

An Exploratory Network Analysis of the Associations Between Symptoms of  
Psychopathology and Romantic Relationship Quality

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<i>Subject:</i> Psychology	
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<i>Title:</i> An Exploratory Network Analysis of the Associations Between Symptoms of Psychopathology and Romantic Relationship Quality	
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<i>Abstract:</i> <p>The purpose of this study was to explore the associations between symptoms of psychopathology and romantic relationship quality using a network approach. The hypothesis of the study was that symptoms of psychopathology would be negatively associated with romantic relationship quality. The present study used a Finnish population-based survey-sample of individuals currently in a romantic relationship (<math>N = 4,136</math>). Romantic relationship quality was measured through six variables: relationship satisfaction, commitment, passion, trust, love, and intimacy. Symptoms of psychopathology were measured through the following variables: depression, anxiety, aggression (physical and verbal), contamination sensitivity and alcohol consumption. The connections between variables were estimated using partial correlation networks. The network analysis revealed strong partial correlations between the six aspects of romantic relationship quality. Weak, negative partial correlations were found between some measures of psychopathology and romantic relationship satisfaction, most notably between depression and satisfaction and trust, between verbal aggression and trust, and between alcohol consumption and commitment. The results indicate that symptoms of psychopathology are associated with lower romantic relationship quality to some degree.</p>	
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<i>Svenskt abstrakt:</i> <p>Syftet med den här avhandlingen var att undersöka sambandet mellan symptom på psykisk lidande och parrelationskvalitet i romantiska parrelationer. Hypotesen var att symptom på psykisk lidande har negativa kopplingar till romantisk parrelationskvalitet. Urvalet av deltagare togs ur ett finskt populationsbaserat enkätdata, bestående av 4136 deltagare som vid datainsamlingstillfället befann sig i en parrelation. Romantisk parrelationskvalitet mättes med hjälp av sex variabler: tillfredsställelse, engagemang, passion, tillit, kärlek och intimitet. Symptom på psykisk lidande mättes med följande variabler: depression, ångest, aggression (både fysisk och verbal), rädsla för smitta och alkoholkonsumtion. Kopplingarna mellan variabler estimerades genom partiella korrelationsnätverk. I resultaten av nätverksanalysen fann jag starka kopplingar mellan alla sex mått på parrelationskvalitet. Svaga, negativa kopplingar mellan symptom på psykisk lidande och parrelationskvaliteten kunde ses i resultaten, i synnerhet mellan depression och tillfredsställelse samt tillit, mellan verbal aggression och tillit och mellan alkoholkonsumtion och engagemang. Resultaten tyder på att symptom på psykisk lidande har negativa kopplingar till parrelationskvalitet.</p>	
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## **Introduction**

Subjective romantic relationship quality (RRQ) has been associated with important outcomes, such as physical (e.g., Bourassa et al., 2020; Robles et al., 2014; South & Krueger, 2013) and mental health (e.g., Gove, Hughes & Style, 1983; Mirsu-Paun & Oliver, 2017; Simon, 2002; Whisman, 2007). The relationship between RRQ and personal well-being has been studied extensively (for a meta-analytic review, see Proulx, 2007) and people who are in satisfying romantic relationships tend to report overall higher average scores on measures of subjective well-being than people who are not. Numerous studies have explored the association between romantic relationships and various psychopathologies, such as depression (Whitton & Whisman, 2010) and anxiety (Vossenkemper, 2020). To my knowledge, no study has examined the interactions of multiple symptoms of psychopathology on different components of RRQ at the same time.

## **Romantic Relationship Quality**

RRQ goes by many names such as relationship success, happiness, adjustment, and satisfaction (T. Li & Fung, 2011). In the study of RRQ, a multitude of scales have been used, however, one of two general strategies have often been applied: either an atheoretical or a theoretical approach (Fletcher et al., 2000). The atheoretical approach defines RRQ as the sum of self-report responses that serve as proxies for objective, observable estimates of RRQ, such as those measured by the commonly used Dyadic Adjustment Scale (Spanier, 1976). Examples of such concepts are frequency of quarrels, sexual problems, and number of shared activities. It is argued that this approach creates a more objective measurement of RRQ, since the concepts are directly observable. However, while it is possible to measure these behaviors, not all relationships are affected by them in the same way (Heyman, Sayers & Bellack, 1994).

These measures may also be problematic if self-reported responses do not correspond to objective measures (Fletcher et al., 2000). The theoretical approach serves as an alternative approach, which directly queries the subjectively held opinions of the partners in a relationship, such as by obtaining self-reports of levels of satisfaction, commitment, trust, intimacy, passion, and love in the relationship (Fletcher et al., 2000). When designing the Perceived Relationship Quality Components (PRQC) scale used in the present study, Fletcher et al. (2000) reviewed the empirical and theoretical literature and chose these six components to define RRQ. These components are discussed below.

### ***Relationship Satisfaction***

There are different theories on how satisfaction is achieved in a romantic relationship. Rusbult (1980) argues that relationship satisfaction equals the outcome of the relationship minus an individual's comparison level. The outcome of a relationship is the sum of one's perception of all attributes of one's partner, both positive and negative, such as perception of intelligence, physical appearance, humor, and temperament of the partner. These attributes are weighted depending on what the individual finds important in a relationship. The comparison level is the standard of a relationship that the individual has come to expect, based on past experiences and the relationships of one's peers (Rusbult, 1980). According to interdependence theory (Kelley & Thibaut, 1978), individuals seek to maximize rewards and minimize cost and will in extension be more satisfied in the relationship when favorable attributes in the relationship are high, negative attributes are low, and expectations on the relationship are congruent with the current state of the romantic relationship. Sternberg (1986), on the other hand, argues that relationship satisfaction is achieved when the current relationship's levels of intimacy, passion, and commitment align with one's ideal levels of these three components in a relationship. In the views of T. Li and Fung (2011), relationship

satisfaction is achieved when one can fulfill one's goals in the relationship. Typically, these goals are personal growth goals in early adulthood, instrumental goals (such as sharing a household and having children) in middle adulthood and companionship goals in later adulthood (T. Li & Fung, 2011).

### ***Relationship Commitment***

Being satisfied in a relationship is not necessarily analogous to having a stable relationship, that is, whether the relationship lasts or not. According to Le and Agnew (2003), satisfaction, in addition to investment in the relationship and availability of potential alternative partners, predict commitment, which in turn predicts whether the relationship will last in the long term. (Le & Agnew, 2003). According to Sternberg (1986), commitment exists in two forms: short-term and long-term commitment. Short-term commitment is defined as choosing to love one's partner on a day-to-day basis, while long-term commitment is to commit to maintaining that love over a long period of time. (Sternberg, 1986). Rusbult (1980) argues that commitment is the sum of the outcome of and investment in the relationship, minus the outcome of alternative options (e.g., another potential partner or being single). Thus, high commitment alone is not indicative of a satisfying relationship, since one may stay in a poor relationship due to high investment, such as having children or sharing a home (Rusbult, 1980). Alternatively, one may be very satisfied, but since there are many other potential partners available, commitment stays low. Commitment is not a perfect indicator of relationship stability. There may be sudden events that end a relationship, even when commitment levels are high, such as moving apart after graduation, infidelity, or social pressure. (Le & Agnew, 2003). In a relationship dissolution that is not mutually agreed upon, it is common that one of the partners has high levels of commitment while only the other partner experiences low commitment (Agnew, 2000).



### ***Relationship Trust***

Rempel, Holmes and Zanna (1985) state that three aspects of trust exist in close relationships: predictability, dependability, and faith. Predictability increases over time when experience suggest that one's partners behavior is consistent, stable and under their control. Dependability concerns the characteristics of the partner; a dependable partner is honest and can be counted on. Faith is defined as a belief beyond evidence, for example, that the relationship will last in the long-term. Out of these three measures, faith is the most important for love and happiness in a relationship. Trust is gained when a relationship is exposed to uncertainty and risk. (Rempel, Holmes & Zanna, 1985). Lack of trust has been linked with reduced levels of commitment and intimacy in the relationship (Towner et al., 2015) and has been proposed as the most important trait in a romantic relationship (Mogilski et al., 2019).

### ***Relationship Intimacy***

Sternberg (1986) defines intimacy as feelings of closeness and warmth in a relationship. High intimacy includes feelings of promoting the well-being of the loved one, experiencing shared happiness, sharing material resources, and valuing the other in one's life, among other things. Intimacy as defined here is not unique to romantic relationship and exists in the same or a similar form in other relationships, such as friendships and in the relationship between siblings. (Sternberg & Grajek, 1984). Joel et al. (2018), found that intimacy is the most common reason for wanting to stay in a relationship, outweighing reasons such as compatibility, the partner's personality, and attraction. A positive association between intimacy and relationship satisfaction has also been found (Greeff & Mahlherbe, 2001; Yoo et al., 2014) and lack of intimacy in the relationship is a common reason for seeking relationship counselling (e.g., Doss et al., 2004).

### ***Relationship Passion***

According to Sternberg (1986), passion is experiences of both psychological and physiological arousal, such as sexual fulfillment. Passion is often connected to relationship intimacy; according to H. Rubin and Campbell (2012) an increase in day-to-day intimacy leads to more passion in a romantic relationship. However, in some relationships, a negative association between passion and intimacy may occur. Some individuals experience that too high intimacy may interfere with passion, such as in close friendships. In these relationships an increase in intimacy will not lead to increased passion (Sternberg, 1986). Passion has been positively associated with relationship satisfaction (e.g., Madey & Rodgers, 2009). Previous studies have shown that relationship duration tends to have a negative association with relationship passion (Busby, Chiu, Leonhardt, Iliff, 2019; Lemieux & Hale, 2002).

### ***Relationship Love***

Researchers define love in various ways. Most agree that there exist many types of love, such as parental love, pet love, and romantic love. However, the exact number of types differs between researchers (Fehr & Russell, 1991). Z. Rubin (1970) developed one of the earliest definitions of love still used today and defines romantic love as an interpersonal attitude made up of three components: attachment, caring, and intimacy. Fehr and Russel (1991) argue that love is an emotion connected to characteristics such as caring, helping, establishing a bond, respect, and closeness. Sternberg (1986) argues for a triangular theory of love, where love is the combination of intimacy, passion, and commitment, and defines eight types of love based on which of these three components are present. According to him, many romantic relationships strive to achieve high levels of intimacy, passion, and commitment as the goal of the romantic relationship, a type of love he has coined consummate love

(Sternberg, 1986). In a meta-analytic study by Graham (2011), he argues that love is made up of two components, romantic and companionate love, and a positive association between love and relationship satisfaction has been found.

