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Does mental well-being predict being perceived as a happy peer? A longitudinal social network study

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ABSTRACT

Social processes depend on individual features that make possible the development of social relationships and strong ties. Mental well-being (i.e., emotional, social, and psychological) in particular plays a key role in these processes influencing the formation of social ties. However, little is known about the potential of perceiving individuals as happy because of their levels of mental well-being. The aim of the study is to perform a longitudinal social network analysis to explore how mental well-being predicts being perceived as a happy individual. The study sample comprised 240 first-year university students and data were gathered through self-reported measures and peer reports, asking the students to select happy peers according to their perceptions. Results confirmed that mental well-being influenced the judgments of individuals regarding being perceived as a happy peer at zero-acquaintance level. These findings support mental well-being as an important resource to facilitate the development of social relationships.

1. Introduction

Generally, the need to belong drives human beings to form and maintain interpersonal relationships throughout their lives (Baumeister & Leary, 1995). However, not all social relationships are equal, and features such as acquaintanceship or liking are considered essential to make these interactions unique (Sun et al., 2020). The study of individuals' motivation to form and maintain interpersonal bonds (e.g., Maslow, 1968) led researchers to investigate the underlying processes that drive the creation and maintenance of interpersonal attachments. Among these, well-being plays an important role in social processes, which can also be perceived as a co-benefit of well-being. Despite the scientific evidence on the link between well-being and social interactions (e.g., Kansky & Diener, 2017; Sun et al., 2020), the number of longitudinal studies examining the influence of well-being on the development of social relationships is still small.

Many individuals feel a sense of belonging and increased positive affect after simply, for example, having a social interaction with a barista at a coffee shop (Sandstrom & Dunn, 2014). Many individuals also recall experiencing greater joy while socializing and interacting with others than during most other activities (Sun et al., 2020). Therefore, individuals with fulfilling social relationships usually report higher levels of mental well-being than those reported by individuals with fewer social connections. One might find, though, some exceptions in certain cases. For example, dysfunctional emotional regulation in non-clinical adolescents and young adults can lead to maladaptive strategies and worsen psychosocial health (Young et al., 2019).

Altogether, the findings suggest that social relationships influence on the satisfaction of an individual's life. However, one question remains: How does well-being influence the development of perceived social relationships? To answer it, one needs to understand the conceptualization of well-being. The World Health Organization (WHO) defines mental health as a "state of well-being in which an individual realizes his/her own capacities, can cope with normal stresses of life, can work productively, and is able to make a contribution to his/her community". According to this conceptualization, the present study follows the mental well-being model (Keyes, 2002) to include three different dimensions of well-being (emotional, social, and psychological) categorizing two approaches: the hedonic approach represents emotional well-being, which entails personal evaluations of life satisfaction, and the presence of positive affect and the absence of negative affect (Diener, 1984); and the eudaimonic approach, which represents social and psychological well-being. Social well-being reveals how an individual functions in society (Keyes, 1998), whereas psychological well-being is

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explained by the development and realization of the human potential (i.e., self-fulfillment; Waterman, 1993).

Regarding mental well-being in connection to social relationships, emotional well-being is associated with a individuals' everyday experiences, such as positive affect, happiness or joy (Kahneman et al., 2004). The link between emotional well-being and social behavior translates, for instance, into spending less time alone and more time talking to others (Mehl et al., 2010). Individuals with high levels of emotional well-being usually invest more time in the formation of social relationships and enjoy a more fruitful social life (Lyubomirsky et al., 2005). Unlike emotional well-being, social and psychological well-being are not a momentary outcome or end state, but they rather entail a process of self-realization connected to long-term benefits (Ryan & Deci, 2001). In fact, psychological well-being has a longer-lasting effect on social relationships than that of emotional well-being, because it is related to the need for fulfillment, long-term importance, and feelings of meaningfulness (Mekler & Hornbæk, 2016). Hence, individuals with high levels in this domain tend to seek warm, satisfying, and trusting relationships and a sense of empathy, affection, and intimacy in their social ties (Ryff, 1995). Still, the extent to which individual's levels of mental well-being predict being perceived as a happy person remains unknown.

