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# RELATIONS OF REMOTE WORKING TO MENTAL HEALTH

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## ABSTRACT

Since the pandemic, remote work is the only option to keep people's productivity outside of the workplace. At first, people were happy to not be having to commute, spending more time at home, and having extra hours to do interesting activities not related to work. But that did not last long. Approximately six months later indicate changes to mental states. The aim of this research is to understand the relations of remote work during the Covid-19 pandemic to mental health and identify activities that help to bridge mental health issues. Conceptual thinking of the research is based on social networks, social relations, lifestyle preference, social media hashtags. Research method uses social network analytics based on Netlytic.org and Gephi tools to determine the depth of the relations. The result states that remote work has relations to mental health, in which the wellbeing of individuals relates to the way they work, which hence alter the use of time to to connect to one another.

## INTRODUCTION

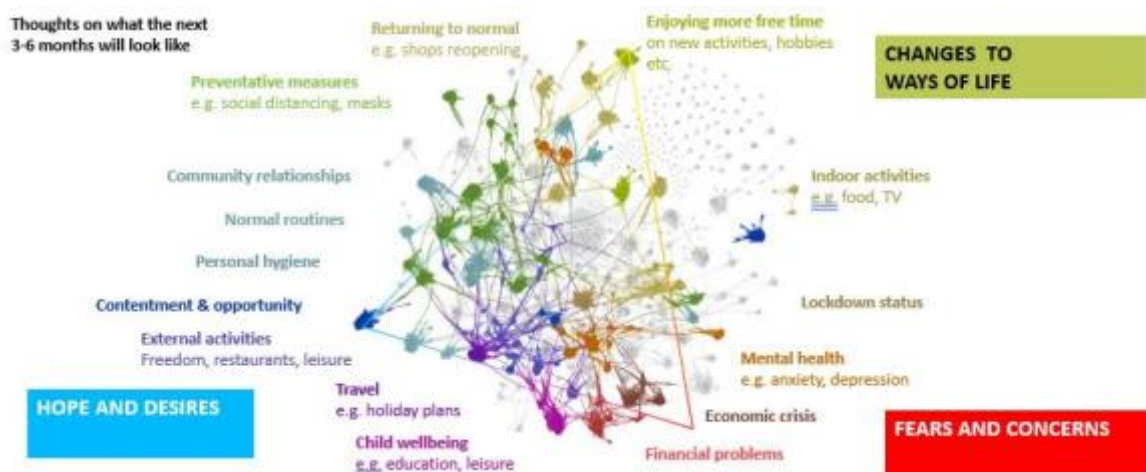
Human beings have been part of social networks from earliest days. People connect with other through networks formed by kinship, language, trade, conflict, citation, and collaboration. Network therefore is a collection of things that are connected and created whenever people interact, directly or indirectly, with other people, institutions, and artifacts (Giuffre 2013). This research leverages on the growth of social media that has generate more relational data than ever before, growing in a golden era of social science research on human relationships and collaboration (Hansen, Shneiderman and Smith 2011). Social media has even become a major source of information and communication. Especially nowadays during this pandemic time, people have been more connected using social media (Arindita, et all, 2021).

Since the pandemic was declared, the impact is being felt differently across markets. Based on Accenture analysis, countries were in different stages after four months the pandemic hit. Major countries in Europe such as France, Germany, Italy, United Kingdom, and Spain that were severely hit by the pandemic have lifted their restrictions, but still putting precaution to remain working from home and limit mobility. Countries like Japan, Switzerland, and Sweden have lower stringency, compared to countries in Asia (India, Indonesia) and Middle East (Saudi Arabia, United Arab Emirates), South America (Brazil, Chile), and Russia, but the behaviour of its people remains the same, where close to 70% of the workforce as consumers planned to do most of their socializing from home for the remaining 2020, and if needed more. These include new consumption shifting from restaurants to take away or delivery, cooking at home to recreate experience in restaurants and seeking new entertainment options that increases eCommerce and virtual experiences (Accenture 2020).