## **Associations Between Symptoms of Psychopathology and Romantic Relationship Quality**

Symptoms of depression have been linked with lowered RRQ (Heene, Buysse & Oost, 2005; P. F. Li & Johnson, 2018; Whitton & Kuryluk, 2012). Davila et al. (1997) have hypothesized that this is due to depressive symptoms leading to more stress in the relationship, leading to lower relationship quality. The link between depressive symptoms and low relationship quality, mediated via stress, is likely to be bidirectional: more depressive symptoms lead to lower romantic relationship quality and vice versa. In a temporal study, Whitton and Whisman (2010) showed that depression scores were positively correlated with varying levels of relationship satisfaction over time, suggesting that instability or variation in levels of relationship satisfaction could lead to higher depression scores.

Vossenkemper (2020) found that higher levels of anxiety correlated with lower levels of marital quality, even after controlling for depression. This relationship was mediated via negative attribution of events, indicating that the interpretation of events plays a major role in the link between anxiety and RRQ. In a large-scale population-based survey, Whisman (2007) found that increased marital distress was associated with higher anxiety and lower marital quality. As with depressive symptoms, it seems that the association between anxiety and RRQ is bidirectional in nature. Etcheverry et al. (2013) found that there was a negative connection between anxiety and commitment, mediated via relationship satisfaction.

Studies have shown that individuals with obsessive-compulsive disorder (OCD) symptoms generally have moderate relationship satisfaction (Remmerswaal et al., 2016; van

Minnen & Kampman, 2000), lower than that of population-based samples (Røysamb, Vittersø & Tambs, 2014). Previous studies have hypothesized that partners of people with OCD-symptoms generally respond to the symptoms in three ways: empathically; by accommodating them; or by criticizing them (Renshaw et al., 2005). Accommodation has a negative effect on the partner accommodating but not on the person experiencing symptoms (Boeding et al. 2013). Severity of either obsessive or compulsive symptoms have not been associated with relationship satisfaction, however, co-morbid depressive symptoms were associated with less relationship satisfaction. (Remmerswaal et al., 2016). Contamination sensitivity, used as a proxy for OCD symptoms in the present study, is one of five content dimensions of OCD and includes both contamination obsessions and washing compulsions (Burns et al., 1996). Contamination sensitivity has been linked to lower sexual arousal which may be linked to lower sexual satisfaction (Pozza et al., 2020).

Previous studies have found that alcohol use and relationship problems often co-occur and is often both affecting and affected by the relationship (Bamford et al., 2007). DiBello et al. (2015) found that alcohol use serves as a coping method for negative relationship events, (e.g., jealousy), for individuals whose self-esteem is closely tied to the relationship quality.

Alcohol use is one of the most common reasons for divorce (Amato & Previti, 2003). Typically, partners share drinking patterns and major discrepancies in partner drinking patterns has been linked with increased relationship distress as well as intimate partner violence (Leadley et al., 2000). The link between excessive alcohol consumption and poorer relationship outcomes has been established (e.g., Leonard & Eiden, 2007; Marshal, 2003)

Intimate partner violence occurs to both men and women to a similar degree (Ahmadabadi et al., 2018), however, women tend to have more severe both medical, judicial and mental consequences than men (Tjaden & Thoennes, 2000). Although not pathological by default, both verbal (Cramer, 2007; Kaura & Lohman, 2007) and physical conflicts

(Ackerman & Field, 2011; Bookwala et al., 1994; Stith et al., 2008) in a romantic relationship affect relationship satisfaction negatively. In heterosexual married couples, physical aggression decreases over time, and it seems that husbands' physical aggression towards their wives predict relationship discord, while wives' aggression towards their husbands predicts relationship dissolution. (Lawrence & Bradbury, 2007).

### **The Network Approach**

Traditionally, mental disorders have often been thought of as latent constructs, similar to other medical conditions, giving rise to various psychiatric symptoms through common pathogenic pathways. For example, depression has been considered an illness giving rise to symptoms such as loss of interest, insomnia and lack of self-esteem. However, for almost all mental disorders, defining such an etiology and working out common pathways has been difficult. The network approach to psychopathology has been proposed as a solution to this difficulty. According to network theory, rather than symptoms being linked with each other through a common cause, symptoms are thought of as being directly connected with each other. Network models can be visualized, where individual symptoms are thought of as “nodes”, connected to other symptoms through connections called “edges”. The pattern of these edges describes the interactions between symptoms in the network structure. In graphic representations, the thickness of edges describes the strength of the connection between nodes and colors are used to represent either a positive or negative connection. These connections (edges) are thought to represent causal connections between variables such as symptoms of psychopathology (however in a network built on cross-sectional data, they depict [partial] correlations). For example, insomnia, can be thought of as a causing factor for fatigue, which may in turn affect concentration, which may in turn affect rumination, which aggravate insomnia, thus creating a self-sustaining, negative feedback loop. The network system enters a

pathological state when symptoms are activated for a prolonged time. There may be individual differences in how easily a node is “activated”: a thicker edge in a network indicates a higher probability for symptom activation. (Borsboom, 2017). The distinction between network and common cause models could have major implications for clinical practice since, depending on which model is true, different treatments should be applied. If the true model of depression is a common cause model, treating individual symptoms will not affect other symptoms, in the same way that treating cough in a patient suffering from tuberculosis will not affect other symptoms, such as fever. However, if the network model is true, treating individual symptoms could have a cascading effect in the network, leading to reduction in other symptoms as well. (Fried, 2020).

In psychological data, one of the most common methods of network modeling is to calculate partial correlations between variables (i.e., calculating the unique association between two variables after controlling for all other variables in the model). The lack of a connection between two variables indicates that these variables are conditionally independent and that any variance these two variables may share is explained by the other variables in the model. (Epskamp & Fried, 2018). For a given node in a network, measures of centrality can be calculated. These measures indicate how influential a particular node is in a network. The most common measures of centrality in psychological networks are how many edges a given node shares with other nodes (i.e., degree centrality), the sum of absolute edge weights for a given node (i.e., strength centrality), how quickly information “travels” via the given node (i.e., closeness centrality) or how often the node is on the shortest path for other nodes in the network (i.e., betweenness). (Epskamp, Borsboom & Fried, 2018).

As a result of the traditional approach to conceptualize mental disorders as latent constructs, statistical methods utilizing latent variables such as structural equation models have often been used to establish connections between mental disorders and other variables. A

potential drawback of structural equation models is that for the structural model to be statistically identifiable, at least some causal assumptions need to be made by the researcher. (Bollen & Pearl, 2013). Network models avoid the need to make causal assumptions, since all partial correlations between measured variables are estimated. Since virtually all real-world variables are correlated to some degree, regularization is used to penalize small partial correlations and set them to zero in order to create sparse and interpretable networks. A major challenge in psychological research is establishing causal patterns. Much research is observational in nature and thus, drawing causal conclusions from cross-sectional data is difficult. Cross-sectional network models cannot be used to establish causal patterns, unless one can be certain that all relevant variables are included in the model. Therefore, cross-sectional networks should be used as a first step to identify potential causal pathways that could be further tested through temporal data. (Pearl, 2009). Whether the true model is a latent model or a network model cannot be resolved statistically, since both models provide approximately the same model fit (Fried, 2020). Thus, when analyzing cross-sectional data, the researcher must decide which model is more plausible. There is no doubt that all psychopathology symptoms affect daily life in some way and therefore, in extension, also romantic relationships. Edges found in a partial correlation network could be indicative of potential causal pathways between various symptoms of psychopathology and romantic relationship quality. The network model was chosen over a latent model in this study, to enable me to make hypotheses about these potential causal pathways. In the present study, I was interested in elucidating how symptoms of psychopathology were associated with components of romantic relationship quality.

## **Aims and Hypotheses**

The aim of the present study was to examine how different symptoms of psychopathology correlate with romantic relationship quality through the use of network analysis. Previous studies have focused on a limited amount of psychopathology symptoms and have often looked at only one aspect of romantic relationship quality. In the present study, a form of network models called Gaussian graphical models were used to calculate and visualize partial correlations between psychopathology symptoms and relationships quality items, creating a network of connected items. While the study is exploratory in nature, my hope was that the results would shed light on the interactions between psychopathology symptoms and relationship quality, allowing further hypothesis-driven research to be built on these results, such as research on treatment planning, (e.g., marriage counselling).

To my knowledge, no study has examined the effect of psychopathology symptoms on various components of relationship quality, while taking into account possible mediating pathways. Based on the previous research reported above, I expected to detect the following associations (partial correlations):

- 1) Strong associations between the measures of different components of RRQ.
- 2) Negative associations between both anxiety/depression and RRQ (in particular relationship satisfaction).
- 3) Negative associations between both verbal and physical aggression and relationship satisfaction.
- 4) No association between contamination sensitivity and relationship satisfaction after controlling for depression.
- 5) Negative associations between alcohol consumption and RRQ, in particular with relationship commitment.



## Method

### Participants

The data used in the present study was obtained from a Finnish population-based study by Tybur, Wesseldijk and Jern (2020). The research plan went through an ethical review and no ethical concerns were found. Twins and siblings of twins in Finland were sent an invitation letter to participate in a survey if they were over 18 years old, their mother tongue was Finnish, and they resided in Finland at the time of gathering contact information. In total, 33,211 eligible addresses were obtained through the Central Population Registry and sent an invitation letter, of which 9,564 responded, resulting in a total response rate of 29%. Out of the respondents 9,319 (97%) agreed to that their data would be used for scientific purposes. For a thorough description of the recruitment process, see Tybur, Wesseldijk and Jern (2020). The survey consisted of a host of variables, of which measures that were associated to either RRQ or symptoms of psychopathology were selected. The selected measures are detailed below.