1.1. How can the social network approach answer this question?

In general, the social network approach focuses on the social relationship links between individuals. More specifically, it focuses on the interactions (i.e., ties) among social actors (Freeman, 2004). As a general introduction, social network analysis (SNA) offers a wide approach to study social relationships because it includes self-reported (actors) and peer-reported (partners) information (see Method for details). Previous studies have employed SNA to examine the effects of narcissism and emotional intelligence on the popularity and leadership of individuals (Czarna et al., 2016; Rogoza et al., 2021). The study of happiness has grown exponentially over the last decades. However, there is still some debate regarding happiness as a distinct or related construct of well-being (Intelisiano et al., 2020). According to Feldman (2010), the well-being of a person is directly proportional to the level of happiness of that person at that time. Hence, it can be assumed that when an individual experiences high levels of well-being, she/he also experience happiness. However, do others also perceive a person with high levels of mental well-being as happy? The SNA can help investigate the longitudinal effects of mental well-being on happiness in the development and maintenance of social relationships.

1.2. Research purpose

The aim of this study is to longitudinally investigate how first-year university students are perceived as happy individuals by their peers according to their mental well-being. We applied a longitudinal SNA to assess, over the first academic year, the impact of self-reported mental well-being on peer nominations of happiness. Freshmen represent an appropriate target to assess the dynamics of mental well-being and its effects on the development of social ties because mental well-being can be affected by novel and transitional circumstances, such as the start of the first university year (Burger & Samuel, 2017). Although no earlier studies exist to formulate robust hypotheses, high mental well-being has been associated with increased psychosocial functioning (Fredrickson, 2004). Therefore, we expected that individuals with high levels of mental well-being will be more nominated as happy individuals by their peers at zero-acquaintance level.

2. Method

2.1. Participants and procedure

The present study included 15 classes ($n = 410$) of freshmen from the University of Lleida. However, since one full class did not complete the second measurement assessment ($n = 35$) and 135 students incorrectly answered the attention check questions or not complete the second assessment neither, the final sample included 14 classes and 240 participants, with the students' ages ranging between 18 and 32 years ($M = 19.31$, $SD = 1.78$, 75.8 % female). The retention rate over the seven months of study was 58.5 %. All students participated voluntarily in the study, without direct compensation, and were required to sign an informed consent form before participating. Random selection was restricted to first-year undergraduates of the faculty, thus all participants who met these criteria were eligible to be included in the study. Because the goal of our research was to investigate how social relationships evolve in groups, no exclusion criteria (rather than not being a class student) was applied. During the first assessment, students were asked to freely remain in the class even if they did not want to participate (rather than asking them to leave the class in order to avoid social influence). However, no students refused to participate. As a source of motivation to participate in both assessments, we explained to students that they would obtain the general group results (but not individual results) of the study once concluded. By this means, they might have the chance to understand the psychosocial processes that featured the interpersonal relationships of their class. As part of the process, at the beginning of the academic year the Institutional Information and Orientation Unit of the University sends reports to the academic community informing about the cases of students with specific needs (e.g., learning, social, intellectual difficulties). Before starting the research, we asked the corresponding professors about cases that would need support to answer the questions, but no group reported cases of special needs.

Data were gathered twice, at the beginning of the academic course (October 2020) and seven months later at the end of the course (May 2021), resulting in a total of 28 networks. To collect the data, we provided participants with a Google Forms link that contained the self-reported measures of mental well-being and a pencil-and-paper sheet for the nomination assignment. After completing the self-reports, the participants were required to mark peers who in their opinion were happy individuals. During the nomination assignment, the students were allowed to mark as many peers as they wished but not themselves. Measurements took place in class, but due to COVID-19 restrictions, two groups completed the measurements online at Time 1 and Time 2. During the academic course students attended classes in-person, however, some groups had to remain at home occasionally. This study was approved by the ethical committee of the faculty of Education, Psychology, and Social Work of the University of Lleida.

To establish the required sample size for the present study, we relied on a power analysis calculation using the *pwr.anova.test* function in the pwr R package (version 1.3; Champely, 2018). We calculated how many groups of approximately $n = 20$ individuals we would need to detect a large effect size ($f = 0.40$; Cohen, 1988) with a 0.010 significance level and a power of 0.95. The results suggested that a sample of 240 participants would be appropriate. The data and R code are available at the Open Science Framework: https://osf.io/g9d2a/.

2.2. Measures

Mental well-being was examined using the Mental Health Continuum Short Form (MHC-SF; Keyes et al., 2008; Spanish adaptation of Echeverría et al., 2017), to assess the subscales of emotional, social, and psychological well-being. This scale consists of 14 items, in which the respondents rate the frequency of every feeling in the past month on a 6-point Likert scale (1 = *never*, 6 = *every day*).

