



香港城市大學
City University of Hong Kong

專業 創新 胸懷全球
Professional · Creative
For The World

CityU Scholars

A Cluster Randomized Controlled Trial of a Multicomponent Positive Psychological Intervention

The Potential Mechanism of Altruism

Hu, Jinghan; Bu, He; Liu, Iris Kam Fung; Yu, Nancy Xiaonan

Published in:

Research on Social Work Practice

Online published: 30/05/2023

Document Version:

Post-print, also known as Accepted Author Manuscript, Peer-reviewed or Author Final version

Publication record in CityU Scholars:

[Go to record](#)

Published version (DOI):

[10.1177/10497315231179097](https://doi.org/10.1177/10497315231179097)

Publication details:

Hu, J., Bu, H., Liu, I. K. F., & Yu, N. X. (2023). A Cluster Randomized Controlled Trial of a Multicomponent Positive Psychological Intervention: The Potential Mechanism of Altruism. *Research on Social Work Practice*. Advance online publication. <https://doi.org/10.1177/10497315231179097>

Citing this paper

Please note that where the full-text provided on CityU Scholars is the Post-print version (also known as Accepted Author Manuscript, Peer-reviewed or Author Final version), it may differ from the Final Published version. When citing, ensure that you check and use the publisher's definitive version for pagination and other details.

General rights

Copyright for the publications made accessible via the CityU Scholars portal is retained by the author(s) and/or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights. Users may not further distribute the material or use it for any profit-making activity or commercial gain.

Publisher permission

Permission for previously published items are in accordance with publisher's copyright policies sourced from the SHERPA RoMEO database. Links to full text versions (either Published or Post-print) are only available if corresponding publishers allow open access.

Take down policy

Contact lbscholars@cityu.edu.hk if you believe that this document breaches copyright and provide us with details. We will remove access to the work immediately and investigate your claim.

The article is protected by copyright and reuse is restricted to non-commercial and no derivative uses. Users may also download and save a local copy of an article accessed in an institutional repository for the user's personal reference. For permission to reuse an article, please follow our [Process for Requesting Permission](#).

Hu, J., Bu, H., Liu, I. K. F., & Yu, N. X., A Cluster Randomized Controlled Trial of a Multicomponent Positive Psychological Intervention: The Potential Mechanism of Altruism, *Research on Social Work Practice*. Copyright © 2023 The Author(s).

DOI: [10.1177/10497315231179097](https://doi.org/10.1177/10497315231179097).

**A Cluster Randomized Controlled Trial of a Multicomponent Positive Psychological
Intervention: The Potential Mechanism of Altruism**

Jinghan Hu¹, He Bu¹, Iris Kam Fung Liu² and Nancy Xiaonan Yu¹

1. Department of Social and Behavioural Sciences, City University of Hong Kong, Hong

Kong, P. R. China

2. International Social Service Hong Kong Branch, Hong Kong, P. R. China

Author Note

Jinghan Hu: jinghhu3-c@my.cityu.edu.hk ORCID iD: 0000-0002-2074-5961

He Bu: hebu22-c@my.cityu.edu.hk ORCID iD: 0000-0001-9390-5404

Iris Kam Fung Liu: i.liu@isshk.org ORCID iD: 0000-0002-8492-8310

Nancy Xiaonan Yu: nancy.yu@cityu.edu.hk ORCID iD: 0000-0002-6371-2684

Corresponding concerning this article should be addressed to Nancy Xiaonan Yu,

Department of Social and Behavioural Sciences, City University of Hong Kong, Tat Chee

Avenue, Kowloon, HKSAR, P. R. China. Tel: +852 34429436. Fax: +852 34420283. E-mail:

nancy.yu@cityu.edu.hk

The authors declare no conflict of interest.

This study was funded by a grant from the Health Care and Promotion Scheme, Food and Health Bureau, Hong Kong SAR, P. R. China (Project No. 08150145).

Abstract

Purpose: Although multicomponent positive psychological interventions (MPPIs) effectively improve well-being, it is crucial to examine which intervention component plays a critical role. **Method:** This cluster randomized controlled trial assigned 221 immigrants from mainland China to Hong Kong to either an MPPI arm ($n = 116$, 11 clusters) or an MPPI + Information arm ($n = 105$, 11 clusters). Both arms aimed to enhance three intervention outcomes: resilience, happiness, and mental health. The MPPI part in the two arms included four components: self-efficacy, positive thinking, altruism, and goal setting. The information part provided information about Hong Kong. **Results:** Both arms effectively improved the four intervention components and three intervention outcomes. MPPI + Information increased the immigrants' knowledge of Hong Kong. The network analysis showed that altruism had the greatest strength in the network. **Conclusions:** Future studies should focus on the specific intervention component of altruism to understand how the MPPI works.

Keywords: altruism, immigrants, network analysis, multicomponent positive psychological intervention, cluster randomized controlled trial

The present study was pre-registered on ClinicalTrials.gov (NCT 02986022).

A Cluster Randomized Controlled Trial of a Multicomponent Positive Psychological

Intervention: The Potential Mechanism of Altruism

The past two decades have seen the emergence and flourishing of positive psychology research (Rusk & Waters, 2013), which examines the positive subjective experience, individual traits, and institutions to improve holistic mental well-being and prevent psychopathologies (Martin & Mihaly, 2000). Multicomponent positive psychological interventions (MPPIs) using theoretically and empirically based pathways or strategies to improve positive emotions, behaviors, and cognitions have been found to have small-to-medium effects on well-being and mental health among different populations (Carr et al., 2021; Hendriks et al., 2020; van Agteren et al., 2021), including immigrants (Tellez Lieberman et al., 2019). However, only few studies have examined the underlying working mechanism behind MPPIs, particularly regarding which component serves as the key factor.

Applying MPPIs Among Immigrants

Under the “One Country, Two Systems” policy, mainland Chinese citizens could apply for permanent residency only after migrating to Hong Kong for 7 years (Choi & Fong, 2017). Although mainland Chinese immigrants in Hong Kong are internal migrants, their immigration experiences are more similar to international immigration, facing various adaptation challenges, such as poverty, discrimination, acculturation stress, mental health problems, marital conflicts, and even domestic violence (Choi & Cheung, 2017; Choi & Fong, 2017; Chou, 2012; Qu et al., 2021; Tsui et al., 2006; Yu et al., 2014).

Ward and Kennedy (1999) proposed two correlated yet conceptually and empirically independent immigrant adaptation domains: psychological adaptation, which refers to

psychological well-being, and sociocultural adaptation, which refers to culturally proper skills for navigating the host country. In addition, Masten (2018) stated that individual adaptation in the face of adversity can be promoted via two different ways—mobilizing the psychological protective process and boosting practical available information and resources. Therefore, our research team designed and conducted two interventions to help new Chinese immigrants survive and thrive in Hong Kong. One intervention was an MPPI, which aimed to promote positive psychological adaptation of immigrants, while the other was an information intervention, which aimed to improve their sociocultural adaptation by providing helpful information about Hong Kong.

In a series of randomized controlled trials (RCTs), Yu et al. (2014) provided new immigrants with either four weekly sessions of an MPPI (i.e., self-efficacy, positive thinking, altruism, and goal setting) or two weekly sessions of an information intervention containing helpful information about Hong Kong. The results showed that the MPPI significantly improved participants' performance on the four intervention components and personal resilience, and the information intervention increased participants' knowledge about Hong Kong (Yu et al., 2014, 2015). In another RCT, Hu et al. (2022) combined an MPPI arm and an Information arm into a compound intervention, considering both practical cost-effectiveness and theoretical suggestion of a moderate correlation between psychological and sociocultural adaptations (Ward & Kennedy, 1999). This study provided either the MPPI (three weekly sessions), information (three weekly sessions), or MPPI + Information interventions (four weekly sessions) to new immigrants. The results showed that although the MPPI + Information intervention showed inferior effects over the MPPI alone during the

intervention period, it yielded better outcomes during the 6-month follow-up in terms of the sum score of the four intervention components and mental health. However, previous studies have used only standard procedures to compare the effectiveness between intervention arms, which may not allow for insights into how MPPI work. Only Yu et al. (2015) tested the mediating effect of each intervention component separately and showed preliminary findings that the four intervention components independently mediated the intervention effect on personal resilience at the 3-month follow-up.