### Measures

**Perceived Relationship Quality Components.** The Perceived Relationship Quality Components (PRQC; Fletcher et al., 2000) was used to assess RRQ. When developing the scale, Fletcher et al. compared multiple factor models for RRQ. The best fitting model was a two-level factor model where indicator variables loaded on six components of RRQ, which in turn loaded on one underlying measure of RRQ. These six factors were satisfaction, commitment, intimacy, trust, passion, and love. They concluded that RRQ should not be conceptualized as a unidimensional construct and that while the six underlying components tend to be highly correlated, they do vary in important ways. Thus, the original PRQC-scale

consists of the six latent factors of romantic relationship, measured by three indicator variables each. In the present study, an abridged version of the original scale was used, as recommended by Fletcher et al. (2000). This version consisted of six items, one item for each of the above-mentioned latent factors, measured on a Likert-scale ranging from 1 “*Not at all*” to 7 “*Very much*”. In the present study the internal reliability of the six PRQC items was good, Cronbach’s  $\alpha = 0.89$ .

**Symptoms of anxiety and depression.** The Brief Symptom Inventory-18 (BSI-18; Derogatis, 2001) was used to assess two domains of psychological distress: anxiety and depression. These domains were measured on two subscales, each containing six Likert-type items ranging from 1 “*Not at all*” to 5 “*Extremely*”. An example of an item from the depression subscale is “*Feeling no interest in things*” and from the anxiety subscale “*Nervousness or shakiness inside*”. In the present study the internal reliability of the two subscales were good, Cronbach’s  $\alpha = 0.86$  for the depression items and Cronbach’s  $\alpha = 0.88$  for the anxiety items.

**Alcohol use.** The Alcohol Use Disorders Identification Test for Consumption (AUDIT-C; Bush, Kivlahan, McDonell, Fihn & Bradley, 1998) was used to assess alcohol consumption. The AUDIT-C consists of three Likert-type items measured on a scale from 0 – 4 and were summed to form a composite variable ranging from 0 to 12, with higher scores indicating higher alcohol consumption. These items were: “*How often do you have a drink containing alcohol?*”, “*How many drinks containing alcohol do you have on a typical day when you are drinking?*” and “*How often do you have six or more drinks on one occasion?*”. Abstainers were assigned a value of zero on this composite variable. Internal consistency was not calculated, since abstainers only responded to the first of the three items.

**Contamination sensitivity.** Contamination sensitivity is an important facet of OCD and was used as a proxy for OCD in the present study. The 10-item subscale for contamination sensitivity from the Padua Inventory-Revised (Burns et al., 1996) was used to measure symptoms of contamination sensitivity. The scale asks participants to indicate a response on a scale from 0 “*Not at all*” to 4 “*Very much*” on questions such as “*I wash my hands more often and longer than necessary.*” The internal reliability of the scale was good, Cronbach’s  $\alpha = 0.86$ .

**Aggression.** An adapted version of the Aggression Questionnaire (AQ; Buss & Perry, 1992) was used to measure aggressive tendencies on two subscales: verbal and physical aggression. The original scale consists of four subscales, physical aggression, verbal aggression, anger, and hostility, each measured by Likert-type questions with five response options, ranging from 1 “*Not at all typical*” to 5 “*Very typical*”. In the present study, only the physical and verbal aggression subscales were used. Examples of items measuring physical aggression were “*If I have to resort to violence to protect my rights, I will*” and verbal aggression “*I tell my friends openly when I disagree with them*”. Cronbach’s  $\alpha = 0.63$  for verbal aggression and  $\alpha = 0.79$  for physical aggression.

## **Data Preparation and Handling**

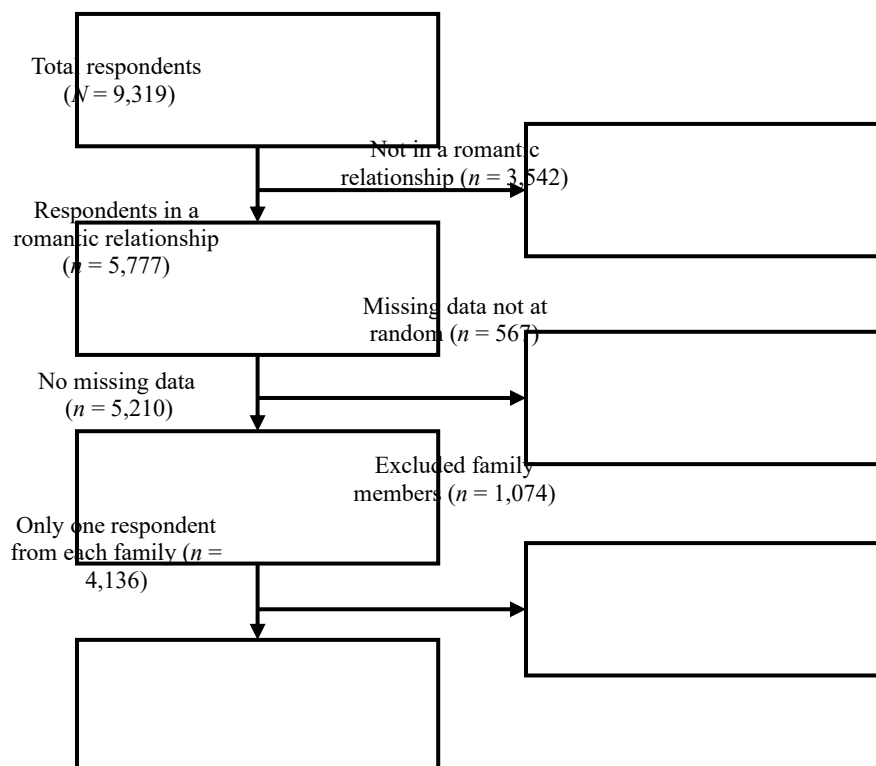
All data preparation and analyses were performed in R version 4.0.2, utilizing R-Studio version 1.3. The following freely available packages were used for data handling, plotting and analyses: *tidyverse* (Wickham et al., 2019), *qqgraph* (Epskamp et al., 2012), *bootnet* (Epskamp et al., 2018), *lavaan* (Rosseel, 2012) and *huge* (Zhao et al. 2012).

Participants for the present study were selected from a larger survey sample on the condition that they reported that they currently are in a romantic relationship. Participants

were asked “Are you in a romantic or sexual relationship with someone at the moment?”, with the response options “No relationship”, “I have a sexual partner, but I’m not in a relationship” and “Yes, I am in a romantic relationship”. Only participants who responded “Yes, I am in a romantic relationship” were included in the present study. The data consisted of responses from 5,777 individuals. Due to some participants being genetically related (e.g., siblings), only one participant from each family was selected at random to avoid observations being dependent on each other. Furthermore, some participants were missing data on relevant variables, due to not finishing the study. Since these observations were not missing at random, these participants were excluded from the analyses. See Figure 1 for a thorough break-down of the exclusion process. The final sample size was  $N = 4,136$ .

**Figure 1.**

*Flow Chart Depicting Exclusion Criteria*



## Network Preparation and Estimation

Theory on network analysis is constantly evolving. According to current theory, when analyzing composite data, factor scores are preferred over sum scores, due to accounting for measurement error. In a blog post on network estimation by Fried (2019), it was shown that using factor scores of subscales expectedly creates more reliable regularized partial correlation networks than using sum scores. If it can be assumed that variation in a latent variable cause variation in the indicator variables (i.e., higher scores on a latent variable “depression” causes higher scores on the observed variables measuring depression), then, using factor scores instead of sum scores will remove some measurement error, which in turn will cause partial correlations between factors to become stronger, since the subscale scores are more reliable. (Fried, 2019). Therefore, in the present study, factors were created for the individual subscales via confirmatory factor analysis using the *lavaan* package (Rosseel, 2012) in R. Due to the ordinal and non-normal nature of the observed variables, diagonally weighted least squares (WLSMV) was used as the estimation method for the confirmatory factor analysis (C. H. Li, 2016). Residuals of items were allowed to correlate within a subscale, if it provided better model fit based on modification indices. The network model was thus estimated from factor scores of the following latent variables: anxiety (BSI-anxiety), depression (BSI-depression), contamination sensitivity (Padua), physical aggression (AQ-physical), and verbal aggression (AQ-verbal). The factor scores were estimated using maximum-likelihood, due to the ordinal nature of the indicator variables. In the present study, the aim was to explore how symptoms of psychopathology correlate with different aspects of relationship quality, therefore, all PRQC items were used in the analysis as individual items and not as a single factor. AUDIT was entered into the model as a sum score of three items. Network estimation relies on the assumption of multivariate normality for continuous variables. Since the factor scores were all heavily positively skewed, a nonparanormal

transformation (Liu et al., 2009) was applied to transform the variables to have a marginal normal distribution. This was accomplished using the *huge* package in R (Zhao et al. 2012). The partial correlation network was estimated using the EBICglasso algorithm. The Least Absolute Shrinkage and Selection Operator (LASSO: Tibshirani, 1996) regularization technique in combination with the Extended Bayesian Information Criterion (EBIC; Foygel & Drton, 2010) was used to avoid false positive edges in the network. The LASSO either shrinks parameters (edges) in the network or sets them to zero using a tuning parameter  $\lambda$  (lambda) that controls the level of sparsity in the network model. Multiple competing network models are estimated with different tuning parameters, of which the model that fits the data best is selected. This selection is based on the model that minimizes the EBIC and selects the network that best corresponds to the preferred level of simplicity, according to a hyperparameter  $\gamma$  (gamma). This hyperparameter in the present study is set to 0.5, as per recommendations to favor parsimonious network models. The model was also thresholded to create a sparser network. This produces an important consideration: the lack of an edge does not necessarily imply that a pathway is missing in the true network, rather that the path is either better explained as a mediating effect or is too small and noisy to be detected and therefore reduced to zero by the LASSO regularization (Epskamp et al., 2018).

Due to the ordinal nature of some of the variables, polychoric correlations were used when estimating edges. For the network estimation, thresholds favoring specificity were used to reduce the risk of finding spurious edges. Edge weights are tested for accuracy and stability by calculating 95 % bootstrap confidence intervals. Large intervals indicate unstable edge-weights, meaning that they will likely vary a lot from sample to sample. An important caveat of these confidence intervals is that they should not be interpreted for statistical significance, as can be done for traditional confidence intervals. Since edge weights are already regularized by the LASSO regularization, only sufficiently strong edges remain in the network. The

stability can be examined via an edge-stability plot. (Epskamp et al., 2018) Node strength, that is, the sum of absolute edge weights for each node, was calculated as a measure of network centrality using the *qgraph* package. Case-dropping bootstrap was used to measure the accuracy and robustness of this strength estimate, the bootstraps examines whether the strength estimate dramatically changes when random subsets of cases are dropped from the data. A dramatic change indicates an unstable strength estimate (i.e., one that is unlikely to replicate in other studies). This stability can be quantified using a correlations stability coefficient (CS-coefficient) and this coefficient should preferably remain above 0.5 (Epskamp, Borsboom & Fried, 2018).

