections to other symptoms and processes. Threat monitoring was the only variable that predicted physical activity, with more threat monitoring than usual predicting being less physically active the next day.

Addressing the possible mechanisms involved in the development and maintenance of anxiety symptomatology among parents in particularly demanding situations has several clinical implications. Overall, considering the psychopathological processes of worry and the perception of uncontrollability of worry as possible treatment targets may serve as a promising approach for alleviating anxious symptomatology in parents, while presenting an interesting avenue for further research. To date, several training methods have used combined procedures to target these types of cognitive processes in clinical interventions (Mogg and Bradley, 2018; Wells, 2009). However, clinical trials are needed that examine the effectiveness of targeting these specific processes in contrast to standard treatments for parental stress. Scalable, low-cost treatment options, including both home-based programs and therapist-guided interventions depending on the complexity and severity of anxiety symptoms, are of particular interest in targeting complex symptom-to-symptom interactions and multiple processes as possible mechanistic variables related to anxiety in parents.

4.1. Strengths and limitations

The present study had several strengths. First, the use of a large sample of parents renders the study the largest intensive longitudinal investigation of parents to date and contributes to the generalizability and robustness of estimates. The longitudinal assessments further modeled within-person effects, a level of analysis that reveals patterns of associations as they occur within individuals on average rather than comparing processes across individuals. However, several limitations must be considered. The use of self-reported data is susceptible to biases and inaccuracies (e.g., recall bias) that might have impacted the findings. Another limitation was the use of single items to measure each construct, as this could compromise the depth and reliability of the construct's assessment. Conversely, reducing the number of items can generally reduce the cognitive load and time required to complete the survey, increase overall participant engagement, reduce the likelihood of survey abandonment and increase the accuracy of responses (e.g., Ahmad et al., 2014; Davey et al., 2007; Lenzner et al., 2010; Rolstad et al., 2011; Stanton et al., 2002). Single items are therefore adapted in intensive longitudinal designs (e.g., daily measures) (e.g., Hoffart et al., 2023). Moreover, associations may exist between the study variables on a different time scale; hence, different time lags should be used in future research. Temporal effects may also be absent not only because they are truly absent but also because the relationships may be nonlinear or time varying. This would necessitate considering various modeling approaches.

4.2. Conclusions

The consistent patterns observed as central across the temporal and

contemporaneous networks in the present study point toward extensive worry, threat monitoring, and the uncontrollability of worry as key overreaching psychopathological processes that trigger other symptoms of anxiety in parents. A particularly strong across-day association between extensive worry and threat monitoring indicates that these variables mutually reinforce each other over time. The implementation of scalable, low-cost interventions that explicitly address threat monitoring and worry as possible treatment targets may be effective in reducing symptoms of anxiety and contributing to reduced distress in the parental population.

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CRedit authorship contribution statement

All authors designed the study, contributed to data collection, managed the literature searches, and contribute to write the manuscript. Author MSJ wrote the protocol and the first draft of the manuscript. Authors MSJ, NS and OVE undertook the statistical analysis. All authors contributed to and have approved the final manuscript.

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Declaration of competing interest

The authors of the submitted research article “Triggered by Worry: A Dynamic Network Analysis of Anxiety and Parental Stress” have no conflicts of interests to disclose.

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