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Character strengths and mental health as complex systems: a network analysis to identify bridge strengths

Ana Blasco-Belled[1]

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Abstract
The network approach poses an alternative focus to understand psychological constructs as emerging from mutual interactions among indicators. Network psychometrics has been applied to psychopathology to unravel the connections between symptoms, but it can also be applied to the study of well-being. The role of character strengths in mental health is at the forefront of research attention. Previous findings suggest that heart character strengths are more predictive of mental health than mind character strengths. Nevertheless, researchers have rarely applied the network approach in this context. The present study examines, from the network approach, the connections between heart and mind character strengths and mental health. Building upon the dual-factor model of mental health, positive (i.e., happiness and life satisfaction) and negative indicators (i.e., depression) were included in the assessment of this construct. A sample of 597 Spanish undergraduates ($M = 23.52$; $SD = 5.25$; 75.6% females) completed cross-sectional self-report measures. Network analysis was used to estimate a network composed of two communities: character strengths and mental health. We used centrality analysis to calculate the importance of each node and bridge centrality to examine the interactions between the communities. The results indicated that the heart strengths of love, zest, hope, and gratitude reported the highest bridge strength centrality, suggesting that they played an intermediary role activating and deactivating components of mental health. Adopting the network approach to explore the connections between character strengths and mental health can help design focused intervention strategies in psychology.

Keywords Character strengths · Mental health · Subjective well-being · Depression · Network analysis

Introduction

Mental health and character strengths

Psychology research has traditionally focused on the study of mental disorders without acknowledging the mechanisms that promote mental health. However, over the last two decades, psychologists have embraced the perspective of mental health as including positive indicators beyond the absence of disease. This is known as the complete state of mental health or dual-factor model of mental health (Keyes, 2005; World Health Organization [WHO], 2001). Questions like how to live a better life or how to increase people's quality of life are at the core of applied and academic psychology. The identification of the mechanisms that help people lead a fulfilling life beyond the absence of disease has become a central issue for the science of well-being (Herron & Trent, 2000; van Agteren et al., 2021; WHO, 2001). Hence, practitioners increasingly recognize psychological interventions targeting the positive and negative indicators of mental health. Positive interventions that focus on positive emotions, thoughts, and behaviors through easy daily routines can promote positive indicators (e.g., subjective well-being) of mental health (Schotanus-Dijkstra et al., 2015), while therapeutic interventions can handle negative indicators (e.g., depression) (Fava et al., 2017). But despite these claims, studies about mental health do not often include these two differential components (Blasco-Belled et al., 2021; Wasil et al., 2020).

One of the psychological attributes that stands out within the framework of well-being refers to the 24 character strengths, defined as a set of positive traits reflected

✉ Ana Blasco-Belled
ana.blasco@udg.edu

[1] University of Girona, Pujada de Sant Domènec, 9, 17004 Girona, Spain

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in thoughts, feelings, and behaviors (Peterson & Seligman, 2004). The character strengths exist in degrees and ought to be measured as individual differences (Park et al., 2004), and these interpersonal differences in character strengths can ultimately influence people's well-being (Dolev-Amit et al., 2020; Gander et al., 2021; Wagner et al., 2021). With a large body of literature reporting the predictive role of mental health (e.g., Leung et al., 2021; Li et al., 2021), the enactment of character strengths should enable thriving communities (Park et al., 2004; Peterson, 2006) and be the backbone of social interventions to ensure sustainable well-being (Proyer et al., 2013). Hence, the association between character strengths and mental health has led to considerable empirical evidence over the last decade (Blasco-Belled et al., 2018; Gander et al., 2019; Huber et al., 2021; Martínez-Martí et al., 2016; Martínez-Martí & Ruch, 2014; Proyer et al., 2013; Ros-Morente et al., 2018; Schutte & Malouff, 2018; Wagner et al., 2020), with intervention studies revealing significant effects on the promotion of subjective well-being and a decrease in depression (Dolev-Amit et al., 2020; Proyer et al., 2013; Schutte & Malouff, 2018; Smith et al., 2020; Tejada-Gallardo et al., 2020).