Interestingly, new social networks become more apparently needed where people seek deeper and more meaningful engagement online, conversations and connections that make virtual communities become stronger as individual seek out those with similar interest. These networks are divided into three main interests as stated in Figure 1 as follows: (1) hope and desires to conduct external activities, travel, and child

wellbeing – including education and leisure (2) changes to ways of life, which includes more free time to do nonjob activities outdoor and indoor; and (3) fears and concerns. Based on the density of the network in Figure 1, the focus of the research is on one of the fears and concerns, which is mental health, which is more connected to the hope and desires compared to other areas. The objective would be to understand relationship of remote work to mental health and identify activities that can help to bridge mental health issues such as anxiety and depression.

Figure 1. Commonalities on how life would be between July-Sept 2020



Source: Accenture

In 2021, A new challenge arose with extended remote work: the disappearance of the boundary between work and home. Some of us were working all day, in the evenings, and on weekends. Family members saw their parents at home, and often didn't respect that they were at work. Although they would never come to the work offices unannounced and casually start a conversation, at home that happened endlessly due to the lack of barrier. Employers were also trying to do hybrid, so there is a sense of presence in the office (Cole 2021).

Cole (2021) also examined when hybrid came about, that many expect they will now work remotely on Mondays and Friday, coming into a physical workplace some of the

remaining time. Yet, most of the CEOs I talk to want their employees back at the office full-time or close to it. Maybe it's ego, and they want to see the troops as they walk through the office. Perhaps, they don't believe that work is really done unless it happens in front of them. Some execs are suspicious that working remotely on Mondays and Fridays just means a three-day work week. Some companies—those that pay their workers more because they live in expensive urban centres — plan to cut wages by as much as 25 percent if their teams move to working remotely full time. That has not met with a warm response from workers. This of course has created additional pressure, which may lead to mental health issues.

## CONCEPTUAL FRAMEWORK

### A. Social Networks

Based on Castell's coined term Network Society - a society whose social structure is made up of networks powered by micro-electronics-based information and communications technologies - social networks formed (Castells, 2010). Castells stated, historically, there have always been social networks, in which the key factor that distinguishes the network society is the use of ICTs helps to create and sustain far-flung networks where new kinds of social relationships are created. Castell in his latest version of the concept (in 2010) already mentioned that work and employment have been transformed due to technology and the quality and quality of jobs, resulted into complex pattern of interaction.

For this research, a social network is a subset type of graph - a set of vertices and edges - as matrices - composed of a set of actors or entities (node) and the relations amongst them. Actors are tied together by specific type of relations. These connections are called "ties" (Cook, 2011). As Monge & Contractor stated, like all networks, social networks consist of two primary building blocks: vertices (nodes or agents) and edges - ties or connections (Monge and Contractor, 2003). These ties can be anything -

any social entity that is engaged in interaction with others of its type – individual, small groups, civic organizations, corporations, or nations. Actors can also be members of the system being analysed, but do not necessarily all have relations with each other ((Giuffre 2013); (Downes, 2005)).

Buchanan (2002) also state that a social network is a collection of individuals linked together by a set of relations. In discussions of social networks, the individuals in question are usually humans, though work in social network theory has found similarities between communities of humans and, say, communities of crickets, or members of a food web. Social networking web sites fostering the development of explicit ties between individuals as “friends” began to appear in 2002. Sites such as Friendster, Tribe, Flickr, Facebook, and LinkedIn were early examples. Less explicitly based on fostering relationships than, say, online dating sites, these sites nonetheless sought to develop networks or “social circles” of individuals of mutual interest. LinkedIn, for example, seeks to connect potential business partners or prospective employers with potential employers. Flickr connects people according to their mutual interest in photography, and numerous sites offer dating or matchmaking services. After an initial surge of interest, however, social networking sites have tended to stagnate (Aquino, 2005). It is arguable that social networking, by itself, has limited practical use, except for the network, except for networking (Downes, 2005).

Although some would state that the growth of social network has made the network analysts see the world as a collection of interconnected pieces. Social network scientists see relationships as the building blocks of the social world, each set of relationships combining to create emergent patterns of connections among people, groups, and things. The focus of social network analysis is between, not within people. This research focuses on the simple Twitter Network that will show a sociogram (or network graph) as a common way of visualizing networks. Like all networks, it consists of two primary building blocks: vertices (nodes or agents) and edges (ties or connections) (Monge and Contractor, 2003).