## Results

The sample consisted of 4,136 participants ages 18 to 60 ( $M = 31.59$ ,  $SD = 7.85$ ). In the sample, 2,781 (67.24%) of participants identified as cisgender women, 1,342 (32.45%) as cisgender men, and 13 participants (0.31%) did not agree with the gender they had been assigned with in the Central Population Registry. Furthermore, 3,746 (90.57%) of the participants described their sexual orientation as heterosexual, 87 (2.10%) as homosexual, 265 (6.41%) as bisexual and 38 (0.92%) as “*Other*”. Descriptive statistics for the variables used in the network analysis can be found in Table 1. Results of network analyzes are reported below, according to current standards of reporting (Burger et al., 2020).

**Table 1***Descriptive Statistics for Scales and Variables (N = 4,136)*

Variable	Item/Sum scores			Factor scores		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
Duration of relationship (years)	7.52	6.77	0–41			
PRQC	35.62	5.68	8–42			
Commitment	6.42	0.96	1–7			
Intimacy	5.99	1.20	1–7			
Love	6.33	1.04	1–7			
Passion	4.94	1.53	1–7			
Satisfaction	5.66	1.29	1–7			
Trust	6.29	1.07	1–7			
AUDIT	6.78	2.57	1–15			
BSI	22.02	8.80	12–60			
Anxiety	10.63	4.63	6–30	0.00	1.00	–3.53–3.53
Depression	11.39	4.79	6–30	0.00	1.00	–3.53–3.53
Padua	10.49	4.54	7–35	0.04	0.92	–1.02–3.53
AQ	22.96	5.78	11–53			
Verbal	12.16	2.77	5–25	0.00	1.01	–3.33–3.53
Physical	10.80	3.78	6–30	0.00	1.01	–3.53–3.53

*Note.* AUDIT = Alcohol Use Disorders Identification Test, AQ = Aggression Questionnaire, BSI = The Brief Symptom Inventory-18, PRQC = Perceived Relationship Quality Components. Sum scores for BSI, Padua and AQ are included in the table for interpretability but were not used in analyses.

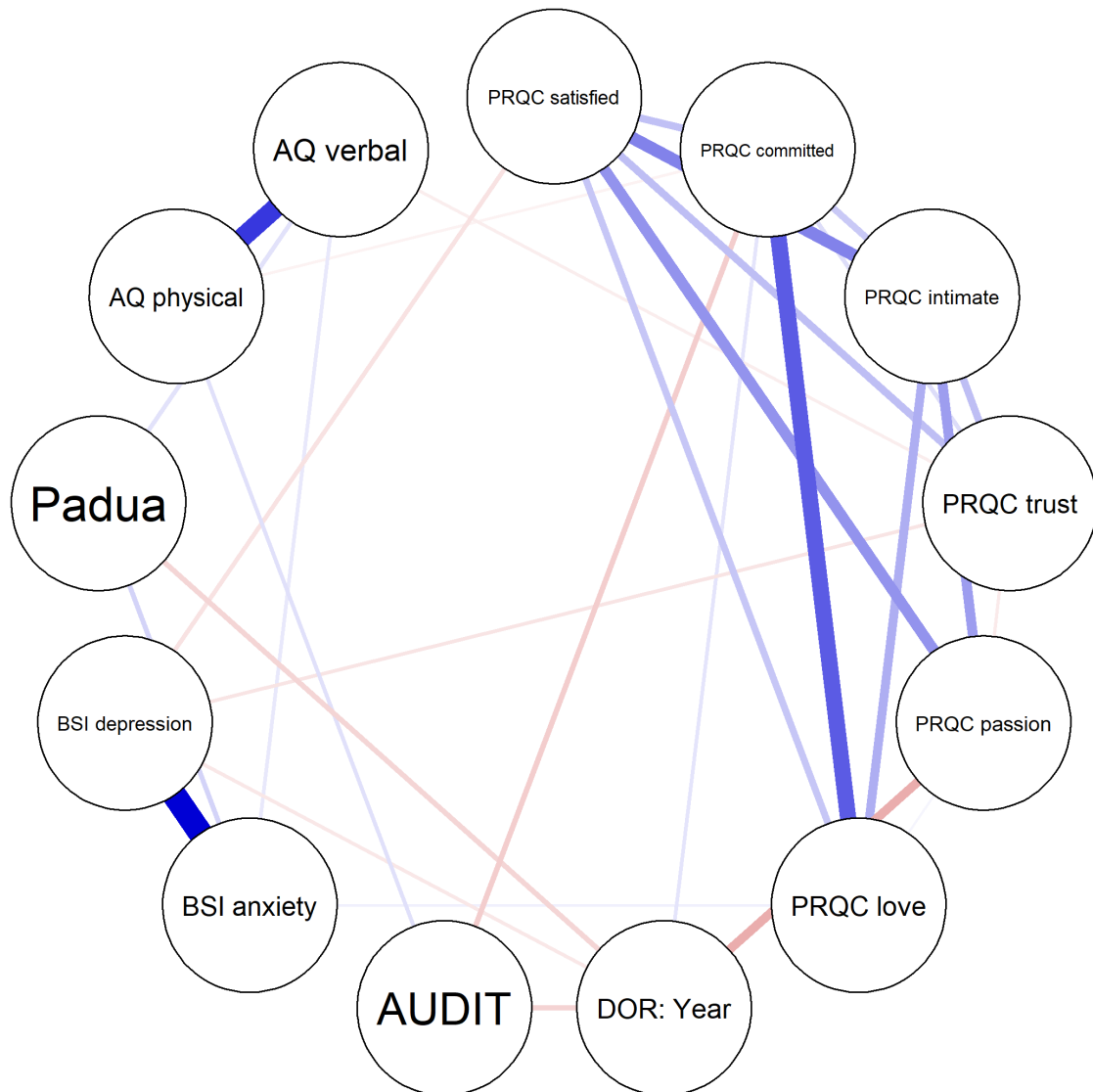


## **Analysis of Network Structure**

The network structure was fully connected, every node had at least one shared edge with another node. A total of 30 edges were found in the network. A visual representation of the network analysis can be found in Figure 2 and values for the network edges can be found in Table 2. The most central finding that can be observed in the network graph in Figure 2 is that there were only weak associations between symptoms of psychopathology and RRQ. These results are further discussed below.

**Figure 2**

*The Network Model*



*Note.* Circles represent nodes, either observed or latent variables, and lines (edges) between nodes represent partial correlation coefficients. Blue edges represent positive partial correlations and red edges negative partial correlations. The strength of the partial correlation is visualized by the thickness of the edge. AUDIT = Alcohol Use Disorders Identification Test, AQ = Aggression Questionnaire, BSI = The Brief Symptom Inventory-18, DOR = Duration of relationship (in years), PRQC = Perceived Relationship Quality Components.

**Table 2***Network Edges: Partial Correlation Coefficients*

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PRQC satisfied												
2. PRQC committed	.18											
3. PRQC intimate	.35	.15										
4. PRQC trust	.18	.10	.18									
5. PRQC passion	.30	–	.27	–.06								
6. PRQC love	.16	.46	.23	–	.03							
7. DOR	–	.08	–	–	–.23	–						
8. AUDIT	–	–.14	–	–	–	–	–.12					
9. BSI anxiety	–	–	–	–	–	.04	–	–				
10. BSI depression	–.08	–	–	–.08	–	–	–.07	–	.72			
11. PADUA	–	–	–	–	–	–	–.12	–	.12	–		
12. AQ physical	–	–.04	–	–	–	–	–	.09	–	–	–	
13. AQ verbal	–	–	–	–.05	–	–	–	–	.06	–	.08	.56

*Note.* For ease of interpretation, only non-zero-partial correlations are displayed. Average absolute partial correlation (excluding zero) was 0.18. AUDIT = Alcohol Use Disorders Identification Test, AQ = Aggression Questionnaire, BSI = The Brief Symptom Inventory-18, DOR = Duration of relationship (in years), PRQC = Perceived Relationship Quality Components.

**Connections between romantic relationship quality items**

As expected, the network analysis found positive edges between most measures of RRQ, indicating that higher values on one aspect of RRQ is associated with higher values on the other aspects of RRQ. An exception was the negative edge between passion and trust, suggesting that passionate emotions increase as trust between partners decreases or vice versa. There were also no edges between passion and commitment and between love and trust, suggesting that these measures are only indirectly associated through other variables.

**Connections between measures of psychopathology**

There were some edges between measures of psychopathology. The strongest positive edges were between depression and anxiety as well as between verbal and physical aggression. Weaker positive edges could be found between alcohol consumption and physical aggression, between verbal aggression and both contamination sensitivity and anxiety, as well

as between contamination sensitivity and anxiety. This indicates that symptoms of psychopathology as measured in the present study are positively linked with each other, higher scores on one measure are associated with higher scores on the other measures. No negative edges between measures of psychopathology were found.

### **Connections between measures of psychopathology and romantic relationship quality items**

There were several negative edges between measures of psychopathology and RRQ items. There was a negative edge between verbal aggression and trust, between physical aggression and commitment, between depression and both satisfaction and trust as well as a negative edge between alcohol consumption and commitment. These negative edges indicate that higher scores on measures of psychopathology are associated with lower RRQ or vice versa that higher scores on RRQ are associated with lower scores on symptoms of psychopathology. There was also a weak positive edge between anxiety and love, indicating that higher scores on anxiety was associated with higher scores of love in the relationship. In addition to these edges, duration of the relationship had a negative edge with contamination sensitivity, alcohol consumption and passion. This indicates that higher scores on these measures of psychopathology were associated with shorter relationship durations. There was a positive edge between duration of the relationship and commitment.