Character strengths can be separated into heart and mind strengths (Peterson, 2006). Heart strengths include strengths related to emotional expression (zest, gratitude, hope, love, curiosity, spirituality, humor, appreciation of beauty and excellence, social intelligence, kindness, forgiveness, teamwork, and leadership), whereas mind strengths include strengths related to intellectual restraint (love of learning, creativity, bravery, perspective, perseverance, self-regulation, fairness, modesty, honesty, prudence, and judgment). According to the available literature, certain heart strengths (i.e., hope, zest, gratitude, love, and curiosity) help preserve relationships and are generally more closely related to subjective well-being than mind strengths, which are more individualistic (Blasco-Belled et al., 2018; Brdar & Kashdan, 2010; Martínez-Martí & Ruch, 2014; Miljković & Rijavec, 2008).

Despite the many studies demonstrating the benefits of developing character strengths to boost mental health, it is important to refine the identification of the specific character strengths that can be the most effective targets in strengths-based interventions. By identifying those character strengths with stronger connections with subjective well-being and depression, it may be possible to guide decisions about which strengths are more relevant to focus on in psychological interventions. To reach this goal, this study proposes to examine how character strengths interact with each other through the lens of the network approach.

The network approach applied to mental health and character strengths

The network approach is increasingly used as a way of analyzing the connections among variables in psychological research (Fried et al., 2017). Within this framework, the interest is on the mutual interactions between variables (symptoms or indicators) that give rise to psychological phenomena (depression or subjective well-being) (Epskamp et al., 2018). Although the network approach has been substantially employed in clinical (Borsboom, 2017; Fried et al., 2019), personality (Costantini et al., 2015), or social psychology (Dalege et al., 2017), its application to well-being research has been scarce (Blasco-Belled & Alsinet, 2022; Kossakowski et al., 2016).

In network models, the variables are represented as nodes, which are the components of the system, and the relations between them are represented as edges, which typically reflect partial correlations. This means that edges display the unique associations of each pair of variables after controlling for all other variables in the network (Borsboom, 2017); that is, the association between two nodes cannot be explained by any other variable within the network. In our study, an edge connecting a particular character strength with happiness implies that the connection is not due to the links with the remaining variables in the network. Positive edges indicate that an increase in activation of that edge is related to an increase in activation of the second edge, while negative edges indicate that an increase in activation of one edge is related to a decrease in activation of the other edge (Rodebaugh et al., 2018).

Traditional perspectives in research commonly understood subjective well-being and depression from the common cause perspective, meaning that a latent variable explained (and caused) how happy, satisfied, or depressed people are. From this traditional perspective, for example, the latent entity of depression causes the symptoms of anhedonia or concentration problems. Conversely, the network approach suggests that psychological phenomena are complex systems caused by the interactions among nodes (e.g., depression is caused by the interaction of anhedonia and concentration problems, among other symptoms). Therefore, factor and network models essentially differ in the interpretation about the cause and co-existence of the data (Bringmann & Eronen, 2018).

In the present study, to comply with the fundamental premise of the complete state model of mental health (Keyes, 2005), we conceptualized mental health as a construct emerging from the connections between positive and negative indicators. It is important to note that this proposed network model does not fully account for the complete conceptualization of mental health, since other variables that

would be important to comprehensibly explain the network of mental health, like additional psychopathology indicators or environmental factors, are not included; yet, this proposal is an initial step towards the integration of the network approach into the complete model of mental health.