The synergistic change model proposes that the different components of psychological functioning have a mutually supportive interaction, and changing specific components may trigger synergistic changes in other components (Rusk et al., 2018). Therefore, the intervention components should be considered to work dynamically and synergistically as a system rather than to work independently on the intervention outcomes. A network analysis can help identify the most crucial component among a set of mutually correlated components of MPPIs.

Applying Network Analysis to Test MPPI Components

Network analysis has emerged as a powerful tool for analyzing complex interrelationships among variables, especially in the fields of clinical psychology and psychiatry (Epskamp et al., 2018; Fried & Cramer, 2017). Previous researchers regard various psychological symptoms as indicators of a “latent” mental disorder, while the network perspective conceptualizes these symptoms as a complex, mutually interconnected system (Borsboom et al., 2011). Each node in the network represents a symptom, and the edge represents the connection between the two symptoms. The network estimation produces

three centrality indices for each node: a) *strength*, which measures how well a node is directly connected to other nodes; b) *closeness*, which measures how well a node is indirectly linked to other nodes; and c) *betweenness*, which measures how significant a node is in the average path between two other nodes (Epskamp et al., 2018). Thus, network analysis could help to dig further into the associations among the psychological symptoms and identify the most crucial symptom in the network (Epskamp et al., 2018; Rodebaugh et al., 2018), whereas the traditional data analysis methods (e.g., ANOVA) analyze multiple psychological constructs separately. In the present study, we applied network analysis in the MPPI, with nodes representing intervention components and outcomes to identify the central intervention component that contributes the most to the intervention effects.

Network analysis serves as an innovative way to evaluate subtle changes induced by interventions that may not be detected by conventional univariate or multivariate analyses. For instance, the ANOVA approach did not show the advantage of a PPI over CBT among women experiencing depression (Chaves et al., 2017). Instead, network analysis revealed unique changes in the patterns of connection between positive and negative mental health components among PPI participants (Blanco et al., 2020). Similarly, adolescents who received an MPPI did not show significant improvements in their anxiety levels compared with those who received a control intervention; however, the network analysis showed that the network structure of adolescent mental health changed immediately following the intervention (Tejada-Gallardo et al., 2022).

Most previous studies have used network analyses to examine the connections and dynamic influences among psychopathological symptoms (Contreras et al., 2019). Among the

relatively few network analyses in MPPI research, only the outcomes of interventions were evaluated, and positive intervention components were ignored (Blanco et al., 2020; Tejada-Gallardo et al., 2022). Following our second RCT, we applied MPPI and MPPI + Information interventions in the present study and used ANOVA to compare their effectiveness in terms of the intervention components and outcomes. Thereafter, we used network analysis to examine the potential working mechanism underlying the MPPI, particularly regarding which intervention component played the most critical role in the overall network.

Therefore, our hypotheses were as follows.

Hypothesis 1a: The MPPI and MPPI + Information arms would improve four intervention components (i.e., self-efficacy, positive thinking, altruism, and goal setting) and three intervention outcomes (i.e., resilience, happiness, and mental health);

Hypothesis 1b: The MPPI and MPPI + Information arms would be comparable in enhancing the four intervention components and three intervention outcomes;

Hypothesis 2: The MPPI + Information arm would provide more knowledge about Hong Kong than would the MPPI arm.

We did not make a specific hypothesis for which intervention component in the MPPI had the most crucial role in the network because it was only an exploratory investigation.

Method

Participants

Our research team utilized a community-based participatory approach in collaboration with a social service agency—International Social Service Hong Kong Branch. Social workers in the agency recruited new immigrants from mainland China to Hong Kong and

conducted the intervention program from December 2016 to December 2017 in Sham Shui Po, Kowloon, Hong Kong. The inclusion criteria included immigration to Hong Kong from mainland China no more than 3 years ago, age of 18 years or above, and at least a primary school education. The exclusion criteria included self-reported current psychiatric consultation, suicidal ideation, emotional problem, or mental retardation.

The research team used G*Power 3.1 (Faul et al., 2007) to calculate the sample size, with two arms, a pre–post design, and a small effect size ($f = 0.1$, $\alpha = .05$, $\beta = .80$).

Accordingly, at least 200 participants needed to be recruited for the present study.

Procedures

As the interventions were provided by group, the research team employed cluster randomization. Prior to recruitment, the research team used Random Allocation Software (Saghaei, 2004) to generate the randomization allocation and disclosed the allocation to the social workers after they recruited enough participants in one cluster (i.e., approximately 10 participants recruited in an intervention venue based on their attendance date to form a group). The allocation ratio was 1:1, with 11 clusters randomly assigned to the MPPI arm ($n = 116$) and 11 clusters to the MPPI + Information arm ($n = 105$). Both the participants and social workers were not blinded to the allocation. The participants were recruited via open recruitment, contacting of current service users in the social service agency, participant referral, and cold calls. Two social workers with at least 5 years of service facilitated the intervention. One of them had experience in delivering the intervention in our previous studies, while the other received training in our prior-intervention one-day train-the-trainer workshop; such experience equipped both of them with the necessary skills for using the

intervention manual.

The participants in the two arms received four sessions within 2 weeks. They completed the assessments before the first session and immediately following the end of the last session. One of the most concerning problems for the participants was that no one cared for their young children during the intervention. Therefore, the social service agency provided child care service to the participants' children upon request. The social workers provided make-up sessions to the participants who were absent in one or more specific sessions. In addition, a research assistant conducted a fidelity check for all intervention sessions, and the overall adherence rating was over 95%. Fifty-three participants dropped out between the first and last sessions owing to employment or return to mainland China. Finally, 87 and 80 participants finished the baseline and postintervention assessments, respectively (Figure 1). At the end of the intervention, the participants received a certificate of recognition for their participation and 100 Hong Kong dollars (1 U.S. dollar = 7.80 Hong Kong dollars) for the two assessments.

All participants provided written informed consent. The study was approved by the ethical review board of the City University of Hong Kong.

Interventions

The research team adapted the intervention manuals from our previous studies for the two arms in the present study (Hu et al., 2022; Yu et al., 2014). The MPPI arm included four 2-hour sessions twice a week. The theme of each session was self-efficacy, which aimed to discover the immigrants' strengths and advantages and enhance their confidence in the face of challenges to adaptation; positive thinking, which encouraged the immigrants to reappraise

the current adversity positively; altruism, which invited the immigrants to serve as volunteers at an elderly home; and goal setting, which asked the immigrants to make long-term achievable goals and plans to achieve such goals. The MPPI + Information arm included four 2.5-hour sessions twice a week, with 2 hours for the MPPI and 0.5 hours for the information intervention about Hong Kong. The MPPI part in the two arms was precisely the same. The information part provided information about Hong Kong, including transportation, housing, medical service, education, and employment for the new immigrants. Table 1 shows the outline of the interventions (the last author can provide the detailed intervention manual upon request).

Measures

Intervention Components

The four intervention components were assessed using a self-developed intervention component scale (Yu et al., 2015). The scale was designed specifically to match the intervention components: a) self-efficacy, three items (e.g., “I found my advantages and strengths”); b) positive thinking, four items (e.g., “I adopted positive thinking in the face of adversity”); c) altruism, four items (e.g., “I enhanced my sense of hope in helping others”); and d) goal setting, three items (e.g., “I set up clear goals for my life”). The items are rated on a 5-point Likert scale, with 1 point representing *strongly disagree* and 5 points representing *strongly agree*. The Cronbach’s α for all four intervention components was above .8 among new immigrants in Hong Kong in the study by Yu et al. (2015) and .82, .85, .91, and .88, respectively, at baseline in the present study.

Intervention Outcomes

Resilience. We used the 25-Item Connor–Davidson Resilience Scale to assess resilience (Connor & Davidson, 2003). The items are rated on a 5-point Likert scale, with 0 points representing *never* and 4 points representing *always*. The Cronbach's α was .92 among new immigrants in Hong Kong in the study by Yu et al. (2014) and .94 at baseline in the present study.