Social networks were assessed with network nominations. At each time point, the students were presented with a list showing the names of all classmates and asked who of their classmates they considered to be happy ("A list of all members from your class is presented below. Please identify the classmates you believe to be happy. You can select as many

Table 1
Descriptive statistics and partial correlations controlling for age and gender.

	M	SD	1	2	3	4	5	α
1. Emotional Time 1	3.60	0.73	–					0.76
2. Social Time 1	2.86	0.77	0.61	–				0.73
3. Psychological Time 1	3.47	0.71	0.60	0.62	–			0.79
4. Emotional Time 2	3.50	0.86	0.52	0.31	0.37	–		0.83
5. Social Time 2	3.58	0.75	0.38	0.33	0.50	0.70	–	0.76
6. Psychological Time 2	3.01	0.79	0.46	0.58	0.46	0.62	0.67	0.83

Note: all correlations are significant at $p < 0.01$.

participants as you want"). Nominations were coded as 1 (tie between two actors) and non-nominations were coded as 0 (absence of a tie).

2.3. Statistical analyses

SNA was used to test the longitudinal dynamics of forming and maintaining social relationships in RStudio (RStudio Team, 2020). First, the dynamics of network relationships were cross-sectionally assessed using an exponential-family random graph model (ERGM) to observe the network structure and determine the underlying processes that create and maintain a network-based social system (Lusher & Robins, 2013). When assessing the longitudinal dynamics we used the temporal exponential-family random graph model (TERGM), an extension of the ERGM. The TERGM was used over the competing model stochastic actor-oriented model (SAOM; Snijders et al., 2010) because TERGM allowed us to model independent networks (i.e., 14 independent classes) and time dependency (i.e., two time points). By contrast, SAOM focuses on dependent relations of a single network between two or more time points. Also, social influence processes are ignored in the present study which reinforces the selection of the TERGM technique.

The models employed in this study (ERGM and TERGM) are used to study the relationships within a group (i.e., network), and these relationships can depend on internal (endogenous) or external (exogenous) covariates. However, exogenous covariates are not considered to be related to the internal mechanisms that create a network. Hence, in our study, we used happiness as an exogenous individual characteristic of the network's nodes that has been treated from an ego (sender, influence in nominating) and alter (receiver, influence in being

