Title
Digital Behaviors of Older Adults: An Examination of Social Media Characteristics, Social Support, and Depression during the COVID-19 Pandemic

Author
Guzman, Ariz Amoroso

Publication Date
2022

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Digital Behaviors of Older Adults: An Examination of Social Media Characteristics, Social Support, and Depression during the COVID-19 Pandemic

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Nursing

by

Ariz Guzman

2022

ABSTRACT OF DISSERTATION

Digital Behaviors of Older Adults: An Examination of Social Media Characteristics, Social Support, and Depression during the COVID-19 Pandemic

by

Ariz Guzman

Doctor of Philosophy in Nursing

University of California, Los Angeles, 2022

Professor Janet C. Mentes, Chair

The population of the United States is aging. Depression in older adults has serious consequences. Social support has long been recognized as a beneficial and protective factor in the prevention of depression in older adults. Social media have allowed older adults to connect with their social networks and social support systems. The use of social media was highlighted during the coronavirus disease (COVID-19) pandemic as social distancing and self-quarantine discouraged face-to-face interactions. While social media behaviors and their influence on mental health is a growing area of research, the digital behaviors of an aging population specific to the relationship between their social media behavior, social network structures, social support, and depression under the context of the Coronavirus pandemic of 2019 (COVID-19) is understudied. This dissertation's overall purpose is to explore the relationship between social media use, social support, and depression in older adults.

The First Manuscript is a review of the literature aimed at identifying and synthesizing quantitative studies addressing the relationship between social media use and depression in

older adults. The findings of this review showed a dearth of literature and a complicated relationship between social media use and depression in older adults. Furthermore, there is a paucity of studies that use validated measures to measure social media use in the older adult population. Age-related health and social variables could potentially influence the relationship between social media use and depression. Further, studies of current social media use measurements in older adults omit descriptions of social network characteristics to include social network structure and function.

The Second Manuscript is a cross-sectional study of 371 older adults. Using multiple mediation models, this study examines the mediating effect of social support in the relationship of social network structures (online and offline) and depression in older adults. This study found that social support does not significantly mediate the relationship between online social network structure and depression. However, social support mediated the relationship between offline social network structure and depression to some extent. The tangible and emotional/informational social support domains did not mediate the known relationship between network structure and depression in older adults. Both structural sizes of online and offline social network size did not show any significant relationship to depression. The size of the offline social network, not the online social network size, predicted higher levels of social support. Higher total social support scores predicted lower depression scores in both online and offline network size models. Online and offline social network size models showed that increased social support predicts lower depression scores on all social support scales except the emotional/informational subscale. Certain domains of social support did not mediate the known relationship between offline social network structure and depression in older adults in the context of the COVID-19 pandemic.

The Third Manuscript examined the mediating effect of social support in the relationship between social media use and depression in older adults, using the Social Media Use Integration Scale. This study showed that social support did not significantly mediate the

relationship between social media use and depression in older adults in models that controlled for demographic and health covariates. Greater social media use significantly predicted higher depression scores in older adults when including only basic demographic covariates (β=.070, se=.333, *p*=.037). However, when health covariates are included, this significant association between social media use and depression is removed (β=.046, se=.032, *p*=.146). Social media use did not show a significant relationship with total social support scores and within each of its subscales in all our models. Increased social support predicts lower depression on all social support scales, except the emotional/informational subscale. The inclusion of health variables in social media use and depression studies could influence the identified relationship between social media use and depression outcomes for older adults. The COVID-19 pandemic, along with an infodemic, may have influenced the results of this study, as older adults' social life changed—from their social media use, social support, and uncertainties brought about by the pandemic.

This dissertation's findings contribute to gaps in our understanding of an older adult's social media and characteristics and media behavior and its relationship to depression and social support. Health and social variables must be considered when exploring the relationship between social media use and depression in older adults. The relationship between social network size (offline and online) to social support and depression might have been complicated during the COVID-19 pandemic as certain domains of social support did not offer significant benefits against depression.

The dissertation of Ariz Guzman is approved.

Mary-Lynn Brecht

Lynn V. Doering

Paul M. Macey

Janet C. Mentes, Committee Chair

University of California, Los Angeles

2022

DEDICATION

To my wife, my life, Angeline

To my son, Aiden

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

I am grateful for the generous support of National Institute of Health / Nursing Research UCLA/CDU Partnership for Enhancing Diversity of Nurses with Research Careers (Grant Number 5R25GM102777-02) which allowed me the opportunity to pursue a doctoral education as I bridged from an Entry Level Master of Science in Nursing Track program from Charles R. Drew University. The experience of my graduate education expanded my views and perspectives of Nursing as a Science and as a Practice beyond the bedside. Thank you also for the Deloras Jones RN Scholarship Program for the financial support.