Happiness. We used the 4-Item Subjective Happiness Scale to assess happiness (Lyubomirsky & Lepper, 1999). The items are rated on a 7-point Likert scale, with 1 point representing *not at all* and 7 points representing *extremely*. The Cronbach's α was .79 among the general population in Hong Kong in the study by Fabrizio et al. (2015) and .80 at baseline in the present study.

Mental Health. We used the 5-Item Mental Health Inventory to assess mental health, including anxiety, depression, general positive affect, and behavioral/emotional control (Berwick et al., 1991). The items are rated on a 6-point Likert scale, with 1 point representing *never* and 6 points representing *always*. The Cronbach's α was .75 among new immigrants in Hong Kong in the study by Hu et al. (2022) and .82 at baseline in the present study.

Knowledge about Hong Kong

Knowledge. We used a self-developed 15-item true/false knowledge scale to assess how much information about Hong Kong the new immigrants acquired after the intervention. A sample item was “After working for 1 year, I am entitled to have at least 7 days’ paid annual leave,” which was correct.

Statistical Analysis

First, an independent samples *t*-test was used to compare the sociodemographic characteristics between the two arms. Second, repeated ANOVA was performed to analyze the intervention effectiveness regarding the intervention components and outcomes between the two arms using the time-by-arm effect, with time as the within-group factor and arms as the between-group factor. Third, a network analysis was used to analyze the data to find the potential mechanism of the MPPI. Generally, the accuracy of a network increases if the sample size is larger (Epskamp & Fried, 2018). Therefore, the participants in the MPPI and MPPI + Information arms were combined into one sample because all participants joined the MPPI. The standardized residual change scores of the four intervention components and three intervention outcomes were calculated as the nodes in the network, and a network analysis was conducted among the 167 participants who completed both baseline and postintervention assessments. According to the recommendation by Epskamp and his colleagues (2018), the robustness of the networks was also examined by thoroughly investigating the accuracy and stability of our model by calculating the following: a) centrality stability and bootstrapped difference of centrality indices; and b) edge accuracy and bootstrapped difference of edges. The bootstrap sample was 2,500. The correlation stability coefficient (i.e., CS coefficient), which represented the maximum proportion of cases that can be dropped with a 95% probability that the new and original networks correlated greater than 0.7, was computed. Epskamp et al. (2018) recommended only interpreting centrality indices with a CS coefficient above 0.25 and preferentially above 0.5. Thereafter, we conducted network analyses in RStudio using R packages bootnet and qgraph (Epskamp et al., 2018) and other analyses in

SPSS 25 among the participants who completed the baseline and postintervention assessments.

Results

Intervention Effectiveness

As shown in Table 2, there were no differences in the sociodemographic characteristics, including sex, age, marital status, education, employment status, family socioeconomic status, and presence of a child, between the two arms. This finding indicated that the participants in the two arms were equivalent to each other, which was one of the prerequisites for combining the two arms into one analysis unit for the network analysis.

As shown in Table 3, the main time effects for the intervention components and outcomes were all significant ($ps < .001$), while the effect sizes for the intervention components and outcomes were all large ($\eta^2 > 0.14$), except for altruism ($\eta^2 = 0.10$). The results showed that the MPPI and MPPI + Information arms improved the intervention components and outcomes from baseline to postintervention, which supported our Hypothesis 1a. There were no significant interaction effects between the time and arm (all $ps > .05$, $\eta^2 < 0.06$), indicating no differences between the two arms regarding all intervention components and outcomes, which supported our Hypothesis 1b. The absence of differences in the intervention components and outcomes between the two arms was the second prerequisite for combining the participants in the two arms into one analysis unit for the network analysis.

As for knowledge, there was a significant interaction effect between the time and arm [$F(1, 157) = 113.18$, $p < .001$, $\eta^2 = 0.42$]. Further simple effect analysis showed that at baseline, there was no difference between the two arms ($p = .60$). At postintervention, the

participants in the MPPI + Information arm significantly acquired more knowledge than did those in the MPPI arm ($p < .001$, $\eta^2 = 0.42$), which supported our Hypothesis 2. The overall results indicated that the participants in the MPPI + Information arm effectively learned more knowledge about Hong Kong than did those in the MPPI arm, consistent with previous reports (Hu et al., 2022; Yu et al., 2014). Notably, the improvement in knowledge was not the focus of the present study, and we did not include this variable in the network analysis.

Network Analysis

Figure 2 shows the estimated network of the intervention components and outcomes. Figure 3 shows the network's centrality indices: betweenness, closeness, and strength. We then investigated the stability in the order of the symptoms across the three centrality indices using the CS coefficient. Epskamp et al. (2018) suggested CS coefficients from 0.25 to 0.5 as acceptable and above 0.5 as preferable. In the present study, the betweenness and closeness indicated a low stability level (CS coefficient = 0 and 0.048, respectively), while the strength indicated an acceptable stability level (CS coefficient = 0.359). These findings indicated that the ranking of the components and outcomes as indexed by strength was robust and trustworthy. Hence, we primarily focused on interpreting symptom strength in the subsequent network analysis.

In terms of strength, altruism was the strongest node in the network (Figure 3). This finding indicated that the changes in altruism showed the most significant influence on the overall network. However, the bootstrapped difference tests between the node strengths showed that the strength of altruism significantly differed only from the strength of resilience and happiness (Figure 4). Therefore, the strength of altruism should be interpreted with

caution. Figure 5 shows the bootstrapped confidence intervals of the estimated edge weights, which were acceptable. Consequently, the edge weights represented in the network model could be considered reasonably accurate.

Discussion and Applications to Practice

This study marked the third RCT in our series of studies implementing an MPPI for new immigrants from mainland China to Hong Kong, showcasing our research team's unwavering commitment to integrating evidence-based MPPIs in social services and the ongoing evolution of intervention trials (Hu et al., 2022; Yu et al., 2014). Our analysis showed that both MPPI and MPPI + Information arms effectively improved the intervention components and outcomes, and the MPPI + Information arm improved the participants' knowledge about Hong Kong. Herein, we further conducted an advanced evaluation of the MPPI using a network analysis to investigate complex patterns of changes in the intervention components and outcomes. We found that the intervention component altruism yielded the most critical impact on the network. These findings contribute new knowledge to understanding how MPPIs work.

Supporting Hypotheses 1a and 1b, the MPPI and MPPI + Information arms yielded equivalent improvements regarding the intervention components and outcomes. These results are promising because our previous study showed that the MPPI + Information arm had inferior effects over the MPPI arm in the short term (Hu et al., 2022). In the present study, we found that the MPPI + Information arm showed equivalent effects with the MPPI arm. Our previous study also found that the MPPI + Information arm showed superior effects over the MPPI arm during the 6-month follow-up (Hu et al., 2022). Therefore, future studies should

include longer-term assessments to capture the improvements yielded by the compound arm.

The present results supported Hypothesis 2: The information intervention effectively increased the participants' knowledge about Hong Kong. Most of our participants were new immigrants who came to Hong Kong within 1 year. They were housewives with low educational levels and had limited access to social services, including information services in Hong Kong. Other immigrant host countries have immigrant settlement programs but only provide services about community connections, language training, information and orientation, and employment-related services (Immigration, Refugees, and Citizenship Canada, 2017). Previous studies have suggested that providing information to new immigrants who are generally in information poverty in their host country improves their sociocultural adaptation, which is moderately related to their psychological adaptation (Caidi et al., 2010; Ward & Kennedy, 1999). The present study combined the information intervention with the MPPI, showing effects no less than those of the MPPI alone. Therefore, social service agencies are recommended to consider implementing the MPPI + Information intervention for new immigrants in their routine work.