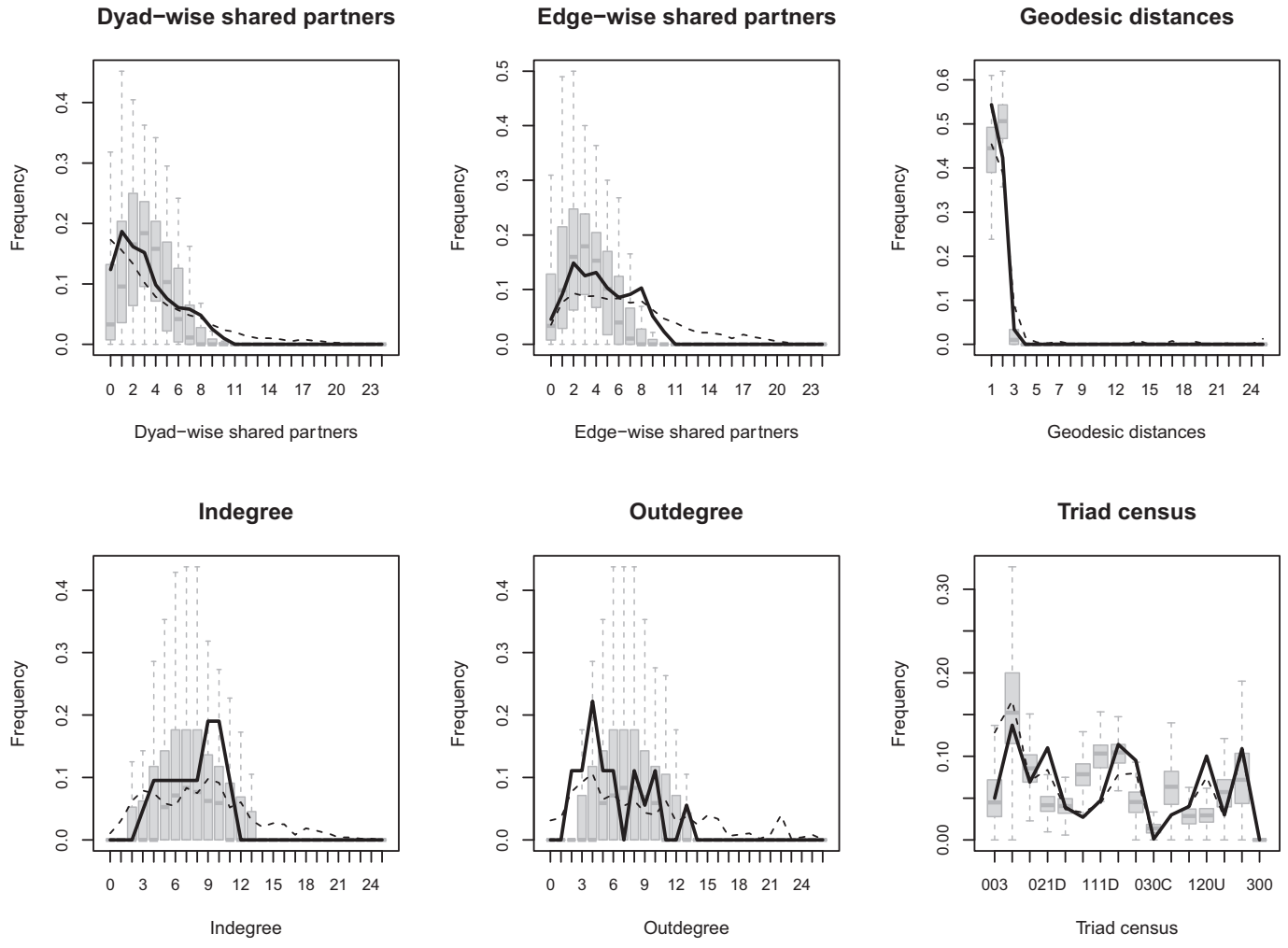

Fig. 1. The goodness-of-fit assessment for the TERGM – Emotional well-being.
Note: the grey boxplots are representing the simulations and the solid and dashed black lines are representing the median and the mean of the observed networks.