Compared to latent variable models, network models have the advantage of providing a clear visualization of the data and the relationships between variables, facilitating the generation of hypotheses about the paths that lead one node to connect with another node. This is an important property because network models are not committed to any a priori theory of a data-generating model, which represents an option to identify alternative mechanisms that connect variables (Marsman et al., 2017). Another relevant advantage of network models over latent variable models is that it is possible, through centrality and bridge centrality indices, to analyze which indicators are more central or important in a network. Centrality indices evaluate the importance of nodes in the network structure, in which (low) high central nodes are strongly (un)connected with the other nodes (McNally, 2016). Bridge centrality informs about how nodes connect different communities (i.e., groups of theoretically connected nodes) of the network. In the present study, we used *node expected influence*[1] to measure the number of connections of each variable – the more connections, the higher strength in the network (Epskamp & Fried, 2018) – and *bridge expected influence*[2] to measure a node's sum connectivity with other communities (Jones et al., 2019; Peters et al., 2021). Although node and bridge strength are typically used, node expected influence and bridge expected influence take into account the value of edges and thus provide the overall connectivity with positive and negative values (Robinaugh et al., 2016). In psychopathology, bridge nodes are symptoms with higher risk of contagion to other disorders and are the target of therapeutic interventions to prevent and treat comorbidity (Cramer et al., 2010). In well-being research, bridge nodes can be conceived as indicators connecting different components of well-being that increase the activation of the network. In our example, a hypothesized character strength might bridge the connection of other character strengths with happiness or depression. To understand this, network psychometrics consider networks as composed of communities, wherein each community involves a theoretically driven set of nodes (Jones et al., 2019). This means that communities are independent of any analytical procedure and researchers create the categories based on theory. This is why the community "strengths" are composed of the 24 character strengths and "mental health" is composed of life satisfaction, happiness, and depression.

The introduction of the network approach into the study of well-being provides an alternative framework to understand, explain and predict psychological constructs, and it seems to be a promising focus in its early stages; Kossakowski et al. (2016) and Blasco-Belled and Alsinet (2022) reported evidence in this realm. Understanding psychological constructs as a common cause can be beneficial to explain relations among behaviors. Supposing that because someone is a wise person, she/he examines things from different perspectives, loves learning new things and give advice to others by seeing the big picture.[3] According to this, these behaviors correlate because wisdom is a common cause of open-mindedness, love of learning, and perspective. A different way to understand how someone scores high on wisdom is to understand that examining things from new perspectives increases the chances of learning different things, which might build novel knowledge that can be useful to advise others. According to this explanation, these behaviors mutually reinforce one another.[4]

This is a novel proposal because the study of latent variables has been more important than that of the relationship between variables, which is the focus of network models, and has resulted in a binary view of either presence or absence of mental health. The implementation of network theories in well-being can help explain why discriminant validity is so challenging in this field, and clarify how competing accounts of well-being in psychology are related. Hence, network psychometrics can help elucidate from a different perspective the connections between character strengths and mental health (Fabian, 2021).

Current study

The goal of this study is to examine the relations between character strengths and mental health through the lens of the network approach. More specifically, it aims to identify which character strengths act as bridge nodes with mental health. As far as we know, no previous study either subjected character strengths to a network structure or tested the potential bridge nodes connecting them to other indicators. According to the literature, the heart strengths of hope, zest, gratitude, curiosity, and love should emerge as bridge

[1] Despite the existence of other centrality metrics, such as *closeness* and *betweenness*, in the present study we only employed *node expected influence* (similar to node strength) because it informs more accurately about the relevance of nodes in the network (Isvoranu & Epskamp, 2021).

[2] These also include the estimates of bridge strength, bridge betweenness, and bridge closeness (Payton et al., 2019).

[3] Wisdom reflects one of the six virtues of the VIA-IS character strengths classification, which integrates the character strengths of creativity, curiosity, open-mindedness, love of learning, and perspective.

[4] This example has been adapted from an example provided by van Bork (2019).

nodes between the community of character strengths and the community of mental health.