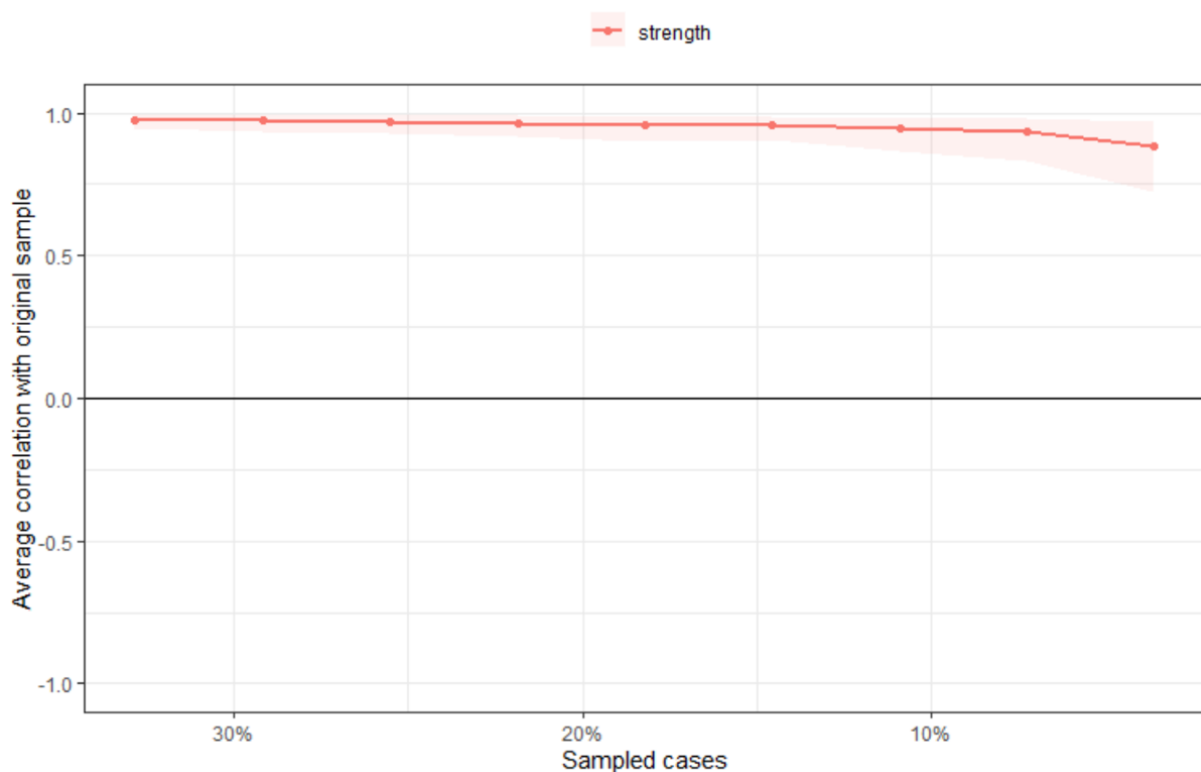
### **Strength Centrality and Stability**

Strength centrality was calculated for the network and case-dropping bootstrap was used to assess the stability of the estimate. For this network, the correlation stability coefficient (CS-coefficient) was 0.75 (the highest level tested), which indicates that the stability of strength centrality in the network was very high. The value represents the

maximum proportion of cases that can be dropped from the network before the 95 % bootstrapped confidence interval of the correlation coefficient falls below a correlation of 0.7 with the original sample. As per recommendations by Epskamp, Borsboom, and Fried (2018), the CS-coefficient should be at least 0.5. See Figure 3 for a plot of the correlation. The values of standardized strength centrality for each node are plotted in Figure 4. Strength centrality is the sum of absolute edge weights for a given node. Relationship satisfaction had the highest strength centrality, followed by intimacy and commitment. The lowest strength centrality of all the nodes was found for Padua and AUDIT.

**Figure 3**

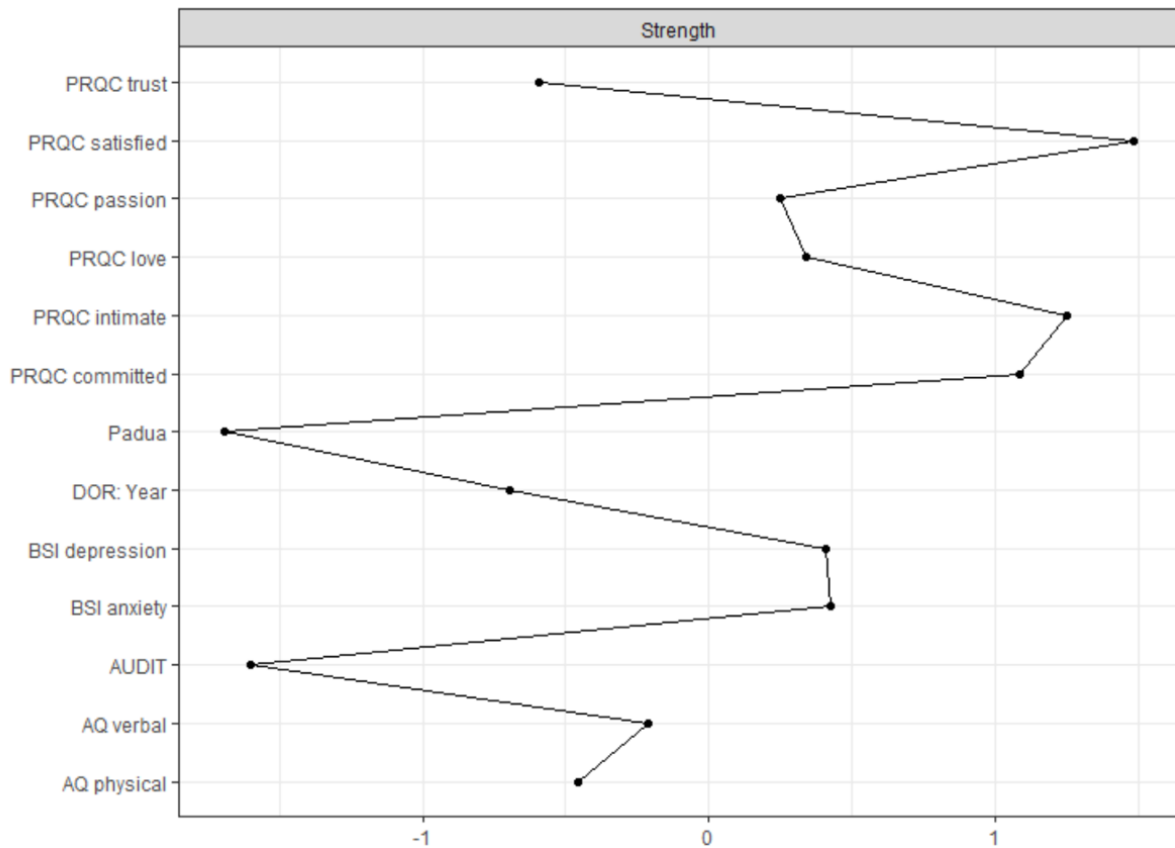
*Plot of Case-dropping Bootstrap for Stability of Strength*



*Note.* The red line represents the average correlation of strength centrality with the original sample. The shaded area represents the 95 % bootstrap confidence interval (percentile).

**Figure 4**

*Standardized Strength Centrality*



*Note.* X-axis represents z-scores for centrality strength measures; y-axis represents individual network nodes.

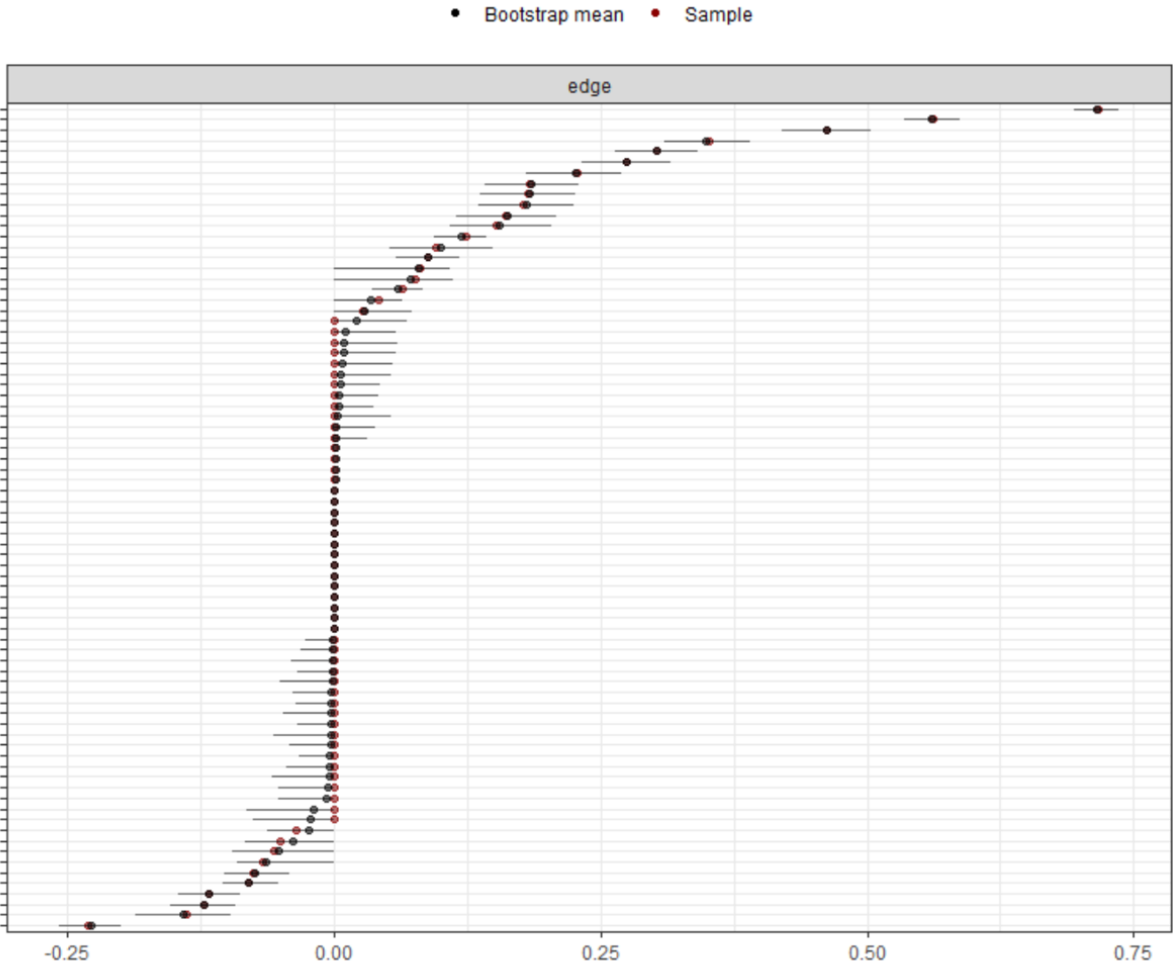
**Edge Strength and Accuracy**

The accuracy and stability of edge-weights was assessed via non-parametric percentile bootstrapped confidence intervals for edge weights (see Figure 5). For non-existent edges in the network, most bootstrapped confidence intervals were also non-existent, indicating that those edge weights most likely are accurate in the sample. Some of the bootstrapped edge weights were larger than non-existent edge weights in the sample, which could indicate that type II errors were made in the network estimation (not finding an edge in sample when a true edge exists). Another indicator that the edge weights in the present study are accurate is that

most sample edge weights did not differ from the average bootstrapped edge weight. This also suggests that the risk of type I errors in the network is low.