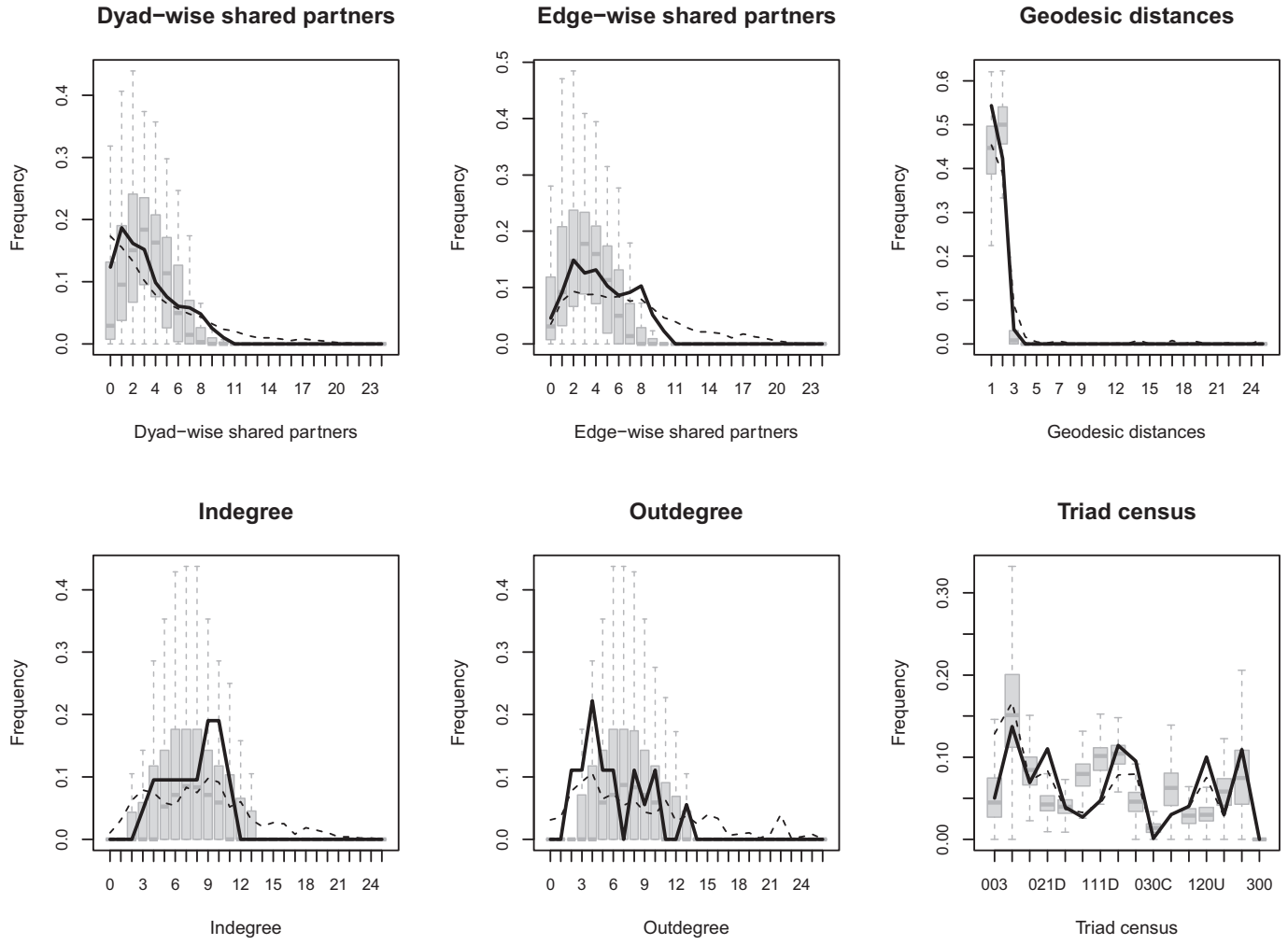

Fig. 2. The goodness-of-fit assessment for the TERGM – Social well-being.
Note: the grey boxplots are representing the simulations and the solid and dashed black lines are representing the median and the mean of the observed networks.

nominated) perspective. Nevertheless, it is important that network studies also consider endogenous network parameters, which are included in the analyzed model (Wasserman & Faust, 1994). Overall, the common tendency within a network to reciprocate relationships was measured using a reciprocity parameter, and the tendency to create triads was measured using a geometrically weighted edgewise shared partner (GWESP) distribution term. Generally, the GWESP distribution term is used to control for the overestimated selection effects (Steglich et al., 2010). We also relied on the geometrically weighted out-degree (GWOD) distribution term because it can handle the fact that some people have lower thresholds of selecting others as happy peers compared to other people (i.e., tendency to select almost everyone). Finally, we included an absolute difference term (absdiff) among the scores of mental well-being for every relationship in each group. If significant, this estimate suggests that the absolute differences of mental well-being domains might influence the likelihood of a relationship between two participants.

Finally, an ERGM and TERGM fit assessment was performed by comparing the random target networks obtained in 100 simulated networks from our model with those not included in the original network (Hunter et al., 2008). We assessed six common network statistics in terms of goodness of fit: dyad-wise shared partners, edgewise shared partners, geodesic distances, in-degree and out-degree relationships, and triad census. To that end, we employed the Markov chain Monte Carlo maximum likelihood estimation in the *xergm* package in RStudio (Leifeld et al., 2018). For further information on the statistical analysis refer to Supplementary material.

3. Results

All the descriptive statistics, partial correlations controlling for age and gender, and reliability estimates between the two measurement assessments are presented in Table 1. The reliability estimates were all acceptable and robust for the analyzed scales across measurement times. Positive correlations between subsequent measurement occasions for all variables were low to moderate.

3.1. Longitudinal social network analysis

3.1.1. Goodness-of-fit assessment

To examine the quality of TERGM fit, 100 new networks were simulated from Time 1 to Time 2. These networks were based on the model parameters and covariates and were compared with the networks obtained from the data of the study. The frequency distribution of the six basic network parameters is presented in Figs. 1–3. The observed distributions of the statistics were found to match well the simulated ones. This goodness-of-fit checking procedure suggested that the estimated models presented in the study are well fitted to the study data.