Social networking web sites fostering the development of explicit ties between individuals as “friends” began to appear in 2002. Sites such as Friendster, Tribe, Flickr, Facebook, and LinkedIn were early examples. Less explicitly based on fostering relationships than, say, online dating sites, these sites nonetheless sought to develop networks or “social circles” of individuals of mutual interest. Using this relation in the matrices provided the guideline on how the analysis can be conducted (Lee, et al., 2014).

## **B. Social Relations**

Social Relations examines the human behaviour as a product between the individual and the situation. This focus led to many distinct findings that some argue were poorly explained. Therefore, Fiske (1992) proposed a unified theory of social relations that could help explain many findings in social psychology. This theory presented four psychological models that focus on human social relations: communal sharing, authority ranking, equality matching, and market pricing. (Willockx, 2016)

This research is relevant to communal sharing, where people treat all members of a category as equivalent. Communal sharing relationships are the most basic form of relationship where some bounded groups of people are conceived as equivalent, undifferentiated, and interchangeable such that distinct individual identities are disregarded and commonalities are emphasized, with intimate and kinship relations being prototypical examples of communal sharing relationship. Common indicators of communal sharing relationships include body markings or modifications, synchronous movement, rituals, sharing of food, or physical intimacy (Willockx 2016).

## **C. Lifestyle Preference**

Communal sharing can be the base of shared lifestyle preference. For this research, the intention was to understand the lifestyle preference to manage mental health using social networks especially through digital media. Scholars have debated about

the extent to which digital media can facilitate movement mobilization or even transform the fundamental characteristics of social movements. Schardie (2019) -- using influential works by Castells (2012), and Bennett and Segerberg (2013) put forward conceptualizations of new kinds of ‘networked movements’ or ‘action logics,’ critics have pointed to the limitations of digital media and the continual significance of formal organizations (Lee, Liang, Cheng, Tang, & Yuen, 2021).

Nevertheless, previous research show that mental health is becoming a concern for everyone. A broad body of research links social isolation and loneliness to poor mental health, and data from late March 2020 shows that significantly higher shares of people who were sheltering in place (47%) reported negative mental health effects resulting from worry or stress related to coronavirus than among those not sheltering-in-place (37%). Isolation and loneliness – being at home - during the pandemic may present specific mental health risks for households with adolescents and for older adults. Data shows that women with children under the age of 18 are more likely to report major negative mental health impacts than their male counterparts (Panchal, et al., 2021).

Although the adolescent brain is more “plastic” than it will ever be again, capable of remarkable adaptability considering the many social, physical, sexual, and intellectual challenges that this developmental phase brings. This is also a peak time for clinical onset of most mental illnesses. One in five adolescents have a mental illness that will persist into adulthood. The chronicity of adolescent-onset disorders is powerful motivation for early interventions to improve quality of life and reduce burdens on society. Yet, studies of interventions’ economic effect have not demonstrated consistent benefits, which may be due, in part, to assessment of treatments that are not biologically based and/or do not consider how neurodevelopmental changes affect long-term effectiveness (Lee, et al., 2014).

In addition, job loss is associated with increased depression, anxiety, distress, and low self-esteem and may lead to higher rates of substance use disorder and suicide. Recent polling data shows that more than half of the people who lost income or



employment reported negative mental health impacts from worry or stress over coronavirus; and lower income people report higher rates of major negative mental health impacts compared to higher income people (Panchal, et al., 2021).

To manage mental health, people has made efforts to change one lasting thing to make remote working an enjoyable situation. These include a move to healthier choices, set time to have family moments, exercise, connect with others, new hobbies or attend to previous hobbies, and find leisure time (Accenture, 2020).

#### **D. Social Media Hashtags**

Social media refers to a set of online tools that supports social interaction between users, transferring monolog (one to many) into a dialog (many to many). At the beginning, social media was to separate previous interactive technology such as email, discussion forums, blogs, texting, chat, and many others, which is to comprehend people's thoughts. In its development, as the world has become increasingly connected, the focus on social media research has shifted to augmenting social experience and collective intelligence using keywords, known as hashtags (Giuffre, 2013). Hashtag as a rule or way to mark a topic that is in an uploaded content (Zappavigna, 2012). Hashtags are also used in various ways such as advertising and social actions. The history of using hashtags can be seen from the development of the hashtag itself in social media. Initially, hashtags were used in conversation rooms spread on the internet, in which then expanded to be used on social media services. The hashtag (#) symbol. has come to comprise an important expression in popular culture and is generally associated with various dimensions of activities in the social media environment (Berg, 2014).