More importantly, we used a network analysis to explore the pattern of the changes in the intervention components and outcomes of the MPPI. We found that altruism was the most pivotal intervention component in the entire network owing to the strongest quantitative relationships with the other intervention components and outcomes. Generally, network analysis models illustrate the possibilities of one component activating another by assigning a strong positive weight to the edge that links the corresponding nodes (Kalisch et al., 2019). This indicates that interventions targeting altruism might leverage changes in the entire

network. In the altruism session, our participants did volunteer work at an elderly home. They not only did activities with older people but also learned about the older people's life experiences. After the volunteer work, the intervention facilitators invited the participants to share their feelings and thoughts during the volunteer work and to use the skills they learned in the previous two sessions—self-efficacy and positive thinking—to summarize their volunteer experience.

Theoretically, coordinating, collaborating, and conducting altruistic behavior toward others with whom an actor shares a common interest can satisfy an internal reward system, leading to a range of positive valenced psychological states (Curry et al., 2018). Empirically, conducting altruistic behavior toward other people can enhance an actor's psychological well-being and mental health (Curry et al., 2018; Jenkinson et al., 2013). Even making others happy increases psychological well-being more than making oneself happy (Titova & Sheldon, 2021). Specific to the present study, most new immigrants were housewives who cared for their young children alone and faced greater psychological distress and social isolation (Choi & Fong, 2017; Ng et al., 2018). The volunteer work did not help solve the immigrants' daily problems but pulled them out of their daily routine of caring for their children. The underlying mechanism between volunteer work and psychological well-being might be the connectedness between the new immigrants and their community, thus leading to positive psychological fulfilment and a sense of beneficence (Curry et al., 2018).

Therefore, altruism had the strongest correlation with the intervention outcomes resilience, happiness, and mental health. However, although altruism had the strongest correlation in the network, it had few differences from the other intervention components. The absence of the

differences may be attributed to the small sample size of the present study despite combining the participants in the two arms into one analysis unit. Future studies should recruit more participants in the MPPI arm to increase the stability and accuracy of the network (Epskamp et al., 2018). Further, future studies may conduct a single intervention on altruism to determine the causal relationship between altruism and other positive psychological outcomes.

The present findings have some implications. First, the synergistic change model suggested that among the different components of the MPPI, the intervention should target the pivotal component and mutually reinforcing component (Rusk et al., 2018). The network analysis in the present study identified altruism as the most critical factor of the MPPI. Future studies may consider implementing a single intervention on altruism among new immigrants from mainland China to Hong Kong given the intervention's cost-effectiveness. Second, the community-based participatory approach of the present RCT yields some implications for public health. The collaboration between the scientific community and social service agencies facilitates the transformation of evidence-based MPPIs into practical use (Fabrizio et al., 2012). Our present series of studies developed not only structured manuals for the MPPI and information interventions but also provided train-the-trainer workshops to efficiently equip intervention facilitators with the necessary skills to lead the intervention (Hu et al., 2022; Yu et al., 2014). All these designs facilitate the dissemination and implementation of the intervention, allowing social service agencies to better address the holistic need of new immigrants and help them adapt to their new life in Hong Kong.

The present study also has some limitations. Because of the small sample size, we

combined the participants in the two arms into one unit in the network analysis. However, it remains unknown whether the information part would yield a difference in the network structure, although repeated ANOVA showed no differences between the two arms.

Knowledge is an important component of sociocultural adaptation, which is moderately correlated with psychological adaptation (Ward & Kennedy, 1999). Future studies should include a no-intervention control arm to compare the different network structures between MPPI and control arms. Moreover, the CS coefficient in the present study indicated low stability for the index of closeness and betweenness. Future studies should include more participants to increase the network's accuracy (Epskamp & Fried, 2018). Another limitation of the present study is the lack of longer-term assessment of outcomes, such as a 6-month follow-up, which should be considered in future research.

Conclusion

Network analyses can be helpful in MPPI research because they can elucidate how complex patterns of connections between psychological components may be affected by positive interventions (Blanco et al., 2020). In the present study, we found equivalent intervention effects between the MPPI and MPPI + Information arms regarding the intervention components and outcomes. The MPPI + Information arm improved the immigrants' knowledge of Hong Kong. The network analysis further elaborated the underlying working mechanism behind the MPPI: The positive component altruism yields the most pivotal effect in the entire network structure. Future studies should focus more on interpersonal positive psychology constructs such as altruism, which might help leverage holistic change and promote new immigrants' psychological well-being.

References

- Berwick, D. M., Murphy, J. M., Goldman, P. A., Ware, J. E., Barsky, A. J., & Weinstein, M. C. (1991). Performance of a five-item mental health screening test. *Medical Care*, 29(2), 169–176. <https://doi.org/10.1097/00005650-199102000-00008>
- Blanco, I., Contreras, A., Chaves, C., Lopez-Gomez, I., Hervas, G., & Vazquez, C. (2020). Positive interventions in depression change the structure of well-being and psychological symptoms: A network analysis. *The Journal of Positive Psychology*, 15(5), 623–628. <https://doi.org/10.1080/17439760.2020.1789696>
- Borsboom, D., Cramer, A. O. J., Schmittmann, V. D., Epskamp, S., & Waldorp, L. J. (2011). The small world of psychopathology. *PLoS One*, 6(11), Article e27407. <https://doi.org/10.1371/journal.pone.0027407>
- Caidi, N., Allard, D., & Quirke, L. (2010). Information practices of immigrants. *Annual Review of Information Science and Technology*, 44(1), 491–531. <https://doi.org/10.1002/aris.2010.1440440118>
- Carr, A., Cullen, K., Keeney, C., Canning, C., Mooney, O., Chinseallaigh, E., & O'Dowd, A. (2021). Effectiveness of positive psychology interventions: A systematic review and meta-analysis. *The Journal of Positive Psychology*, 16(6), 749–769. <https://doi.org/10.1080/17439760.2020.1818807>
- Chaves, C., Lopez-Gomez, I., Hervas, G., & Vazquez, C. (2017). A comparative study on the efficacy of a positive psychology intervention and a cognitive behavioral therapy for clinical depression. *Cognitive Therapy and Research*, 41(3), 417–433. <https://doi.org/10.1007/s10608-016-9778-9>

- Choi, S. Y. P., & Cheung, A. K.-L. (2017). Dissimilar and disadvantaged: Age discrepancy, financial stress, and marital conflict in cross-border marriages. *Journal of Family Issues, 38*(18), 2521–2544. <https://doi.org/10.1177/0192513X16653436>
- Choi, S. Y. P., & Fong, E. (2017). Migration rethinking border and boundary. In S. Y. P. Choi, & E. Fong (Eds.), *Migration in post-colonial Hong Kong* (pp. 1-12). Routledge. <https://doi.org/10.4324/9781315466699>
- Chou, K.-L. (2012). Perceived discrimination and depression among new migrants to Hong Kong: The moderating role of social support and neighborhood collective efficacy. *Journal of Affective Disorders, 138*(1–2), 63–70. <https://doi.org/10.1016/j.jad.2011.12.029>
- Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety, 18*(2), 76–82. <https://doi.org/10.1002/da.10113>
- Contreras, A., Nieto, I., Valiente, C., Espinosa, R., & Vazquez, C. (2019). The study of psychopathology from the network analysis perspective: A systematic review. *Psychotherapy and Psychosomatics, 88*(2), 71–83. <https://doi.org/10.1159/000497425>
- Curry, O. S., Rowland, L. A., Van Lissa, C. J., Zlotowitz, S., McAlaney, J., & Whitehouse, H. (2018). Happy to help? A systematic review and meta-analysis of the effects of performing acts of kindness on the well-being of the actor. *Journal of Experimental Social Psychology, 76*, 320–329. <https://doi.org/10.1016/j.jesp.2018.02.014>
- Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavior Research Methods, 50*(1), 195–212.

<https://doi.org/10.3758/s13428-017-0862-1>

Epskamp, S., & Fried, E. I. (2018). A tutorial on regularized partial correlation networks.

Psychological Methods, 23(4), 617–634. <https://doi.org/10.1037/met0000167>

Fabrizio, C. S., Hirschmann, M. R., Lam, T. H., Cheung, T., Pang, I., Chan, S., & Stewart, S.