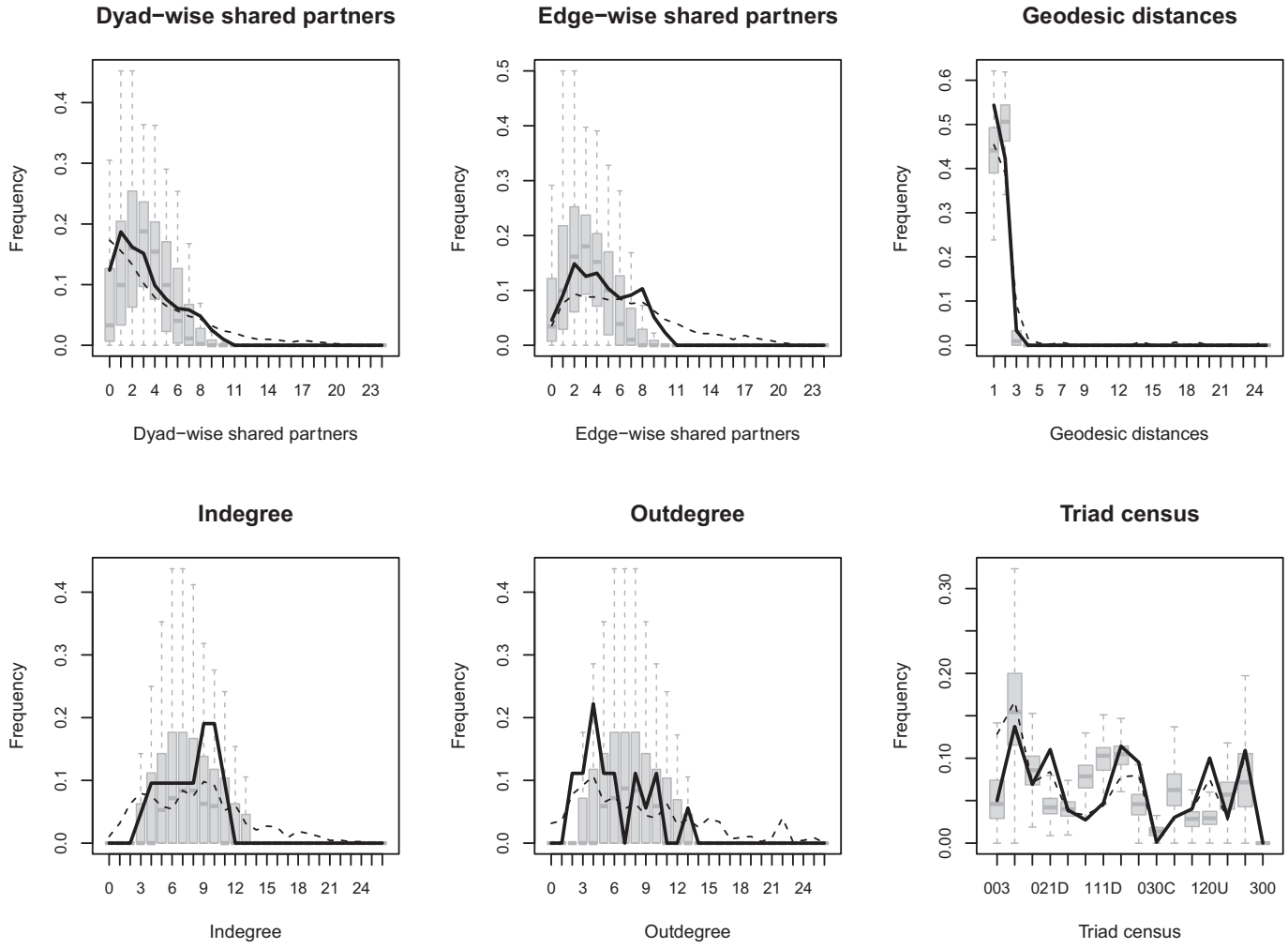

Fig. 3. The goodness-of-fit assessment for the TERGM – Psychological well-being.
Note: the grey boxplots are representing the simulations and the solid and dashed black lines are representing the median and the mean of the observed networks.

3.1.2. Main effects

Table 2 includes the model parameters and odds ratios of the analyzed TERGMs. As for the main effects, we considered the incoming relationships, which show how individuals with high levels of mental well-being are perceived by their peers. Overall, two groups of main effects were distinguished: (1) how differences in the levels of mental well-being predict the probability of being selected as a happy peer and (2) how this probability changes over time. In general, mental well-being proved to be a significant factor, indicating that high levels of mental well-being (emotional, social, and psychological) predict higher chances of being perceived as a happy individual by peers at the zero-acquaintance level.

Regarding the long-term results, a significant but negative effect was found only for individuals with emotional well-being, showing that being perceived as a happy individual fades over time. Figures illustrating the tendency of the interaction effects (incoming) with time are presented in the Supplementary material (Figs. S1–S3).

3.1.3. Exogenous control variables

For the exogenous variables, we included the outgoing relationships, which show how mental well-being predicts perceiving others as happy peers, as well as the prospective probability of change. Individuals with high levels of social well-being tend to perceive others as happy peers at Time 1. Among individuals with psychological well-being, an increased tendency to select happy peers was found in the long term.