Twitter use hashtags that can be placed anywhere within a tweet, and it is usually used to highlight the tweet's keywords or main subject matter. Popular hashtags are presented on Twitter as trending topics. The discussion of celebrities, TV shows and movies, natural disasters like fires and earthquakes, and political hot topics all use



hashtags so that, when searching a site like Twitter, posts on the topic of interest can be easily found. On Twitter, a post may contain none, one, or as many hashtags as the user may desire (or may fit within the 140-character limit). Research has shown that tweets with hashtags receive two times the engagement than those without, and that tweets with one or two hashtags have 21% higher engagement than those with three or more. In addition to Twitter, hashtags are used copiously in other social media sites such as Instagram, Pinterest, Google+, Tumblr and Orkut. Starting in 2013, the social media giant, Facebook, has supported Twitter-like hashtags. The use of hashtags as a marketing tool, and analysis of hashtags to track and measure hashtag engagement and influence have spawned many businesses, including websites such as [hashtags.org](http://hashtags.org) (Reuter, Pereira-Martins & Kalita, 2016).

Hashtags typify a significant chunk of conversational language online. They have spread beyond Twitter and into most popular social media sites. Some Twitter posts contain two, three or more hashtags. Instagram posts can contain ten or more hashtags. Thus, ignoring hashtags in analysing texts in social media posts can make for impoverished understanding. One extension could be to create a graph of relationships among hashtags, allowing machines to first process a hashtag, then not only explore related topics within that tag, but other topics within related tags. In which this research is all about (Reuter, Pereira-Martins, & Kalita, 2016).

## METHODOLOGY

### A. Context

The research method applied is using qualitative – descriptive through social network analysis. Network analysis provides an important and interesting lens with which to look at communities because it is concerned with the relations among the people and groups who make up those communities. Network analysis allows to examine those relations directly (Giuffre, 2013).

Monge and Contractor said that network analysis should be able to apply a set of relations to an identified set of entities that define the nature of the communication connections between people, groups, and organizations. The typical social network as a system can be analysed by identifying ties through link, frequency, stability, multiplexity, strength, direction, and symmetry; or describing the networks through size, inclusiveness, component, connectivity, connectedness, density, centralization, symmetry, and transitivity (Monge & Contractor, 2003).

For this research, as mentioned above, used Twitter hashtags to define the relationship between social networks based on density, strength, and multiplexity. Density is the ratio of the number of actual links to the number of possible links in the network. Strength is shown by the intensity, and multiplexity is defined to which two actors are linked together by more than one relationship.

## **B. Data Gathering**

The direct relations being sought are based on hashtags mentioned in Twitter social media. Hashtags for this research is #mentalhealth and #remotework as stated in the background of the research. By applying social network analysis, it complements methods that focus more narrowly on individuals, adding a critical dimension that captures the connective tissue of societies and other complex interdependencies (Hansen, Shneiderman, & Smith, 2011)

The data is drawn by using the analytic software Net lytic (<https://netlytic.org/home/>) - a community-supported text and social networks analyser that can automatically summarize and visualize public online conversations on social media sites. It is made for researchers by researchers, no programming/API skills required. For the purpose of this research, each hashtag was input into the program separately (known as ego network) and then combined as a system (Lizardo & Jilbert, 2020).

After all data is compiled and made into a combined data set, it was analysed using the Gephi tools. Gephi is used because it can determine the colour of the nodes,

in which the size of a node depends on the value of its “degree centrality” (its number of connexions). The centrality measures are essential metrics to analyse the position of an actor in a network. They come in many variations, such as degree centrality, number of connexions; closeness centrality, closeness to the entire network; betweenness centrality, bridges nodes; and Eigenvector centrality, connexion to well-connected nodes (Grandjean, 2013).