M. (2012). Bringing scientific rigor to community-developed programs in Hong

Kong. *BMC Public Health*, 12(1), Article 1129. [https://doi.org/10.1186/1471-2458-](https://doi.org/10.1186/1471-2458-12-1129)

12-1129

Fabrizio, C. S., Lam, T. H., Hirschmann, M. R., Pang, I., Yu, N. X., Wang, X., & Stewart, S.

M. (2015). Parental emotional management benefits family relationships: A

randomized controlled trial in Hong Kong, China. *Behaviour Research and Therapy*,

71, 115–124. <https://doi.org/10.1016/j.brat.2015.05.011>

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G* Power 3: A flexible statistical

power analysis program for the social, behavioral, and biomedical sciences. *Behavior*

Research Methods, 39(2), 175–191. <https://doi.org/10.3758/bf03193146>.

Fried, E. I., & Cramer, A. O. J. (2017). Moving forward: Challenges and directions for

psychopathological network theory and methodology. *Perspectives on Psychological*

Science, 12(6), 999–1020. <https://doi.org/10.1177/1745691617705892>

Hendriks, T., Schotanus-Dijkstra, M., Hassankhan, A., de Jong, J., & Bohlmeijer, E. (2020).

The efficacy of multi-component positive psychology interventions: A systematic

review and meta-analysis of randomized controlled trials. *Journal of Happiness*

Studies, 21(1), 357–390. <https://doi.org/10.1007/s10902-019-00082-1>

Hu, J., Liu, I. K. F., Stewart, S. M., Lam, T. H., & Yu, N. X. (2022). The more the better, only

in the longer term: A cluster randomized controlled trial to evaluate a compound intervention among mainland Chinese immigrants in Hong Kong. *Behavior Therapy*, 53(5), 944-957. <https://doi.org/10.1016/j.beth.2022.04.003>

Immigration, Refugees, and Citizenship Canada. (2017). *Evaluation of the Settlement Program*. <https://www.canada.ca/en/immigration-refugees-citizenship/corporate/reports-statistics/evaluations/settlement-program.html>

Jenkinson, C. E., Dickens, A. P., Jones, K., Thompson-Coon, J., Taylor, R. S., Rogers, M., Bambra, C. L., Lang, I., & Richards, S. H. (2013). Is volunteering a public health intervention? A systematic review and meta-analysis of the health and survival of volunteers. *BMC Public Health*, 13(1), 773. <https://doi.org/10.1186/1471-2458-13-773>

Kalisch, R., Cramer, A. O. J., Binder, H., Fritz, J., Leertouwer, Ij., Lunansky, G., Meyer, B., Timmer, J., Veer, I. M., & van Harmelen, A.-L. (2019). Deconstructing and reconstructing resilience: A dynamic network approach. *Perspectives on Psychological Science*, 14(5), 765–777. <https://doi.org/10.1177/1745691619855637>

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research*, 46(2), 137–155.

Masten, A. S. (2018). Resilience theory and research on children and families: Past, present, and promise. *Journal of Family Theory & Review*, 10(1), 12–31. <https://doi.org/10.1111/jftr.12255>

Martin, S., & Mihaly, C. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5–14. <https://doi.org/10.1037/0003-066X.55.1.5>

- Ng, F. F. -Y., Tamis-LeMonda, C. S., & Sze, I. N. -L. (2018). Parenting among mainland Chinese immigrant mothers in Hong Kong. In S. S. Chuang & C. L. Costigan (Eds.), *Parental roles and relationships in immigrant families: An international approach* (pp. 147–167). Springer International Publishing. https://doi.org/10.1007/978-3-319-71399-1_9
- Qu, D., Chen, C., Kouros, C. D., & Yu, N. X. (2021). Congruence and discrepancy in migrant children's and mothers' perceived discrimination: Using response surface analysis to examine the effects on psychological distress. *Applied Psychology: Health and Well-Being, 13*(3), 602–619. <https://doi.org/10.1111/aphw.12249>
- Rodebaugh, T. L., Tonge, N. A., Piccirillo, M. L., Fried, E., Horenstein, A., Morrison, A. S., Goldin, P., Gross, J. J., Lim, M. H., Fernandez, K. C., Blanco, C., Schneier, F. R., Bogdan, R., Thompson, R. J., & Heimberg, R. G. (2018). Does centrality in a cross-sectional network suggest intervention targets for social anxiety disorder? *Journal of Consulting and Clinical Psychology, 86*(10), 831–844. <https://doi.org/10.1037/ccp0000336>
- Rusk, R. D., Vella-Brodrick, D. A., & Waters, L. (2018). A complex dynamic systems approach to lasting positive change: The synergistic change model. *The Journal of Positive Psychology, 13*(4), 406–418. <https://doi.org/10.1080/17439760.2017.1291853>
- Rusk, R. D., & Waters, L. E. (2013). Tracing the size, reach, impact, and breadth of positive psychology. *The Journal of Positive Psychology, 8*(3), 207–221. <https://doi.org/10.1080/17439760.2013.777766>

- Saghaei, M. (2004). Random allocation software for parallel group randomized trials. *BMC Medical Research Methodology*, 4(1), Article 26. <https://doi.org/10.1186/1471-2288-4-26>
- Tejada-Gallardo, C., Blasco-Belled, A., & Alsinet, C. (2022). Changes in the network structure of mental health after a multicomponent positive psychology intervention in adolescents: A moderated network analysis. *Applied Psychology: Health and Well-Being*, 14(3), 987–1003. <https://doi.org/10.1111/aphw.12363>
- Tellez Lieberman, J., Lobban, K., Flores, Z., Giordano, K., Nolasco-Barrientos, E., Yamasaki, Y., & Martinez-Donate, A. P. (2019). “We all have strengths”: A retrospective qualitative evaluation of a resilience training for Latino immigrants in Philadelphia, PA. *Health Equity*, 3(1), 548–556. <https://doi.org/10.1089/heq.2019.0070>
- Titova, M., & Sheldon, K. (2021). Happiness comes from trying to make others feel good, rather than oneself. *The Journal of Positive Psychology*, 17, 1–15. <https://doi.org/10.1080/17439760.2021.1897867>
- Tsui, K., Chan, A., So, F., & Kam, C. (2006). Risk factors for injury to married women from domestic violence in Hong Kong. *Hong Kong Medical Journal*, 12(4), 289–293.
- van Agteren, J., Iasiello, M., Lo, L., Bartholomaeus, J., Kopsaftis, Z., Carey, M., & Kyrios, M. (2021). A systematic review and meta-analysis of psychological interventions to improve mental wellbeing. *Nature Human Behaviour*, 5(5), 631–652. <https://doi.org/10.1038/s41562-021-01093-w>
- Ward, C., & Kennedy, A. (1999). The measurement of sociocultural adaptation. *International Journal of Intercultural Relations*, 23(4), 659–677. <https://doi.org/10.1016/S0147->

1767(99)00014-0

Yu, X., Lam, T. H., Liu, I. K. F., & Stewart, S. M. (2015). Mediation of short and longer term effects of an intervention program to enhance resilience in immigrants from mainland China to Hong Kong. *Frontiers in Psychology*, 6, Article 1769.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2015.01769>

Yu, N. X., Stewart, S. M., Chui, J. P., Ho, J. L., Li, A. C., & Lam, T. H. (2014). A pilot randomized controlled trial to decrease adaptation difficulties in Chinese new immigrants to Hong Kong. *Behavior Therapy*, 45(1), 137-152.