**Figure 5**

*Non-parametric 95 % Bootstrapped Confidence Intervals for Edge Weights*



*Note.* Edge weights (partial correlations) are plotted on the x-axis, y-axis represent edges (displayed without labels for clarity). Dots represent either sample (red) or bootstrap (black) mean edge weights. Bars represent 95 % percentile bootstrapped confidence interval.

## **Discussion**

In the present study, I was interested in the partial correlations between psychopathology symptoms and components of RRQ. The participants were selected from a population-based sample. Participants were included in the analyses if they were in a romantic relationship, and if they had responded to the items of interest in the present study. The aim was to use network analysis to explore which symptoms of psychopathology were connected to different components of RRQ. One of the main benefits of using partial correlation network analysis is that associations between two variables are analyzed while removing the influence of other variables. Symptoms of psychopathology were directly associated with relationship commitment, trust, satisfaction, and love. Although the analyses were exploratory in nature, and because causal pathways can seldom be determined in cross-sectional data, these results could provide further hypotheses for testing such causal pathways and potentially developing clinical practice.

### **Network Edges**

Most RRQ items had positive edges connecting them, indicating that higher scores on one component of RRQ is associated with higher scores on the other components of RRQ. The strongest positive associations were between love and commitment, intimacy and satisfaction, intimacy and passion, and passion and satisfaction. There was one negative association between passion and trust. This supports Fletcher's (2000) theory of RRQ, where a single latent factor of RRQ is associated with these six components of RRQ. The results also support their idea that RRQ is not best conceptualized as a single factor, since all components are not equally correlated. In the network estimated in the present study, there were only positive associations between psychopathology symptoms. Unsurprisingly, depression and anxiety, as well as verbal and physical aggression, were strongly correlated.



Relationship trust, commitment, satisfaction, and love were the components of RRQ that had associations with symptoms of psychopathology. Duration of the relationship had a negative edge with relationship passion. This association has been found in other studies (e.g., Busby, Chiu, Leonhardt, Iliff, 2019; Lemieux & Hale, 2002) showing that as the relationship matures, passion tends to dwindle. Verbal aggression had a negative association with trust in the relationship. Lack of trust may cause more arguments in the relationship, but arguments may also cause trust to diminish between the partners. Physical aggression was not connected to relationship duration; however, the former variable had a small negative association with relationship commitment. Since relationship commitment is measured from the physical aggressor's perspective, one hypothetical explanation for this edge would be that physically aggressive individuals tend to remain uncommitted in their relationships. In the present study, both physical and verbal aggression tendencies in general were measured, not explicitly aggression towards the partner. An important note is that most participants in this study scored low on physical aggression, thus conclusions that can be drawn regarding physical aggression are limited.

Contamination sensitivity had a negative edge with duration of the relationship but no edge with relationship commitment. This could perhaps indicate that contamination sensitivity is not at hindrance for short-term commitment, however, in the long-term it may affect relationship duration negatively. Contamination sensitivity symptoms in themselves do not seem to directly be associated with relationship quality but might have an impact on it via the associations to anxiety symptoms and verbal aggression. This is in line with previous research (e.g., Remmerswaal et al., 2016), that has shown that severity of OCD symptoms does not affect relationship satisfaction directly, but rather through co-morbid depression or anxiety. Contamination sensitivity had an association with lower relationship trust only through verbal aggression. Typically, symptoms of OCD are met by either accommodation or criticism

(Renshaw et al., 2005) from a partner. The results in the present study could indicate that partners who accommodate the contamination sensitivity symptoms of their partner do not cause lower relationship quality for the person experiencing the symptoms, however, partners who criticize the person may cause lower relationship quality.

Symptoms of depression had a negative edge with relationship satisfaction, which is in line with previous research (e.g., P. F. Li & Johnson, 2018). There was also a negative edge between symptoms of depression and trust. Plausibly, higher feelings of worthlessness associated with depression decreases the faith that one's partner actually loves you and therefore lowers trust in one's partner. Alternatively, due to feeling worthless, one does not believe their partner when they say that you are not worthless. Interestingly, higher scores on symptoms of anxiety were positively related to higher scores on relationship love. Multiple explanations could be provided for this association. One explanation would be that persons scoring high on symptoms of anxiety also experience other sensations more strongly, such as love. Another explanation could be that symptoms of anxiety such as nervousness, fear or restlessness are mistaken as feelings of love.

Alcohol consumption had a negative edge with both relationship commitment and duration. This could indicate that persons consuming higher amounts of alcohol experience both higher commitment and are in shorter relationships on average. This is supported by previous studies, such as Amato and Previti (2003).

One important note is that all partial correlations between symptoms of psychopathology and RRQ were small, the highest absolute partial correlation of .14 was between alcohol consumption and commitment. On the other hand, the estimating methods in the present study prioritized specificity over sensitivity, increasing the probability that the edges found in the present study are probable real (i.e., replicable) edges. This indicates that for the person suffering from symptoms of psychopathology, their relationship quality is not

highly affected, or vice versa, that poor RRQ does not dramatically affect symptoms of psychopathology. The use of network analysis enables one to create hypotheses about mediating effects, although as with direct effects, the direction of causality should be interpreted with care. In the present study, relationship intimacy and passion were not directly associated with any symptoms of psychopathology. Perhaps these components of RRQ are instead indirectly affected: intimacy either through trust, commitment or love and passion through intimacy or satisfaction.

As such, most of the hypotheses in the present study were confirmed: (a) there were strong associations between the measures of RRQ, (b) a negative association between symptoms of depression and relationship satisfaction was found, (c) no association between contamination sensitivity and relationship satisfaction after controlling for depression was found, and (d) a negative association between alcohol consumption and relationship commitment was found. In contradiction to the hypotheses, there was no direct, negative association between symptoms of anxiety and RRQ, rather this association seems to be mediated via depression or verbal aggression. There were also no direct, negative associations between either physical or verbal aggression and relationship satisfaction, however, both forms of aggression had associations with other measures of RRQ and may therefore be indirectly associated with relationship satisfaction.

### **Strength Centrality in the Network**

Analyses of centrality indices indicated that node strength, measured as the sum of absolute edge weights of a node, was highest for satisfaction, commitment and intimacy, and lowest for Padua and AUDIT. This suggests that factors that influence the nodes satisfaction, commitment and intimacy could have larger implication for the rest of the network variables compared to the other nodes. However, the use of statistical measures of centrality is debated

in psychological network theory and should be interpreted with care (Bringmann et al., 2018). The strong partial correlations between satisfaction, intimacy, passion and commitment in the present study support Sternberg's triangular theory of love: that high relationship satisfaction is achieved when the levels of intimacy, commitment and passion in relationship aligns with one's ideal levels of these three components. Thus, satisfaction is a plausible causal endpoint of other measures of RRQ, indicating that when, for example, relationship intimacy declines, so does relationship satisfaction.

Thus, the results of the present study indicate that relationship satisfaction, trust and commitment are the most vulnerable aspects of a relationship to potential effects of psychopathology. In light of these results, relationship satisfaction, commitment and trust seem to be the variables most associated psychopathology symptoms. As with all cross-sectional data, determining the direction of causality is difficult, however, it is defensible to argue that there might exist bidirectional causal pathways between the nodes. In order to benefit clinical practice (e.g., marriage counselling) it would thus be important to determine whether it is the psychopathological symptoms that are causing relationship distress or vice versa.

### **Strengths, Limitations, Clinical Implications and Further Research**

One of the main strengths of the present study, is that it uses a large, population-based sample. The large sample in combination with validated and highly reliable measurements and well-reasoned statistical analysis increases the probability that the edges detected in the network are real. Thus, the results can be generalized to the adult, heterosexual population in Finland currently in a romantic relationship.

There are several limitations in the present study. One limitation is that the theoretical approach (Fletcher et al., 2000) for determining RRQ was used, meaning that the subjective

opinion of one partner was measured rather than some more objective measures (such as frequency of quarrels). This introduces one type of measurement error, since participants may not be able to assess their true level of RRQ. This also holds true for measurements of psychopathology and is further amplified since individuals suffering from illness such as depression may not be able to critically evaluate their relationship. In addition, since the data were cross-sectional in nature, spurious perturbation such as a recent quarrel may affect the responses in the questionnaire. These limitations would likely be avoidable in a time-series design, where participants' opinions would be measured at multiple time points. Answering the questionnaire in a socially desirable way may further amplify measurement error; it is plausible that participants may underreport tendencies of aggression and alcohol consumption, among other variables. Another limitation is that the current data is measured only through one partner's perspective. In monogamous relationships, the two partners may have differing views on the quality of the relationship. Even though one partner might be satisfied in the relationship, the other partner might not be. For the individual suffering from depression symptoms, relationship satisfaction might on average only be slightly lower, while the partner having to deal with the depressive symptoms in their partner may experience it as very taxing on relationship satisfaction. Thus, one should be cautionary in making predictions how the relationship would develop over time based on these results. While the measurements used in the present study were highly reliable, one limitation was that these measures are not measures of actual psychopathology, rather self-perceived symptoms. There was also no measure for all facets of OCD available, which is why contamination sensitivity was used as a proxy for OCD. It is likely that the other four facets of OCD could have some effects on RRQ. Since the present study is exploratory in nature, I opted to include all available variables measuring symptoms of psychopathology. Another limitation is that the sample consisted mostly of participants who identified as heterosexual (90.57%), thus the results in

the present study should be interpreted with care when generalizing to participants of other sexual orientations.