## FINDINGS & DISCUSSION

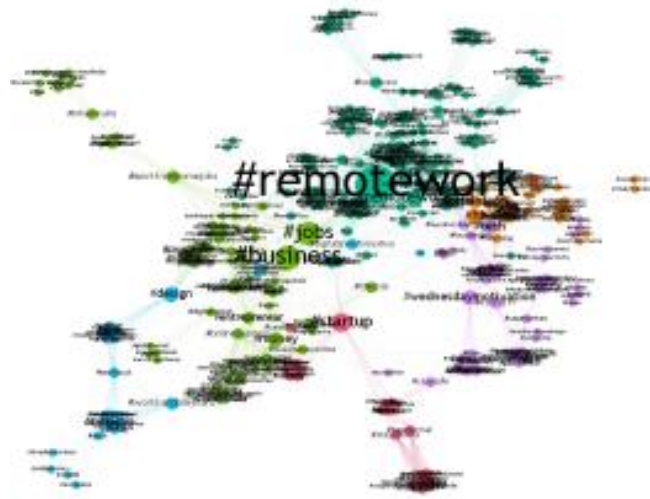
The results of the individual hashtags data collection are the following:

1. The graph distance results for ego network #mentalhealth shows diameter of 3, density: 0.002 with radius: 0, and an average Path length of 1.1. This indicate there are better density and links between other nodes, which means the networks are more bonding towards another.
2. The graph distance results for ego network #remote work shows diameter of 8. Density of Density: 0.027, and Radius: 4. With an average Path length: 3. The result shows the closeness or density is more apart compared to the graphs distance for #mentalhealth but does not mean they lack relations. The main reason can be because not everyone working remotely are related to one another.

Nevertheless, both hashtags have links to various nodes in its own cluster, in which they may not be connected since they are differentiated between community ties as explained in point 2. The visualization of the above graph distance are as follows, in which can be seen the density for each hashtag is different in size.

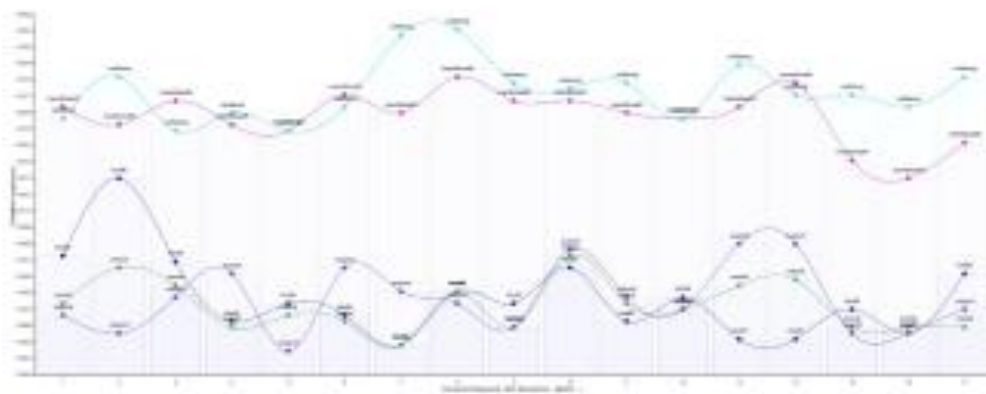
As confirmed in Panchal’s research that isolation and loneliness during the pandemic may present specific mental health risks for households with adolescents and for older adults, can be seen that there are efforts to connect using social media as seen in figure 1 and figure 2 on the tightness of the relations.





Source: Gephi analysis

Figure 3. #Mentalhealth Overtime



Source: Gephi analysis

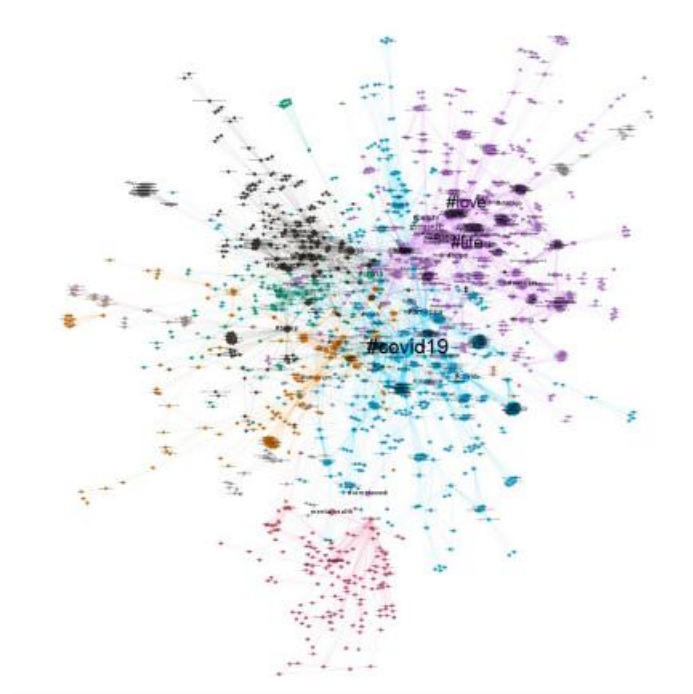
### A. Mental Health and Remote Work as a System