Methodology

Participants and procedure

The sample consisted of 597 undergraduates ($M = 23.52$; $SD = 5.25$; 75.6% females) of the University of Lleida who voluntarily took part in a scientific project aimed at assessing character strengths and mental health. The project was advertized in the hall and corridors of several faculty buildings. As compensation, participants received a report with their character strengths. Those who accepted to participate were provided with a Google Forms link that they completed in the computer room of each faculty. They were informed of the purpose of the study and the procedure, and they signed an informed consent to participate. We ensured the terms of confidentiality and anonymity of all participants. All the online questions were mandatory and thus missing responses were not registered. The study was approved by the institutional review board of the Faculty of Education, Psychology and Social Work of the University of Lleida.

Instruments

The Values in Action Inventory of Strengths - Short Form (VIA-IS; Peterson & Seligman 2004; Spanish adaptation of Azañedo et al., 2017). This is a 120-item self-report that assesses 24 character strengths on a 5-point Likert scale ranging from 1 (*very much unlike me*) to 5 (*very much like me*). Each item presents the description of a character strength and measures to what extent participants agree to each statement. We averaged total scores across items to each strength (subscales), which ranged between 10 and 50. A sample item for the strength of persistence is "I never quit a task before it is done."

Subjective Happiness Scale (Lyubomirsky & Lepper, 1999; Spanish adaptation of Extremera & Fernández-Berrocal 2014). This 4-item questionnaire measures global subjective happiness by means of statements about respondents' self-rating, their comparison to others and brief happiness descriptions on a 7-point Likert scale (the response rate varies depending on the item). Sample items include "In general, I consider myself…" (1 = *not a very happy person*; 7 = *a very happy person*).

Satisfaction with Life Scale (Diener et al., 1985; Spanish adaptation of Atienza et al., 2003). This 5-item self-report assesses people's judgments about their life satisfaction as a whole on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 *(strongly agree*). A sample item is "In most ways my life is close to my ideal."

The Patient Health Questionnaire (PHQ-9: Kroenke et al., 2001; Spanish adaptation of Diez-Quevedo et al., 2001). This 9-item scale is a self-report to screen nine symptoms that make up the diagnostic criteria of major depressive disorder. Respondents rate in a 4-point categorical scale (0 = *not at all*; 1 = *several days*; 2 = *more than half the days*; 3 = *nearly every day*) the frequency of depressive symptoms experienced over the previous week. A sample item is "Over the last seven days (I have been bothered by) feeling down, depressed, or hopeless."

Data analysis

To examine the connections between character strengths and mental health, we applied network psychometrics using Rstudio (R Core Team, 2020). Data and code analysis are available from https://osf.io/fqhvt/?view_only=98cd394c786f4505aee220bac64a8c4d.

Network Estimation and Stability. First, two networks were estimated including (1) the 24 character strengths and (2) the 24 character strengths plus the indicators of mental health using the EBICglasso from the *estimateNetwork* function of bootnet R-package version 1.4.3 (Epskamp et al., 2018). This estimates networks using graphical LASSO regularization, a technique that shrinks all connections and sets small values close to zero to reduce the inclusion of false positive edges in the model (Epskamp & Fried, 2018). This allows an estimation of a network in which the relations between nodes are unique and are not explained by other variables in the network. Afterwards, the centrality metric of node expected influence was analyzed (i.e., how strongly a node is connected to the other nodes of the network, considering positive and negative edges) using the *centralityPlot* function of the qgraph R-package version 1.6.9 (Epskamp et al., 2012). Higher values reflect a node's greater importance to the network based on the sum of edges.