<https://doi.org/10.1016/j.beth.2013.10.003>

Table 1*Outline of the Multicomponent Positive Psychological Intervention and Information**Intervention*

Session	Multicomponent positive psychological intervention Two hours per session	Information intervention Half an hour per session
1	<p>Self-efficacy</p> <ul style="list-style-type: none"> ● Share the difficulties faced during immigration. ● Discuss resilience. ● Provide seven reasons to thank yourself. ● Find your strength and advantage. ● Homework: a) Write down something you did successfully in Hong Kong and what you appreciate about yourself; and b) write down the things that make you feel happy and grateful every day (positive energy diary). 	<ul style="list-style-type: none"> ● Public transportation ● Homework: Search the bus/railway route online.
2	<p>Positive thinking</p> <ul style="list-style-type: none"> ● Find happy things. ● Antecedent–belief–consequence ● Positive thinking ● Homework: a) Do happy things with your family members, and write down your feelings; and b) work on the positive energy diary. 	<ul style="list-style-type: none"> ● Housing ● Homework: Fill in the application form for public rental housing.
3	<p>Altruism</p> <ul style="list-style-type: none"> ● Volunteer work at an elderly home. ● Homework: a) Write down something you did to help others and your feelings; and b) work on the positive energy diary. 	<ul style="list-style-type: none"> ● Medical service ● Homework: Locate the public hospital nearby.
4	<p>Goal setting</p> <ul style="list-style-type: none"> ● Goal, motivation, and plan ● Homework: a) Write down your goals, plans, and motivations; and b) work on the positive energy diary. 	<ul style="list-style-type: none"> ● Education ● Employment ● Homework: Find the introductory program for newly arrived children and the labor department for themselves.

Table 2*Sociodemographic Characteristics in the Multicomponent Positive Psychological**Intervention (MPPI) And MPPI + Information Intervention*

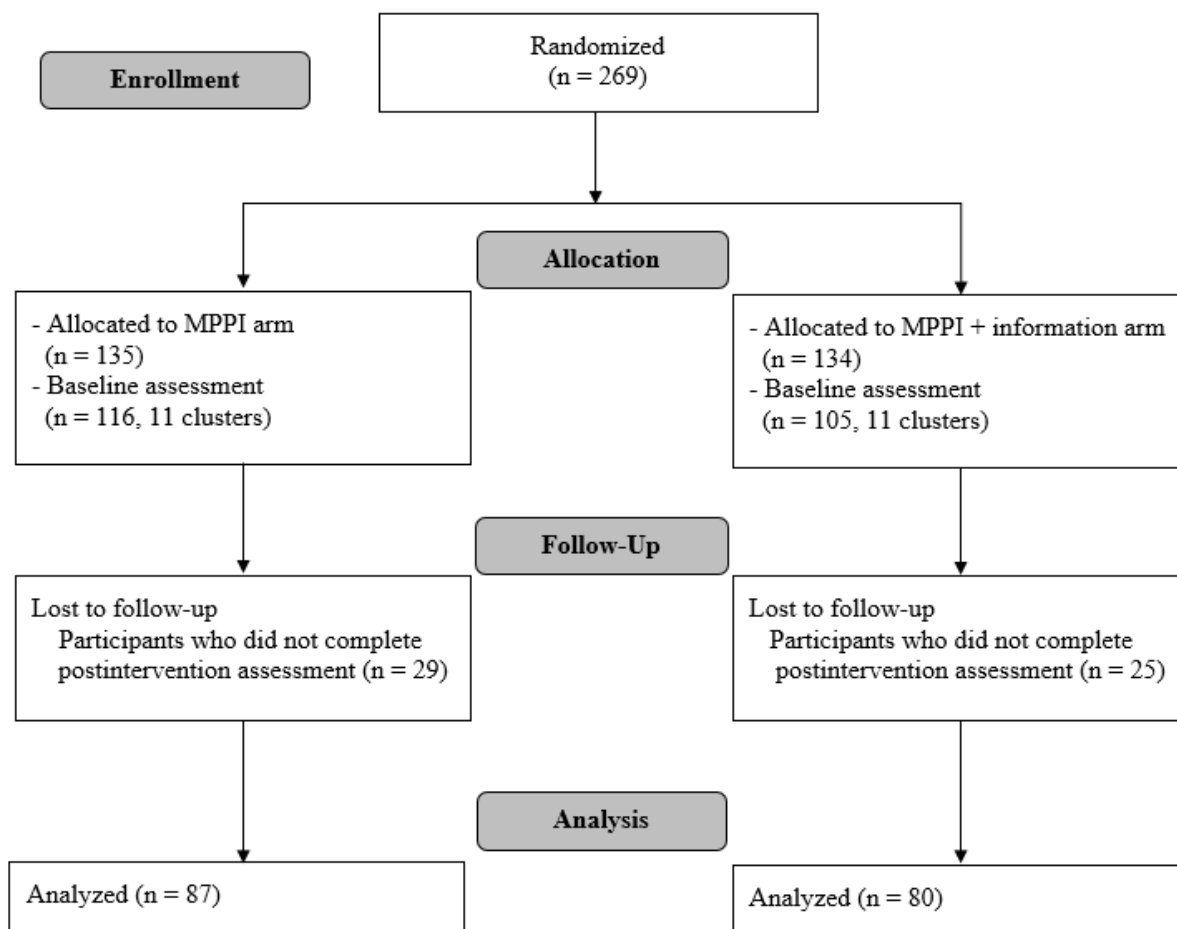
	MPPI n = 87 n (%) or Mean ± SD	MPPI + Information n = 80 n (%) or Mean ± SD	<i>p</i>
Female	75 (86.2%)	75 (93.8%)	0.11
Age	37.43 ± 10.93	36.69 ± 9.85	0.65
Marital status	73 (83.9%)	67 (83.8%)	0.98
Education			
Primary	9 (10.3%)	7 (8.8%)	0.66
Secondary	48 (55.2%)	40 (50.0%)	
Tertiary	30 (34.5%)	33 (41.3%)	
Unemployed status	75 (88.2%)	72 (91.1%)	0.54
Missing value	2	1	
Monthly income (Hong Kong dollars)			
< 5000	13 (15.3%)	11 (13.8%)	0.21
5000-10999	23 (27.1%)	16 (20.0%)	
11000-15000	28 (32.9%)	21 (26.3%)	
> 15000	21 (24.7%)	32 (40.0%)	
Missing value	2	0	
Duration in HK			
1 year	67 (77.0%)	61 (77.2%)	0.63
2 years	12 (13.8%)	8 (10.1%)	
3 years	8 (9.2%)	10 (12.7%)	
Missing value	0	1	
Receiving CSSA	12 (13.8%)	8 (10.4%)	0.51
Missing value	0	3	
Having at least one child	67 (77.0%)	61 (76.3%)	0.91

Note. 1 U.S. dollar = 7.80 Hong Kong dollars. CSSA = Comprehensive Social Security Assistance.

Table 3*Repeated ANOVA Analyses for the Intervention Components and Intervention Outcomes*

	MPPI		MPPI + Information		<i>Time main effect</i>			<i>Time × arm interaction</i>		
	n = 87		n = 80		<i>F</i>	<i>p</i>	η^2	<i>F</i>	<i>p</i>	η^2
	Mean ± SD		Mean ± SD							
	Baseline	Postintervention	Baseline	Postintervention						
<i>Intervention components</i>										
Self-efficacy	10.54 ± 2.30	12.10 ± 1.92	10.28 ± 2.26	11.69 ± 2.06	96.84	< .001	0.37	0.25	.62	0.002
Positive thinking	15.72 ± 2.82	16.63 ± 2.57	15.21 ± 2.62	16.64 ± 2.12	37.63	< .001	0.19	1.85	.18	0.011
Altruism	16.33 ± 2.89	16.99 ± 2.82	15.84 ± 2.88	16.99 ± 2.57	17.27	< .001	0.10	1.30	.26	0.008
Goal setting	11.30 ± 2.35	12.29 ± 2.05	10.95 ± 2.43	12.36 ± 1.90	49.53	< .001	0.23	1.55	.22	0.009
<i>Intervention outcomes</i>										
Resilience	60.76 ± 16.31	68.75 ± 14.14	59.98 ± 15.26	66.90 ± 15.62	45.93	< .001	0.22	0.23	.63	0.001
Happiness	20.41 ± 5.63	21.97 ± 4.61	20.01 ± 5.61	22.81 ± 4.36	41.66	< .001	0.20	3.43	.07	0.020
Mental health	22.15 ± 4.06	23.87 ± 3.71	22.03 ± 4.62	23.93 ± 3.77	40.57	< .001	0.20	0.10	.76	0.001
Knowledge	3.76 ± 2.37	3.96 ± 2.52	4.53 ± 2.82	9.64 ± 3.04	195.70	< .001	0.56	113.18	<.001	0.42