The results of the present study could have clinical implications in couple's therapy. According to this model, verbal aggression, depression and alcohol consumption are the symptoms of psychopathology most highly linked to lower RRQ, affecting primarily relationship satisfaction, trust and commitment. Although the causal pathways are unclear, it is plausible that clinical interviewing could solve whether the symptoms of psychopathology is causing the problems in the relationship, vice versa or if the pathway is bidirectional.

Although arguments for the ability to find casual pathways in cross-sectional data has been proposed (Pearl, 2009), it is difficult to be certain that all relevant variables have been included in the model. Thus, further research should strive to confirm whether the associations found here hold up in temporal network structures. By expanding this cross-sectional model to a time-series design, the model could potentially be used for identifying early warning signs of relationship dissolution. One hypothetical example would be that depression does not directly decrease commitment in a relationship, however, by decreasing satisfaction and trust, it may lead to lower commitment indirectly. A therapeutic intervention could thus focus on improving trust and satisfaction in the relationship, to avoid dissolution.

## **Conclusions**

The connections between symptoms of psychopathology and romantic relationship quality were explored through network analysis. The study found that most measures on romantic relationship quality were strongly associated with each other. Positive associations were also found between symptoms of psychopathology. Some associations were found between symptoms of psychopathology and romantic relationship quality, most notably between depression and satisfaction and trust, between verbal aggression and trust, and

between alcohol consumption and commitment. Highest strength centrality was found for satisfaction, commitment, and intimacy, which suggests that these nodes may be the most influential nodes in the network. Further research could focus on replicating the results in the present study in temporal networks.

# **En explorativ nätverksanalys av kopplingarna mellan symptom på psykiskt lidande och parrelationskvalitet**

## **Introduktion**

Den subjektiva upplevelsen av kvaliteten i ens romantiska parrelationer har kopplats till viktiga aspekter i livet, såsom fysisk (Robles et al., 2014; South & Krueger, 2013) och psykisk hälsa (Gove, Hughes & Style, 1983; Mirsu-Paun & Oliver, 2017; Simon, 2002; Whisman, 2007). Förhållandet mellan ens eget välmående och kvaliteten i ens parrelation har undersökts i betydande utsträckning, se Proulx (2007) för en meta-analytisk översikt. Ett flertal studier har undersökt förhållandet mellan enskilda aspekter av psykiskt lidande och parrelationskvalitet men till min kännedom har ingen enskild studie sett på sambanden mellan ett flertal aspekter av psykiskt lidande på olika dimensioner av parrelationskvalitet samtidigt.

## **Parrelationskvalitet**

Ett sätt att studera parrelationskvalitet är ur den så kallade teoretiska synvinkeln (Fletcher et al., 2000). Utgångspunkten är att man frågar en partner om den subjektiva upplevelsen av kvaliteten i parrelationen, till exempel genom att direkt fråga efter subjektiv tillfredsställelse, engagemang, tillit, intimitet, passion och kärlek i parrelationen. (Fletcher et al., 2000). Tillfredsställelse i parrelationen har inom forskningen definierats på olika sätt. Forskare har dragit olika slutsatser för hur man kan uppnå mest tillfredsställelse i relationen: genom att ens parrelation överträffar de förväntningar man har på en parrelation (Rusbult, 1980), genom att ha en partner med fler goda än negativa egenskaper (Kelley & Thiabaut, 1978), genom att ha höga nivåer av intimitet, passion och engagemang i relationen (Sternberg, 1986) eller genom att lyckas uppnå olika livsmål i relationen, såsom personlig utveckling eller instrumentella mål, såsom att få barn (T. Li & Fung, 2011). Engagemang i parrelationen kan



enligt Sternberg (1986) förekomma i två former: kortsiktigt och långsiktigt engagemang. Kortsiktigt engagemang är definierat som det beslut man tar varje dag att fortsätta älska sin partner medan långsiktigt engagemang är definierat som ett åtagande att upprätthålla kärleken över en längre tid. Att vara tillfredsställd i en parrelation är inte en garanti för att parrelationen ska bestå utan påverkas också av tillgången till andra, bättre partner (Le & Agnew, 2003) och av hur mycket man har investerat i relationen (Rusbult, 1980). Enligt Rempel, Holmes och Zanna (1985) innefattar tillit i parrelationen tre egenskaper: förutsägbarhet, förtroende och tro. Förutsägbarhet ökar i takt med relationens längd, då man lär sig hur ens partner agerar i olika situationer, förtroende ökar då man lär sig att ens partner är en ärlig och pålitlig person och tro innebär att man förlitar sig på att parrelationen kommer att hålla i längden. Intimitet kan enligt Sternberg (1986) definieras som närhet och värme i parrelationen. Höga nivåer av intimitet innebär att man vill höja sin partners välmående, dela resurser och att man värdesätter den andra personen. Denna typ av intimitet är inte unik för romantiska parrelationer utan finns också mellan exempelvis vänner och syskon. Hög intimitet har ett positivt samband med tillfredsställelse i parrelationen (Greeff & Mahlherbe, 2001; Yoo et al., 2014) och avsaknad av intimitet är en vanlig orsak till att par söker sig till parterapi (Doss et al., 2004). Passion i en parrelation definieras enligt Sternberg (1986) som upplevelser av såväl psykisk som fysiologisk upphetsning. Passion i parrelationen har kopplats till intimitet och ju mer intimitet, desto högre passion (H. Rubin & Campbell, 2012). Inom parrelationsforskningen definierar man kärlek på olika sätt, och det finns flera former av kärlek som exempelvis den kärlek en förälder känner till sitt barn, kärlek till husdjur och romantisk kärlek (Fehr & Russell, 1991). En av de tidigaste definitionerna av kärlek utvecklades av Z. Rubin (1970) som definierar kärlek som ett mellanmänniskt förhållningssätt bestående av anknytning, omsorg och intimitet. Sternberg (1986) definierar kärlek som ett tredelat koncept bestående av intimitet, passion och engagemang.

## **Nätverksanalys för kopplingar mellan symptom på psykiskt lidande och parrelationskvalitet**

Ett flertal studier har påvisat kopplingar mellan symptom på psykiskt lidande och sänkt parrelationskvalitet, såsom depression (Heene, Buysse & Oost, 2005; P. F. Li & Johnson, 2018; Whitton & Kuryluk, 2012), ångest (Vossenkemper, 2020; Whisman, 2007), tvångssyndrom (Remmerswaal et al., 2016; van Minnen & Kampman, 2000), alkoholkonsumtion (Bamford et al., 2007; DiBello et al., 2015) och aggression (Ackerman & Field, 2011; Cramer, 2007; Kaura & Lohman, 2007; Stith et al., 2008). Traditionellt sett har psykiska svårigheter ofta antagits orsakas av en underliggande psykisk sjukdom. Exempelvis har man tänkt att en underliggande depression kan orsaka symptom såsom anhedoni, sömnlöshet eller bristande självkänsla. Det har dock visat sig utmanande att kunna påvisa en sådan etiologi. Nätverksanalys har utvecklats som ett alternativt förhållningssätt till psykisk svårighet, där man istället för att anta att psykisk svårighet orsakas av en underliggande sjukdom istället tänker att symptom på psykisk svårighet direkt orsakar andra symptom. Som exempel tänker man sig att insomni orsakar trötthet som i sin tur orsakar koncentrationssvårigheter, som åter ökar sömnlöshet. Dessa nätverk kan visualiseras genom noder (eng. nodes) och kopplingar (eng. edges) mellan noder. Noder brukar ritas ut som cirklar i diagram medan kopplingarna ritas ut som raka linjer. Styrkan på kopplingarna kan ses i en visualisering av nätverket: ju tjockare linje, desto starkare partiell korrelation eller koppling mellan noderna finns det. Positiva korrelationer brukar ritas i blå eller grön färg medan negativa korrelationer ritas i rött. (Borsboom, 2017). För ett givet nätverk kan man sedan räkna ut vilka noder som är mest centrala eller inflytelserika. Centraliteten kan exempelvis räknas ut genom att addera den absoluta summan av partiella korrelationer som hänger ihop med en given nod. (Epskamp, Borsboom & Fried, 2018).

## **Syfte och hypoteser**

Syftet med den här avhandlingen är att undersöka sambandet mellan olika symptom på psykiskt lidande och parrelationskvalitet. I enlighet med tidigare forskning förväntar jag mig hitta negativa kopplingar mellan symptomen och parrelationskvalitet men målet är att se vilka kopplingar som kvarstår då man beaktar de olika symptomen i modellen samt vilka kopplingar som är starkast.

## **Metod**

Samplet i den här avhandlingen kommer från en populationsbaserad datainsamling gjord av Åbo Akademi i Finland 2019; för mer information om samplet, se Tybur, Wesseldijk och Jern (2020). Totalt 9319 deltagare gav sitt samtycke att deras data får användas i forskningssyfte. I den här avhandlingen analyserades symptom på psykiskt lidande och parrelationskvalitet, vilket innebar att enbart deltagare som var i en parrelation och hade besvarat de relevanta frågorna i enkäten valdes ut. Det slutgiltiga samplet bestod således av 4136 personer.

Följande variabler användes i de statistiska analyserna. Som mått på parrelationskvalitet användes ”The Perceived Relationship Quality Components” (PRQC; Fletcher et al., 2000), bestående av sex mått som mäter subjektiv tillfredsställelse, engagemang, tillit, intimitet, passion och kärlek i parrelationen. Som mått på symptom på psykiskt lidande användes ”The Brief Symptom Inventory-18” (BSI-18; Derogatis, 2001) för depression och ångest, ”The Alcohol Use Disorders Identification Test for Consumption” (AUDIT-C; Bush, Kivlahan, McDonell, Fihn & Bradley, 1998) som mått på alkoholkonsumtion, ”Padua Inventory-Revised” (Burns et al., 1996) som mått på rädsla för smitta och en tillämpad version av ”Aggression Questionnaire” (AQ; Buss & Perry, 1992)

som mått på verbal och fysisk aggression. Dessutom fick deltagarna ange hur länge de hade varit i en parrelation, uttryckt i antal år.