The stability of the networks was tested by means of non-parametric and case-dropping bootstrapping. This is a procedure that provides a 95% confidence interval (CI) that contains the true value of the parameter, known as bootstrapped CI, in which the model is repeatedly estimated under simulated data to assess the accuracy of the structure (Efron, 1979). Bootstrapped CI plots (1,000 bootstraps) were displayed using the bootnet R-package to test which edge and centrality values could be meaningfully interpreted. The stability of the centrality measures was inspected applying case-dropping bootstrapping in the bootnet R-package to calculate the *correlation stability coefficient* (*CS*-coefficient), which tests the maximum proportion of cases that can be dropped while the correlation between

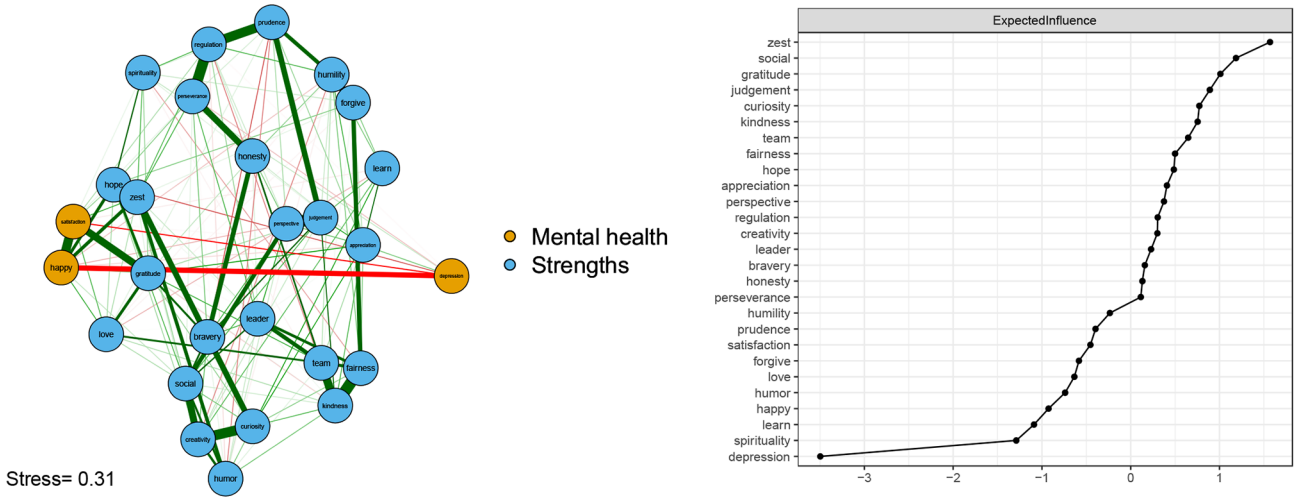

Fig. 1 Network Structure and Expected Influence of Character Strengths and Mental Health.
Note: Positive (negatives) relationships between nodes are represented by green (red) edges. The distance between variables and width of edges indicate the magnitude of the correlation.

the resulting centrality estimate and the original centrality estimate is 0.70 or higher with a 95% probability. If the correlation between the original centrality indices and the bootstrapped indices does not change, the interpretation of centralities is plausible (Epskamp et al., 2018). By default, the *CS*-coefficient computes a correlation of 0.70 with a 95% CI. *CS*-coefficients > 0.25 (and preferably > 0.50) are recommended to interpret centrality differences (Epskamp et al., 2018).

Bridge Centrality. Bridge centrality was analyzed to identify nodes that connect the two communities of the network. Communities are theoretically driven groups of highly interconnected nodes. In the present study, two communities were defined: mental health (composed of happiness, life satisfaction, and depression) and strengths (composed of the 24 character strengths). The *bridge* function in the networktools R-package version 1.3.0 (Jones et al., 2019) was used to calculate bridge expected influence, defined as a node's total connectivity with other communities by summing the positive and negative value of every edge that connects the node of a community with the nodes of the other community.

Results

Network generation and stability

The descriptive statistics and correlations of the study variables can be found in the supplementary materials. Figure1 depicts the network of strengths and mental health.[5] Edges between nodes correspond to partial correlations, and the visualization was generated using multidimensional scaling, implying that nodes with stronger similarities are plotted closer and the distance between nodes is interpretable (Jones, 2018). Centrality analysis showed the strength centrality (expected influence) measures for all network items. Zest, social intelligence, gratitude, and judgment emerged as the most central variables in the network, suggesting that these variables had the largest influence on the other network's nodes. The stability of the network (Figure S5) and the centrality metrics were high since the bootstrapped CI containing edge values was narrow (Figure S6). The difference test revealed that most of the expected influence values were different from each other (Figure S7). The *CS*-coefficient was at the tested boundary of 0.75, indicating that at least 75% of cases could be dropped with an r = .70 and a 95% CI and thus centrality metrics can be interpreted.