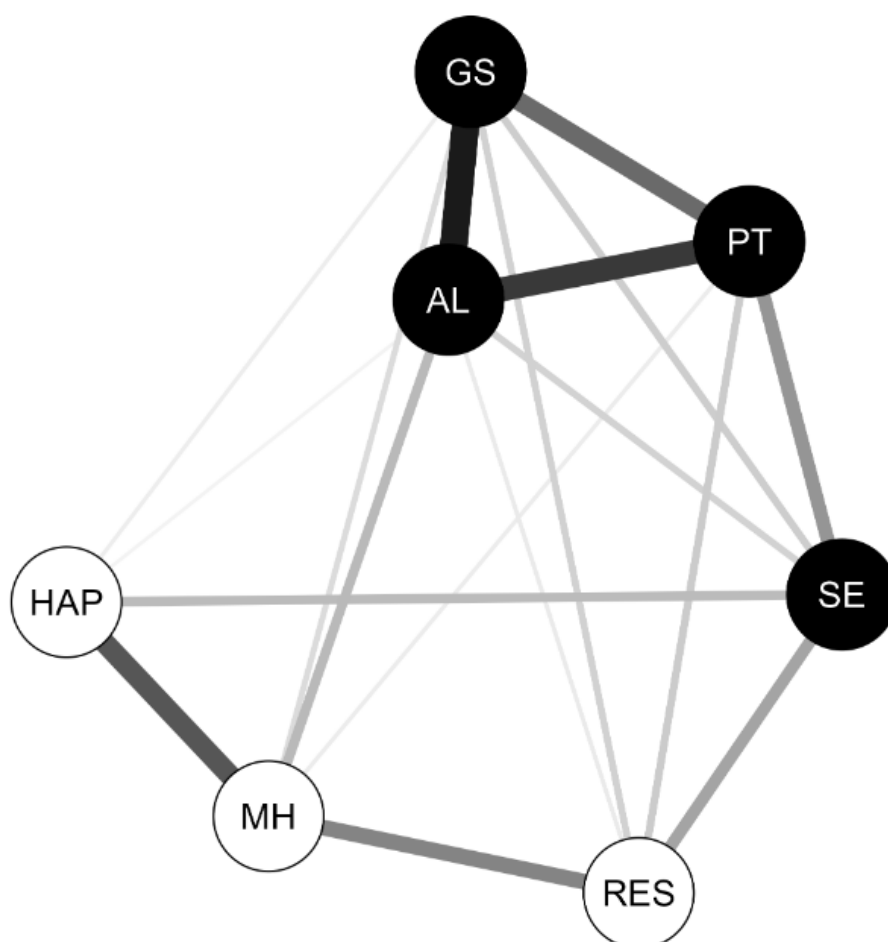
Note. We calculated effect size using η^2 for repeated ANOVA analyses, small = 0.01, medium = 0.06, large = 0.14. MPPI = Multicomponent positive psychological intervention.

Figure 1*CONSORT Flow Diagram of Participants*

Note. MPPI = Multicomponent positive psychological intervention.

Figure 2

Estimated Network of the Standardized Residual Change Scores of the Four Intervention Components and Three Intervention Outcomes.



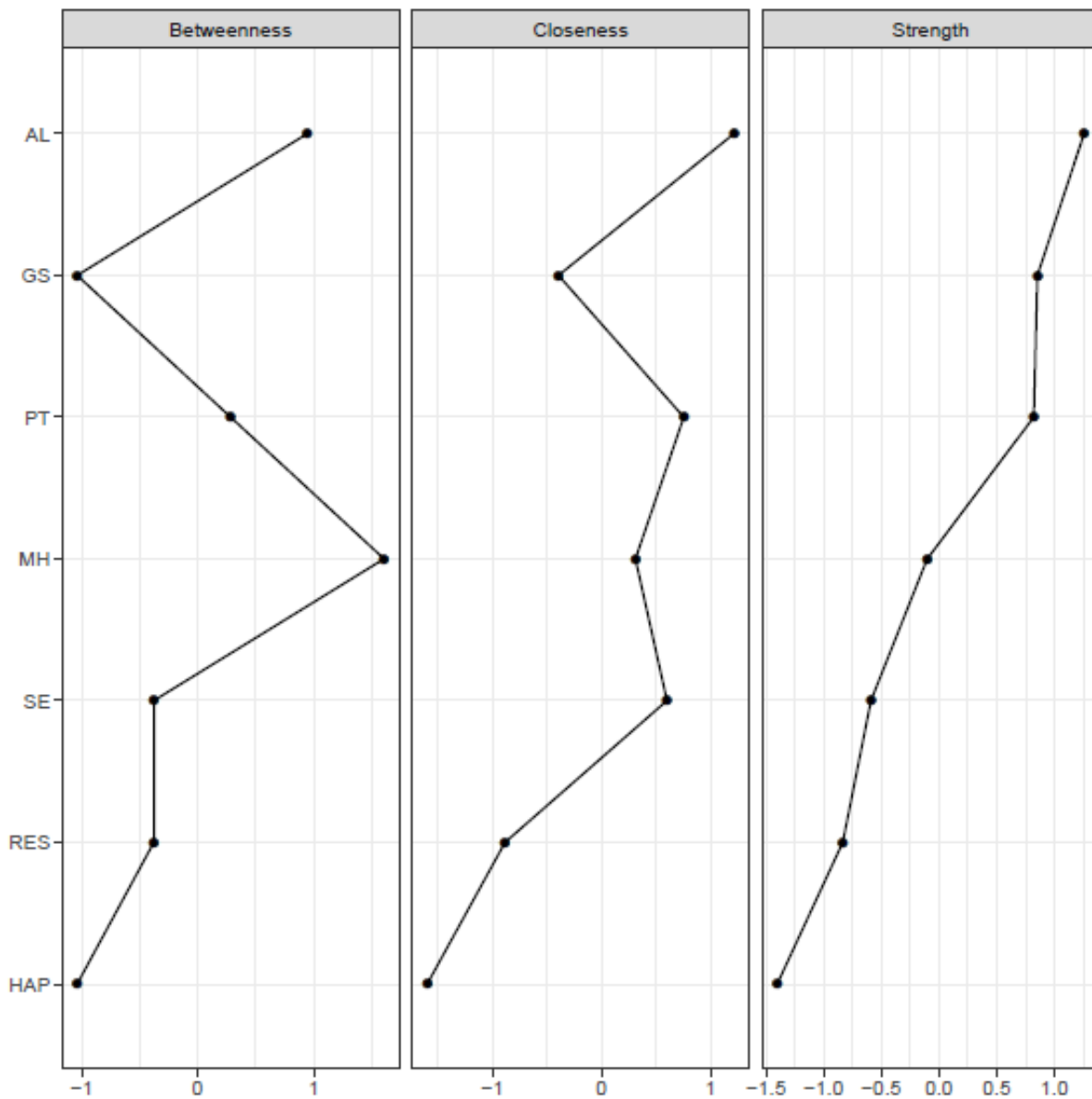
Note. The thickness of the edges represents the magnitude of the association. All the lines are positive partial correlations.

Intervention components were dark nodes: SE = Self-efficacy; PT = Positive thinking; AL = Altruism; GS = Goal setting.

Intervention outcomes were white nodes: RES = Resilience; HAP = Happiness; MH = Mental health.