## **Statistiska analyser**

Ett partiellt korrelationsnätverk för de totalt 4136 deltagarna räknades ut i dataprogrammet R version 4.0.2, och paketen *tidyverse* (Wickham et al., 2019), *qpgraph* (Epskamp et al., 2012), *bootnet* (Epskamp et al., 2018), *lavaan* (Rosseel, 2012) och *huge* (Liu et al., 2009) användes för att städa, analysera och göra grafer av data. I en nätverksanalys räknas partiella korrelationer mellan noder ut och för att öka på sannolikheten för att dessa nätverk stämmer överens med verkligheten, används olika metoder för att undvika överflödiga kopplingar. EBICglasso-algoritmen som användes i den här avhandlingen för att undvika dessa överflödiga kopplingar består av två delar: regulariseringstekniken ”the Least Absolute Shrinkage and Selection Operator” (LASSO; Tibshirani, 1996) och ”Extended Bayesian Information Criterion” (EBIC; Foygel & Drton, 2010). Dessa metoder räknar ut flera olika nätverksmodeller och väljer sedan den modell som bäst passar ihop med data och bäst undviker överflödiga kopplingar. Dessutom kontrolleras modellens stabilitet och precision för både centralitet och de enskilda kopplingarna.

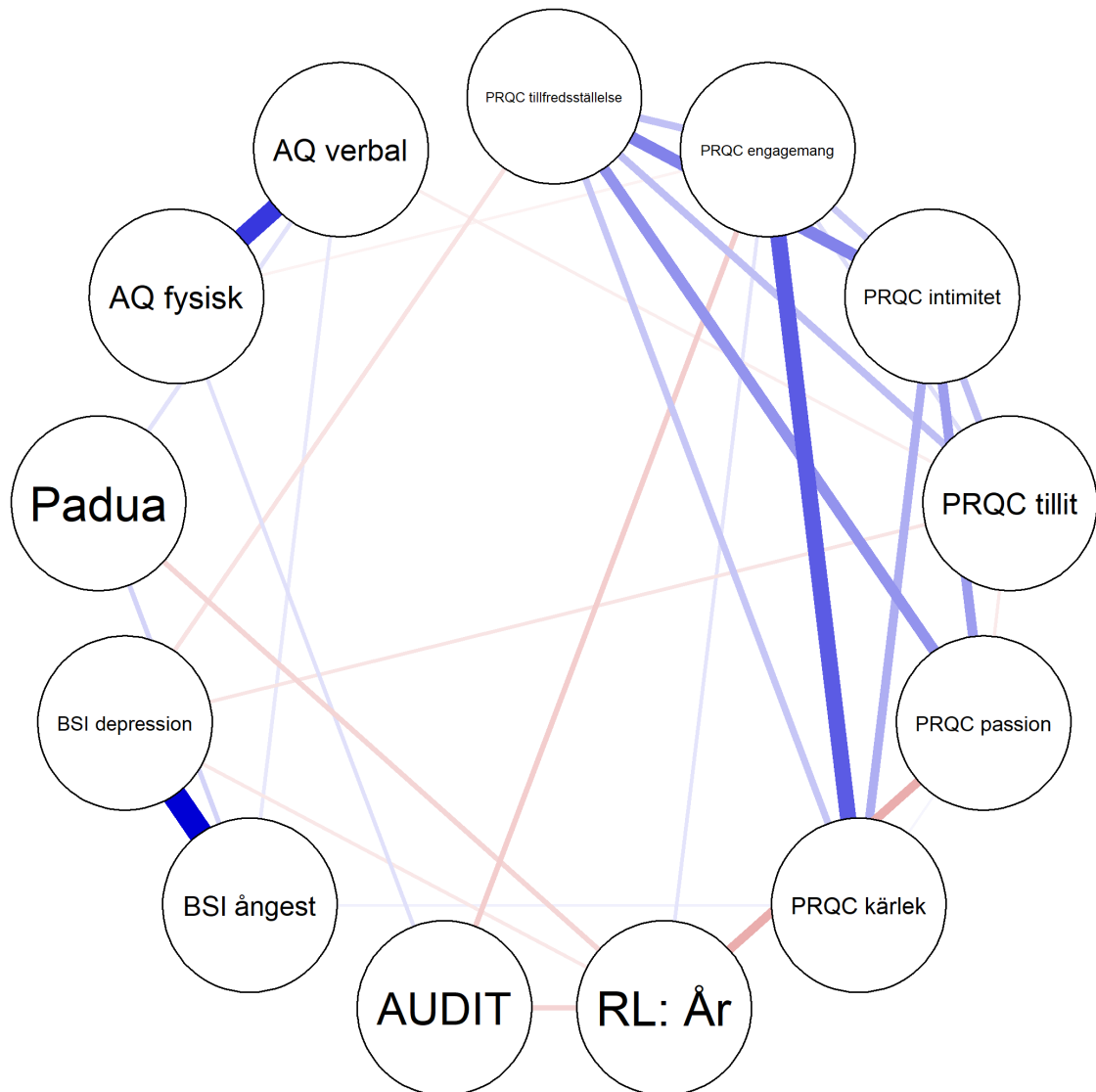
## **Resultat**

De flesta mått på parrelationskvalitet hade starka kopplingar med varandra. Även symptom på psykiskt lidande hade positiva kopplingar till andra symptom. I enlighet med hypoteserna fanns det en rad kopplingar mellan symptom på psykiskt lidande och parrelationskvalitet. Direkta negativa kopplingar fanns mellan tillit och verbal aggression samt depression, mellan engagemang och fysisk aggression samt alkoholkonsumtion, mellan tillfredsställelse och depression och också en positiv koppling mellan kärlek och ångest. De

flesta av dessa kopplingar var dock svaga, den starkaste kopplingen hade en absolut partiell korrelation på 0,14 som motsvarar ett svagt samband. För samtliga noder räknades centralitetsmått ut, där tillfredsställelse, engagemang och intimitet hade starkast inflytande i nätverket. I figur 1 visualiseras nätverksanalysen. Modellen visade sig vara stabil och precis, då olika så kallade bootstrap-estimeringar utfördes för att undersöka modellen.

**Figur 1**

*Nätverksmodellen*



*Notera.* Cirklarna representerar noder och kopplingarna mellan noder visar partiella korrelationer. Blå linjer är positiva korrelationer och röda negativa. Linjens tjocklek visar styrkan på kopplingen. AUDIT = Alcohol Use Disorders Identification Test, AQ = Aggression Questionnaire, BSI = The Brief Symptom Inventory-18, RL = Relationens längd (mätt i år), PRQC = Perceived Relationship Quality Components.

## Diskussion

Syftet med denna avhandling var att undersöka kopplingarna mellan symptom på psykiskt lidande och parrelationskvalitet genom att estimerade partiella korrelationsnätverk. Analyserna gjordes i utforskande syfte för att se vilka symptom som hänger ihop med vilka mått på parrelationskvalitet samt hur starka dessa kopplingar är. I enlighet med hypoteserna fann jag i resultatet en rad negativa kopplingar mellan symptomen och parrelationskvalitet. Också om nätverksanalys inte kan användas för att fastställa orsakssamband mellan noder, möjliggör modellen ändå det att skapa hypoteser kring dessa samband. Den negativa kopplingen mellan tillit och verbal aggression kan tolkas antingen som att avsaknad av tillit orsakar mer gräl i parrelationen eller att det att man grälar mycket gör att man litar mindre på sin partner. Den negativa kopplingen mellan tillit och depression kan tolkas som att man till följd av depressiva symptom inte litar på att ens partner tycker om en eller att man upplever sig mer deprimerad då tilliten i parrelationen sjunker. Den negativa kopplingen mellan engagemang och fysisk aggression kan eventuellt förklaras med att man bara är fysiskt aggressiv om engagemanget till ens partner är lågt eller att fysisk aggression ökar då engagemanget sjunker. Den negativa kopplingen mellan engagemang och alkoholkonsumtion kan eventuellt tolkas som att hög alkoholkonsumtion orsakar lägre engagemang i parrelationen eller att lågt engagemang får en att konsumera mer alkohol. Den negativa kopplingen mellan depression och tillfredsställelse kan förklaras med att depressiva symptom gör att man njuter av livet i lägre grad rent generellt eller att låg tillfredsställelse gör att man blir mer deprimerad. Något förvånande fanns det en positiv koppling mellan ångest och kärlek. Eventuellt upplever ångestbenägna personer även andra upplevelser såsom kärlek mer intensivt än andra. Dessa förklaringar är bara hypotetiska och det går inte utesluta att andra variabler än de som har beaktats i den här nätverksmodellen bättre kan förklara kopplingarna mellan noder eller att det finns andra orsakssamband mellan noderna. Att centralitetsmättet

var högst för tillfredsställelse, engagemang och intimitet kan innebära att dessa noder är de mest inflytelserika i en parrelation. Fortsatt forskning kunde i så fall undersöka huruvida det lönar sig att arbeta med just dessa aspekter av parrelationskvalitet då relationen lider exempelvis i parterapi.

### **Begräsningar och sammanfattning**

Nätverksanalysen i den här avhandlingen bygger på tvärsnittsdata, vilket är en begräsning då det inte går att säga hur noderna skulle hänga ihop med varandra för ett specifikt par eller hur noderna skulle påverka varandra över tid. Således skulle det vara intressant att i fortsatta studier undersöka enskilda par över tid, för att se om samma noder är centrala också över tid. Själva måtten som använts i den här avhandlingen har också en del begräsningar. Måtten förutsätter att deltagarna korrekt kunnat bedöma sin subjektiva parrelationskvalitet och symptom på psykiskt lidande, vilket är svårt att validera. Nätverken är också estimerade ur bara en av personerna i parrelationens perspektiv. Det kan hända att nätverket skulle se annorlunda ut ifall man hade tillgång till båda partners data.

Sammanfattningsvis kan man konstatera att ett flertal symptom på psykiskt lidande har kopplingar till sänkt parrelationskvalitet. Dessa kopplingar är dock svaga, vilket innebär att åtminstone för den som själv upplever psykiska svårigheter så är kopplingen till sänkt parrelationskvalitet inte så omfattande.



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