Bridge centrality

Bridge centrality analysis showed that zest, hope, gratitude, and love were the character strengths exhibiting the highest levels of bridge expected influence (Fig.2). Happiness and life satisfaction also emerged as bridge nodes from the mental health community. These variables therefore showed the greatest connectivity between the other character strengths and the indicators of mental health. These results supported the study's expectations, except in the case of curiosity, the

[5] The network of character strengths and the centrality estimates can be found in the supplementary materials (Figures S1—S4).

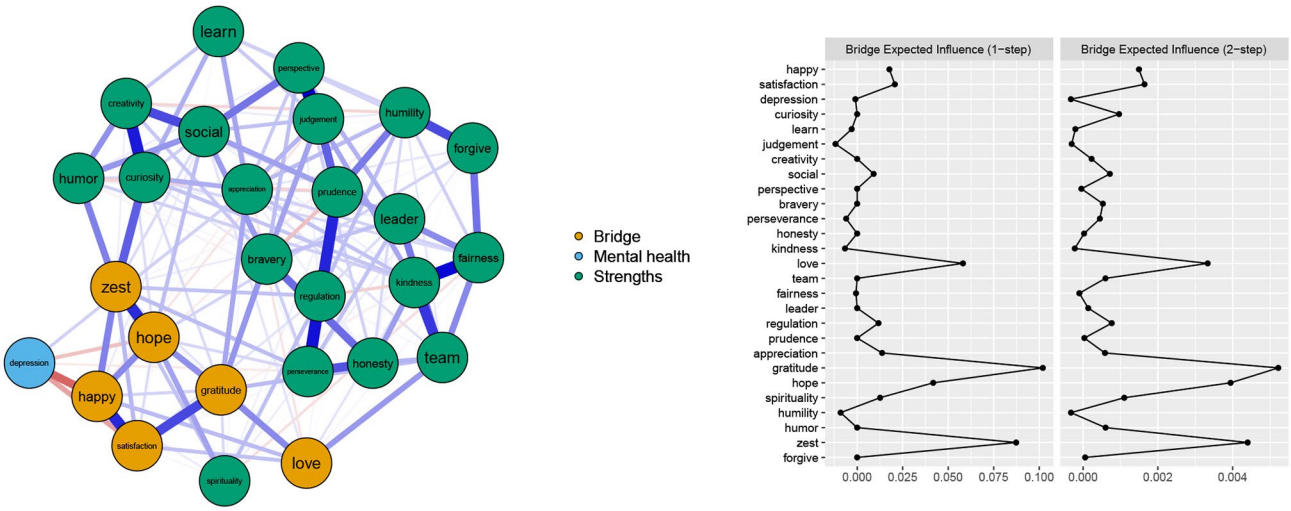

Fig. 2 Network Structure and Bridge Expected Influence of Character Strengths and Mental Health.
Note: Positive (negatives) relationships between nodes are represented by blue (red) edges. The distance between variables and width of edges indicate the magnitude of the correlation. Node colors correspond to the community domain: character strengths (green), mental health (blue), and bridge nodes (yellow).

only hypothesized variable that did not emerge as a bridge character strength.