The density of a network property is important to consider for two reasons. First, is that it can help us understand how connected the network is compared to how connected it might be. Second, when comparing two networks with the same number

of nodes and the same type of relationships, it can tell us how the networks are different (Lizardo & Jilbert, 2020).

Based on the data extracted by Gephi, the diameter is 13 with density: 0.006, radius: 7 and average path length: 4.36. This data indicates that the betweenness of centrality distribution is dense or closely interlinked; and the closeness centrality and harmonic closeness are low, which also means closely related. For the Eigenvector centrality shows that the network interpretation is undirected, with number of iterations 100, and the sum change is 0.16. This means the centrality is closely interlinked.

Figure 4. Network of #mentalhealth and #remotework



Source: Gephi analysis

As seen in Figure 5 the entire network as a system is considered dense between the hashtags of life, love, and Covid-19. There are 8 clusters that can be identified as follows: (a) blue, (b) purple, (c) green, (d) red, (e) orange, (f) black, (g) grey, (h) light grey, with the strongest cluster is blue – being the hub – related to #Covid-19 – and purple, being related to #life and #love. The #mentalhealth and #remote work

interestingly have a close connection despite the different clusters. Hashtag mental health is part of the purple cluster, and #remotework is part of the red cluster. As a summary, the system describes the various social networks are connected through communal sharing on mental health and remote work.

## B. Network Modularity

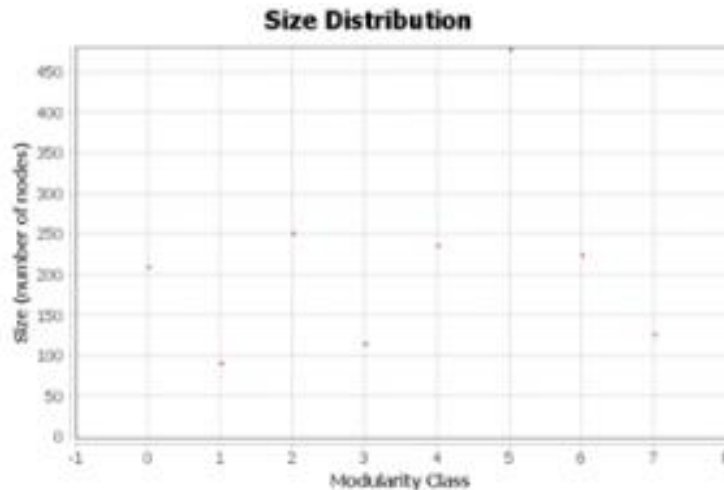
Modularity tells us when there are more edges within communities than we would expect based on chance. Network modularity is essential to understand the degree to which a system's components may be separated and recombined, often with the benefit of flexibility and variety in use. The resolution limit of modularity is a phenomenon that imposes a limit on the size of the smallest community one can obtain by modularity optimization. It is a fundamental issue emerging from the definition of modularity (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008). By applying network modularity, this research can identify the internal subdivisions called communities. There are methods that permit to highlight these communities, which depend on the comparison of the densities of edges within a group, and from the group towards the rest of the network. Several methods have been proposed to partition a network into communities, to coarse grain the level of description of the system but also to identify underlying, often unknown, functionalities or relationships between the nodes (Lambiotte, Delvenne, & Barahona, 2015)

For this research. the modularity score for the network is 0.732, the modularity resolution is 4.456, and main communities/clusters of eight. This means that the network is considered balance, in which the clusters are seen to have proximity that indicates relations to one another through eight communities, with the largest cluster is related to Covid-19. For each community, modularity measures the number of edges within the community and the number of edges going outside the community and gives a value between -1 and +1. Modularity scores of +1 mean that all the edges in a community are connecting nodes within the community (Stuart, 2020). This



mean the two clusters related to #mentalhealth that are aligned to #remotework and connected to #Covid-19.