The "time period" parameter informs about the probability of a person nominating another at Time 2. The results revealed this trend in social and emotional well-being, suggesting that individuals with high levels in these domains have an increased probability of nominating others between the first and second assessment. Also, significant sex differences were observed in the three well-being domains, indicating a preference to nominate peers from the other sex. These results are presented in Table 2. The tendency of the interaction effects (outgoing) with time are presented in the Supplementary material (Figs. S4–S6).

3.1.4. Endogenous network dependencies

In terms of the analyzed social networks, a typical and highly significant network dependency was observed, indicating a tendency to reciprocate relationships. The tendency to create triads (GWESP) was also present within the networks, supporting the reliability of the procedure. However, the trend of selecting almost everyone (GWOD) did occur among the participants of our study.

4. Discussion

In the present study, we investigated the influence of mental well-being on being perceived by (and perceiving) others as happy individuals at the zero-acquaintance level over the course of one academic year. Even though many studies have investigated the relationship between mental well-being and social relationships, these analyses focused

Table 2
Estimates of the TERGM model for the happiness network.

	TERGM (*SE*)	OR	95 % CI
Main effects			
Emotional: receiver	0.49*** (0.09)	1.64	[1.36, 1.98]
Social: receiver	0.32*** (0.09)	1.38	[1.16, 1.65]
Psychological: receiver	0.30** (0.09)	1.36	[1.12, 1.64]
Emotional: receiver × time	−0.20*** (0.05)	0.81	[0.72, 0.90]
Social: receiver × time	−0.08 (0.05)	0.91	[0.82, 1.02]
Psychological: receiver × time	−0.07 (0.05)	0.93	[0.82, 1.04]
Exogenous control variables			
Emotional: Time period	1.02*** (0.25)	2.79	[1.71, 4.56]
Emotional Sex: node match	−0.36*** (0.07)	0.69	[0.60, 0.79]
Emotional: sender × time	0.01 (0.05)	0.98	[0.88, 1.09]
Emotional: absdiff	0.03 (0.05)	1.03	[0.93, 1.14]
Social: Time period	0.60** (0.21)	1.83	[1.20, 2.78]
Social Sex: node match	−0.30*** (0.06)	0.73	[0.65, 0.83]
Social: sender × time	0.06 (0.05)	0.94	[0.84, 1.04]
Social: absdiff	0.07 (0.04)	1.08	[0.99, 1.18]
Psychological: Time period	0.04 (0.25)	1.04	[0.62, 1.72]
Psychological Sex: node match	−0.34*** (0.06)	0.70	[0.61, 0.80]
Psychological: sender × time	0.11* (0.05)	1.11	[1.00, 1.24]
Psychological: absdiff	−0.04 (0.04)	0.95	[0.87, 1.04]
Emotional: sender	0.07 (0.08)	1.07	[0.90, 1.27]
Social: sender	0.25** (0.08)	1.29	[1.10; 1.52]
Psychological: sender	−0.09 (0.08)	0.90	[0.76, 1.07]
Endogenous network dependences			
Emotional			
Edges	−2.64*** (0.43)	0.07	[0.03, 0.16]
Reciprocity	0.78*** (0.06)	2.19	[1.94, 2.47]
GWESP	−0.21*** (0.06)	0.80	[0.71, 0.91]
GWODegree	−3.37*** (0.32)	0.03	[0.01, 0.06]
Social			
Edges	−2.18*** (0.35)	0.11	[0.05, 0.22]
Reciprocity	0.74*** (0.06)	2.11	[1.87, 2.39]
GWESP	−0.21** (0.06)	0.80	[0.70, 0.91]
GWODegree	−3.36*** (0.31)	0.03	[0.01, 0.06]
Psychological			
Edges	−1.25** (0.42)	0.28	[0.12, 0.65]
Reciprocity	0.77*** (0.06)	2.18	[1.91, 2.47]
GWESP	−0.21** (0.06)	0.81	[0.70, 0.92]
GWODegree	−3.40*** (0.30)	0.03	[0.01, 0.06]

Note: p*** < 0.001; p** < 0.01; p* < 0.05.

on one direction (i.e., how social relationships predict mental well-being; Sandstrom & Dunn, 2014; Sun et al., 2020). Hence, the number of longitudinal studies investigating the opposite pattern (i.e., how mental well-being influences the development of social relationships) is still limited. To accomplish our goal, we applied a multimethodological approach including a self-reported measurement of mental well-being and a social network perspective to assess peer-based reports of happiness.