Discussion

The aim of the present study was to examine the connections between character strengths and mental health from the network approach. We estimated the network structure of character strengths and the interactions with subjective well-being (i.e., happiness and life satisfaction) and depression, which partly reflects the dual-factor model of mental health (Keyes, 2005; WHO, 2001). To explore these interactions, we identified the character strengths that connected the two communities (bridge strengths). The heart strengths of love, zest, hope, and gratitude played an intermediary role between the rest of the character strengths and mental health, which is in line with previous research (Blasco-Belled et al., 2018; Brdar & Kashdan, 2010; Martínez-Martí & Ruch, 2014; Miljković & Rijavec, 2008). The most central variables of the network were zest, social intelligence, gratitude, and judgment, while depression emerged as the least central variable. Considering that character strengths have led to a wide array of research, adopting an alternative focus to investigate the associations with mental health, in this case the network approach, can offer several advantages. First, it provides an easy, clear visualization of the data and the connections between the variables. Second, as positive and negative components of mental health were included in this study, network analysis enabled identification of the variables that connect both communities and that might be proposed as potential therapeutic targets (McNally, 2016).

Depression is among the leading debilitating causes worldwide (Vigo et al., 2016) and is becoming a societal burden (WHO, 2017). An effective response to this problem would be to embrace the model of the complete state of mental health (Keyes, 2005) and include positive and negative indicators in the measurement and promotion of mental health. In efforts to mitigate the detrimental consequences of depression, psychological interventions can focus on the identification and enhancement of the mechanisms that help people not only to recover from traumatic experiences, but also to lead a fulfilling life. One such mechanism is character strengths (Schutte & Malouff, 2018). The findings of the present study contribute to describing possible paths of intervention.

According to network theory, changes in a network structure should lead to more durable intervention effects (Borsboom, 2017), and in particular, changes in bridge nodes can spur changes in the rest of the network (Jones et al., 2019). Hence, targeting the strengths of love, zest, hope, and gratitude seems to be a tenable option, and especially in people with high subjective well-being because happiness and life satisfaction also appeared as bridge nodes. All bridge strengths identified in this study pertained to heart strengths, a set of character strengths that help build harmonious relationships and tend to be strongly linked to subjective well-being (Haridas et al., 2017). In agreement with meta-analytic evidence (Schutte & Malouff, 2018), the present findings suggest that heart strengths can also serve to decrease depression. But to provide an explanation of

the network derived in this study, it must be interpreted as a complex system. In this sense, the connections between character strengths and mental health are viewed as a network of two different communities that emerge from a set of co-existing variables, wherein the activation of bridge character strengths can stimulate the activation of subjective well-being (and the rest of the character strengths) and lead to the diminishment of depression.

Unlike subjective well-being, depression did not emerge as a bridge node, indicating that this variable did not propel substantial connections between the other variables. This suggests that the association of character strengths with positive components differs from the associations with negative components of mental health. Notwithstanding, one should note that the sample was non-clinical and high levels of depression were therefore unexpected. Adopting the dual-factor model of mental health is fundamental to advance our understanding of its mechanism and determinants (van Agteren & Iasiello, 2021). Unfortunately, this is not the standard rule in character strength research (even less in research examining heart/mind-strength correlates), as studies typically focus on either well-being or depression measures without implementing them in conjunction. This practice can impose a limitation to understanding how mental health develops because psychological interventions can differently influence positive and/or negative indicators (Iasiello et al., 2020; Trompetter et al., 2017). For example, Jans-Beken et al., (2018) showed that gratitude had complex and distinct associations with well-being and depression. Advocating for the incorporation of the two components of mental health together (instead of only one or the other) in the realm of character strengths can provide a more complete picture of their role in the promotion of mental health.