Figure 3

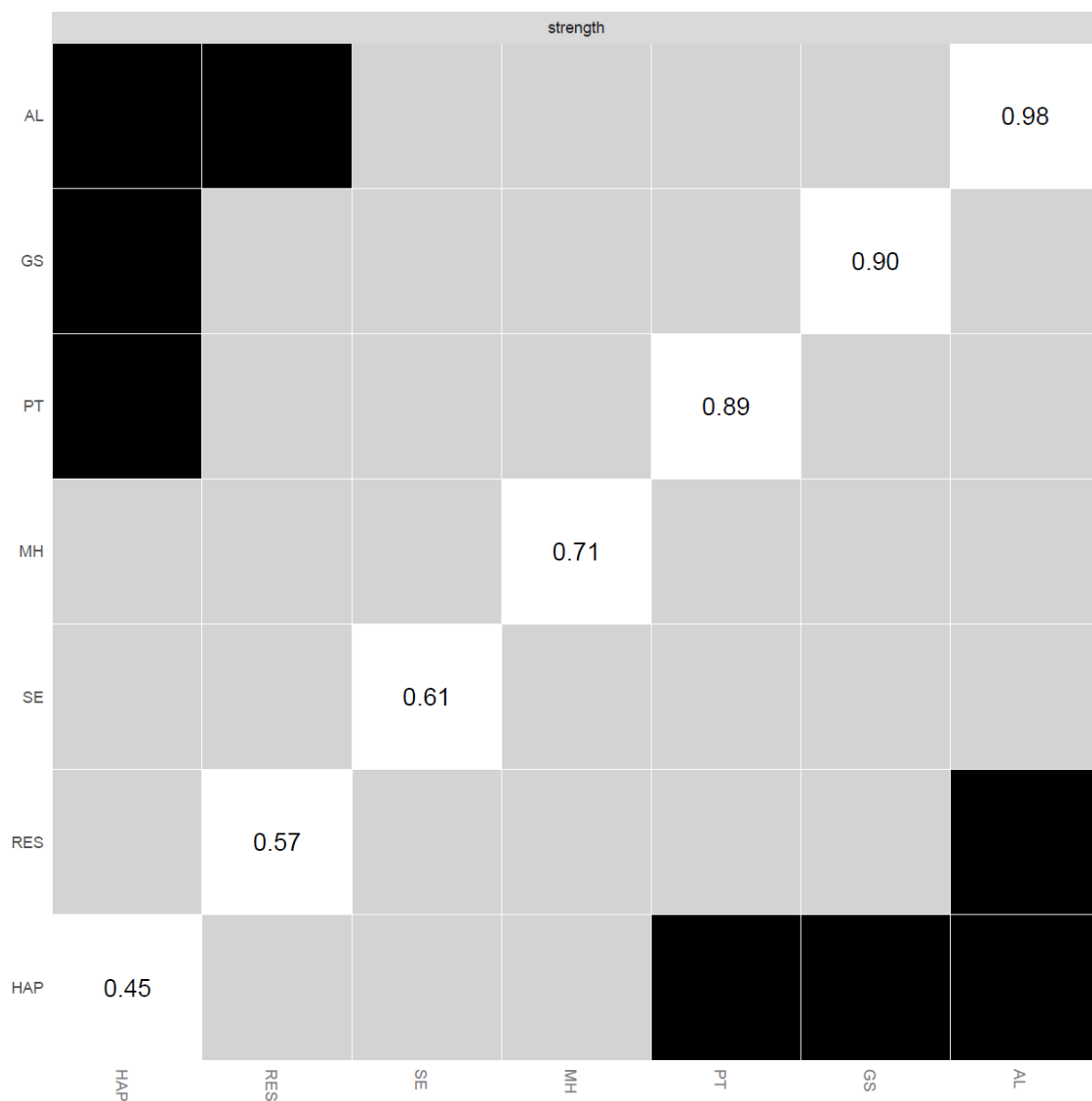
Centrality Index for the Four Intervention Components and Three Intervention Outcomes



Note. AL = Altruism; GS = Goal setting; PT = Positive thinking; MH = Mental health; SE = Self-efficacy; RES = Resilience; HAP = Happiness.

Figure 4

Non-Parametric Bootstrapped Difference Test for Strength.

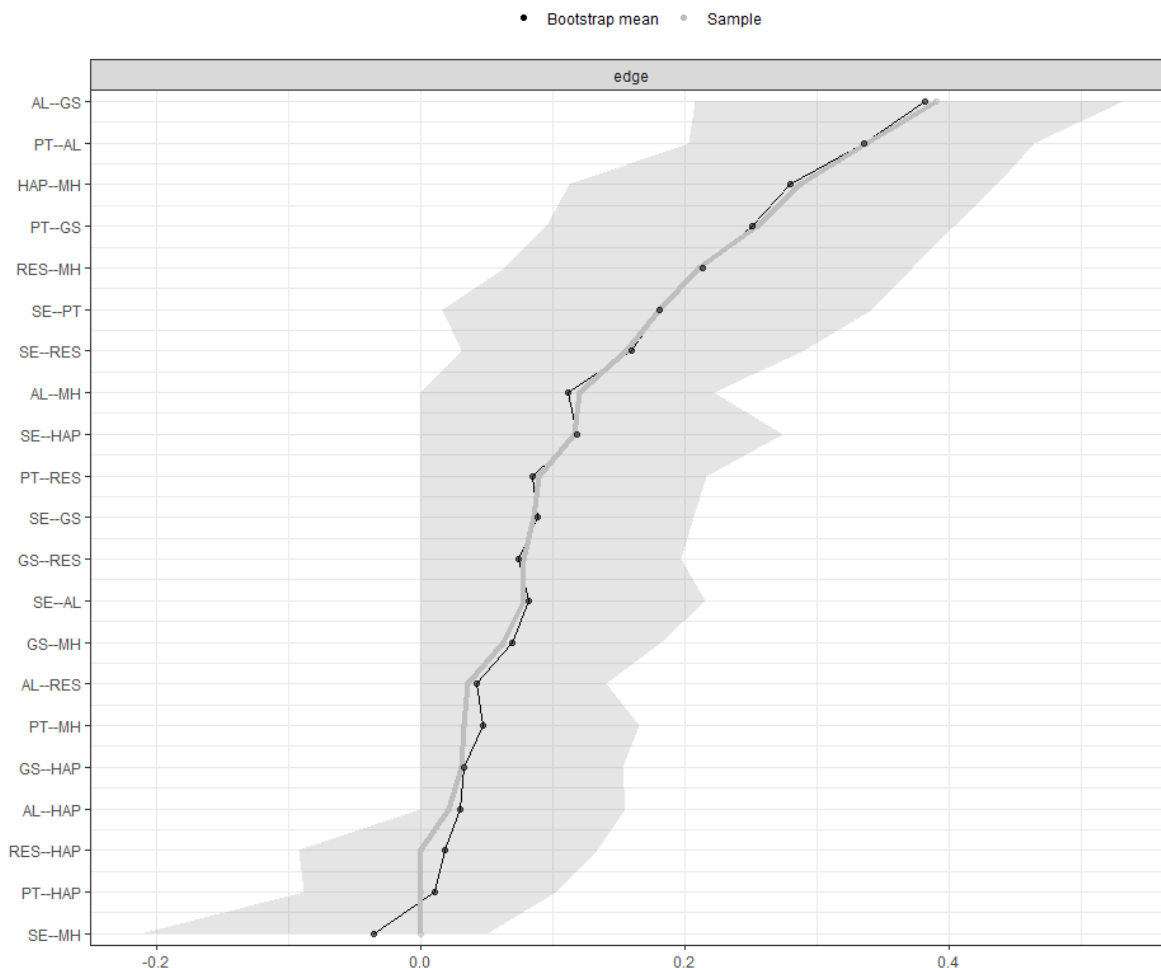


Note. Gray boxes indicate no difference between nodes, while black boxes indicate a significant difference ($\alpha = 0.05$). Values reported in the diagonal represent the strength values of each node.

AL = Altruism; GS = Goal setting; PT = Positive thinking; MH = Mental health; SE = Self-efficacy; RES = Resilience; HAP = Happiness.

Figure 5

Bootstrapped Confidence Intervals of Estimated Edge-Weights for the Network



Note. The red line indicates the sample values, and the grey area is the bootstrapped CIs.

Each horizontal line represents one edge of the network, ordered from the edge with the highest edge-weight to the edge with the lowest edge-weight.

AL = Altruism; GS = Goal setting; PT = Positive thinking; MH = Mental health; SE = Self-efficacy; RES = Resilience; HAP = Happiness.