The results demonstrated that individuals with high levels of mental well-being are perceived as happy peers by others at the zero-acquaintance level. This suggests that the way people feel and think about their lives as a whole influences how other individuals perceive them (e.g., happy). This means that "being perceived as happy" would make the person attractive as a potential target for development of social ties, hence, an individual's level of mental well-being becomes meaningful in these social processes (Maccagnan et al., 2019). Being satisfied with one's own life and having positive emotions of self-fulfillment can provide a wide range of positive outcomes, such as physical health or success in the workplace (Kansky & Diener, 2017). Our study extends the array of these benefits to the realm of social relationships. In addition, previous findings suggesting that an individual's affect shape their social behavior and interactions with others over time (Keltner & Haidt, 2001) can help explain our findings. The experience of positive affect might stimulate people not only to be more open to cooperative behavior and to interact with others (Carnevale, 2007), but also to be perceived as happy during the early stages of relationship formation, which might contribute to setting the initial social bonding between zero acquaintances. Supporting this, individuals with higher levels of emotional well-being were perceived as favorable targets on first dates (Kerr et al., 2020). In brief, an individuals' mental well-being influences others to perceive them as a happy individual, at least in the short term, which is considered a useful feature in the development of durable social relationships. In terms of long-term findings, however, mental well-being does not exert such an influence. In this case, other factors might interfere in the maintenance of social relationships, such as personality traits (Malcolm et al., 2021) or how perceptions of an individual change over time, whose judgments of others with greater acquaintanceship might become more accurate as they interact more with one another (Brauer et al., 2022).

We found that individuals with high levels of social well-being selected more happy peers at the early stages of relationship formation. In the long term, the findings showed that only individuals with high levels of psychological well-being nominated more happy peers. As a tentative explanation, individuals with high levels of social well-being function well in society, which implies accepting and trusting others and feeling comfortable in the presence of their peers (Keyes, 1998). Therefore, it is likely that they perceive others as happy peers at the zero-acquaintance level as a result of their predisposition to accept them the way they are, trying to hold on the positive qualities of their relationships. On the contrary, individuals with high psychological well-being tend to seek fulfillment of the self but also in the relationships with others, which is connected to long-term benefits characteristic from this well-being domain (Ryan & Deci, 2001).

On a side note, our findings revealed that some individuals have low thresholds of perceiving others as happy. This fact may be explained by the social desirability that pushes individuals to show how happy and satisfied they are with their own lives. Showing unhappiness, on the contrary, can undeniably be very hard (Carlsson & Kataria, 2018). Hence, people tend to nominate others easily as happy individuals, especially in the short term. Others' perceptions of our mental well-being might be used as an observable characteristic that confers new acquaintances a hallmark of our own happiness, probably because emotional well-being (the only indicator showing decreasing long-term effects) is the easiest way to show yourself to be happy in a culture where unhappiness is not socially desirable (Mauss et al., 2011). But one's own mental well-being will not eventually draw the whole picture of our happiness in close acquaintances. Contrary (and luckily) to Andrew Grant's renowned quotation: "you never get a second chance to make a first impression", we shall consider that "you will likely get future chances to make a happy impression".

4.1. Limitations

This study is not without limitations. The findings reported are restricted to an undergraduate sample size (university students), preventing the generalizability of the results. Therefore, future studies should incorporate different demographic and cultural characteristics in order to replicate the findings. Also, the naturalistic setting adopted did not allow to control for confounding variables such as the frequency that participants interacted during the study. Hence, future studies should consider controlling these variables. Finally, in order to detect changes in zero-acquaintance relationships over time, future studies might also include more measurement time points and shorter intervals between measurements (Beer, 2020).

5. Conclusions

The aim of this study was to develop an understanding of how the formation and maintenance of relationships are influenced by the mental well-being of individuals. The findings revealed that mental well-being is a significant resource especially in the formation of social

relationships. The presence of high levels of mental well-being in university students seems to made them look like happy individuals in the short time, but not in the long term. Mental well-being can be a facilitator during the first step of social relationship formation during transitional or challenging stages (e.g., new contextual situation or facing health crises). All in all, mental well-being is of great importance to facilitate the development of social relationships.

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

CRediT authorship contribution statement

Claudia Tejada-Gallardo: Conceptualization, Methodology, Data curation, Writing - Original draft preparation. **Ana Blasco-Belled:** Conceptualization, Methodology, Writing - Reviewing. **Carles Alsinet**: Visualization, Supervision.

Conflicts of interest

The authors declare that they have no conflict of interest.

Data availability

The data and materials supporting the analyses presented in this manuscript can be found at https://osf.io/g9d2a/.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2022.111988.

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