Adopting the network approach to embrace the complexity of mental health can better inform about the interactions that co-occur among character strengths and mental health at a more fine-grained level and generate alternative treatment strategies. For instance, it may be possible to target specific associations among nodes rather than intervening on single nodes to change the structure of the network (Borsboom et al., 2021). The network approach does not only provide researchers with a statistical toolbox to operate psychological data, it also (and more importantly) entails a novel framework to understanding psychological constructs (Van Der Maas et al., 2006). Some researchers argue that network and factor models are mathematically equivalent (Marsman et al., 2015; Van Der Maas et al., 2006); however, this does not mean that the derived implications are also equivalent. Despite network and factor models having statistical equivalence, the interpretation and theoretical implications that these models reflect need not be equally plausible (van Bork et al., 2019). The present findings evidence the feasibility of approaching character strengths as a network and invites consideration of an alternative framework to understand its role in mental health. In fact, an important goal in network research is to gain insight into the underlying mechanisms of psychological constructs to accommodate the development of user-friendly practices that help widen the scope of psychological interventions (McNally, 2021).

Positive interventions, and more specifically character strengths-based interventions, can be beneficial in non-clinical contexts (Koydemir et al., 2021; Smith et al., 2020; Tejada-Gallardo et al., 2020), but interesting results can also be expected from psychopathology contexts. As such, therapeutic interventions in depression that focus on strategies to develop heart strengths might prove fruitful. Previous studies have highlighted the role of depression and happiness in understanding mental health (Blasco-Belled et al., 2020). However, positive indicators of mental health are rarely included as intervention outcomes in psychopathology research (Boumparis et al., 2016). Targeting interpersonal strengths that promote social relationships may be an interesting approach in psychopathological treatments. Although the network approach to psychopathology has mainly represented the study of mental disorders, recent research has recommended the application of this framework to the science of well-being (Fabian, 2021) as well as the development of positive interventions in clinical populations (Johnson & Wood, 2017). Overall, the conjunction between network theory and positive interventions in non-clinical and clinical settings can improve the understanding of the mechanisms through which mental health can be supported, both in psychiatric populations and lay people.

Conclusion

This study scrutinized the relations between character strengths and mental health using the network approach. Although comparing the results between traditional latent studies and network analysis studies can be challenging due to variability in demographics and methodological assumptions, the findings of this study are in line with those of previous research from the latent perspective. But a network view on this data entails different theoretical implications that can contribute to intervention design. Keeping this in mind, the present network study adds empirical evidence to the notion that heart strengths are more related to subjective well-being and depression than mind strengths. The estimated network indicated that the strengths of love, zest, hope, and gratitude bridged the communities of character strengths and mental health. The associations between these specific strengths and mental health can represent viable targets in interventions aimed at promoting mental health

and add exploratory value to the underlying mechanisms of mental health.

Limitations and Future Avenues

The present study has several limitations. First, the cross-sectional design does not allow one to infer temporal relations between the variables. Therefore, caution is required when interpreting the results. The selection of measures included in the study can limit the accuracy of the network, and since the number of items differed among measures, the results derived from the network analysis can be affected. It may be worth considering other indicators of mental health to evaluate the links with character strengths from the network perspective. Future research should also incorporate causal mechanisms within the external field to add explicative value. Despite the suggestion to focus on nodes with high centrality as potential predictors of recovery in psychopathology (Elliott et al., 2020; Papini et al., 2020), their value as therapeutic targets is still ambivalent (Rodebaugh et al., 2018; Spiller et al., 2020). More research is needed to examine which character strengths-based interventions and which specific components are most effective in enhancing mental health, both in clinical and non-clinical samples. Adjusting the conditions of participation to the implementation of positive interventions can serve as an early estimation of its effectiveness on subjective well-being and depression (Proyer et al., 2015). Given that the present analyses were based on group-level data, it would be advisable to employ a different analytic approach to model the data of individual participants so as to detect meaningful targets of interventions, such as idiographic network analysis (Fisher et al., 2017).

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Data availability The data and analysis code associated with this article is available from https://osf.io/fqhvt/?view_only=98cd394c786f4505aee220bac64a8c4d.

Declarations

Conflict of interest The author has no competing interests to declare that are relevant to the content of this article.

Ethical approval This study was approved by the Standards Committee of the Faculty of Education, Psychology and Social Work, University of Lleida and is in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to participate All participants were informed about the research and gave explicit consent to treat anonymously their data.

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