Figure 5. Modularity of #mentalhealth and #remote work network

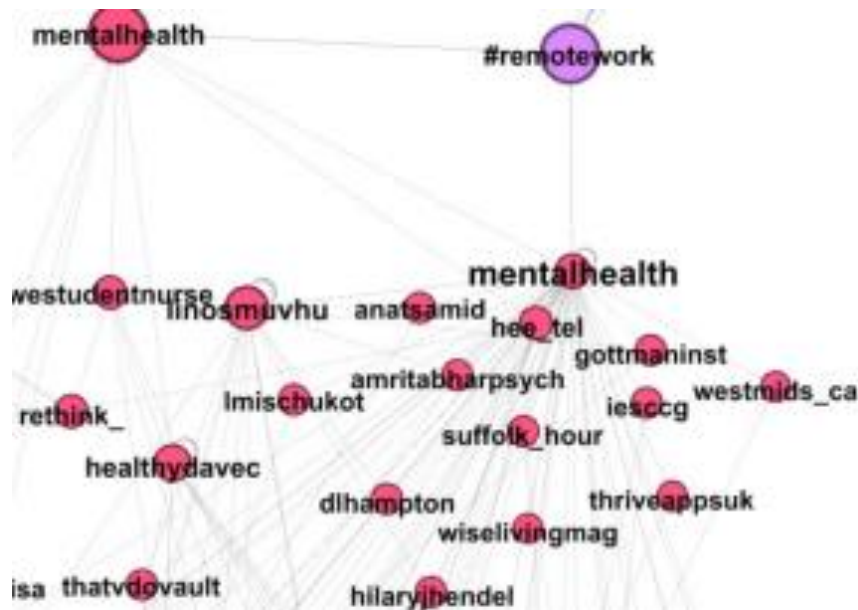


Source: Gephi analysis

### C. Network of #mentalhealth and #remote work

The network for #mentalhealth and #remotework are closely interlinked as can be seen in Figure 7. The link for #remotework is interestingly connected to two #mentalhealth nodes, which indicates that there is a strong link between mental health and remote work. Based on social network measures, the communal sharing is described as multiplexity, in which two actors are linked together by more than one relationship. Figure 7, which is the low part of the system, describes that the relationship of remote work to mental health are through various nodes, meaning more than one relationship, and that the relation of remote work is strong on mental health. This means individuals who are talking about remote work, can relate to one another on the topic of mental health.

Figure 7. Network of #mentalhealth and #remote work ego network



Source: Gephi analysis

## CONCLUSION

As the workforce is making change to how they live, shop and work, the relation of remote work to mental health is considered dense, strong and carries multiplexity that is also related to issues of Covid-19. Therefore, in answering the research question, there is a relationship of remote work to mental health. The relation is since social networks can create stronger links or connection and bound each node closer to seek their wellbeing through the connection of similar issues.

These can be summarised as follows: (1) #remotework and #mentalhealth are mentioned as part of the network as a system, and is considered dense with the #Covid-19 as two separate, but interlinked clusters; (2); the modularity scores of the network #remotework and #mentalhealth show that all the edges in a community are connecting nodes; (3) the strong link between mental health and remote work based

on social network measures is considered as multiplexity communal sharing, in which two actors are linked together by more than one relationship.

## LIMITATION AND STUDY FORWARD

Despite the fact there is a connected community within #remotework and #mentalhealth, the identification of activities that can help to bridge mental health issues is not prominently seen because the link is based on Twitter accounts. In addition, although there are hashtags that are present related to appreciation of wellness, such as #health, #startup and #jobs in an ego network, and #love and #life as a system network, but there are no explicit mentions of activities being conducted.

Recommendation for further research is to add more categories/variables if conducting quantitative research. This is hoped to be able to identify options taken to manage mental health during remote work, and not necessarily during pandemic times.

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