In the poem *Ulysses*, Alfred Lord Tennyson wrote “I am part of all that I have met” to declare that Ulysses’ travels and encounters have shaped who he is as a person. I am who I am because of the connections I have formed and the people who shaped my experience as a clinician and a scholar.

To **Dr. Janet Mentes**, my committee chair, mentor, dissertation advisor extraordinaire. You were there at the very start of my nursing journey—as a new nurse and as a young researcher. Thank you for your patience and I am forever ever ever ever grateful for your insight, guidance, continuous encouragement, and unwavering endless support. This dissertation would not have been possible without those meetings through zoom making me accountable to meet the deadlines I set. Those meetings were my motivations to keep putting in the work.

To my committee members, **Dr. Mary-Lynn Brecht, Dr. Lynn Doering and Dr. Paul Macey**. Thank you for your insight, feedback, and advice as it was influential and essential in this dissertation.

To my mentors from the UCLA/CDU Bridge Program: **Dr. Ebere Ume, Dr. Sharon Cobb, and Dr. Linda R. Phillips,** along with **Dr. Janet Mentes** who promoted diversity in nursing research. The voiceless, the underserved and vulnerable population will be in my mind when it comes to my health research.

To **Dr. Irene Benliro and Dr. Anne Grace Guzman**. I was told I can do anything, so I did everything without a focus, without a plan. It was partly because of you and your experience in the medical field that helped me get started to focus on Nursing.

To my PhD cohort, **Tiffany Dzou, Selamawit Balcha, Tracy Ono, Dave Hanson, Anna Dermenchyan, Allan Cresencia, Sarah Alkhaifi, Paula Belson, Flerida Imperial.** I was lucky to enter this doctoral program with a group of friends as supportive as you. Our group chat helped me as I struggled to finish this dissertation project under COVID-19. I was never alone.

To mom and dad, for your love and unconditional support—**Amy Guzman** and **Glorioso Guzman.** Thank you for your sacrifices to give everything to me and my sisters—you provided us with everything we need and for that, we are truly blessed.

To my family of friends, I extend my heartfelt appreciation. I have been blessed to be in your company. Furthermore, To **Naruto Uzumaki**. Thank you for bringing the ninja village together and for finally achieving your dream of becoming a Hokage. You have inspired me to become a Hokage in my discipline. And to **Monkey D. Luffy**. for his continued resolve and drive to become the Pirate King. For valuing loyalty and friendship, I wish you the best in your pursuit for the legendary One Piece.

Lastly, this dissertation would not be possible without my loving wife, my life, **Angeline Mariam**. Thank you for trust and believing in me. You are the earth that keeps me grounded, my moon that guides me in darkness. You are my direction. I love you to the end of time.

I love you too, my son **Aiden Enzo Guzman.** Be kind when you grow up.

VITA

EDUCATION

Charles R. Drew University of Medicine and Science May 2015
Master of Science in Nursing
University of California Los Angeles June 2010
Bachelor of Arts, American Literature & Culture

PROFESSIONAL AND WORK EXPERIENCE

Registered Nurse/CNIII: Transplant/Thoracic PCU September 2017—present
Cedars-Sinai Medical Center, Beverly Hills, CA
UCLA School of Nursing Remote Teaching Resource Task Force January 2020—July 2021
University of California, School of Nursing, Los Angeles, CA
Teaching Apprentice September 2017—July 2020
University of California, School of Nursing, Los Angeles, CA

- Spring 2020: N173—Introduction to Nursing Research and Writing II
- Spring 2019: N204—Nursing Research and Critique
- Winter 2019: N39A—Adult-Gero Primary Healthcare for Advanced Practice Nurses I
- Fall 2018: N231—Pathophysiology for Advanced Practice Nurses
- Winter 2018: N230B—Advance Pathophysiology
- Fall 2017: N204—Nursing Research

Research Assistant—Dr. Janet Mentes September 2015—August 2017
University of California, School of Nursing, Los Angeles, CA
Registered Nurse June 2015—September 2017
Centinela Hospital Medical Center, Inglewood, CA
Administrator and General Manager 2008—2012
Hayes Home Board and Care Facility, Long Beach, CA
United States Army Reserves, 250th Transportation Company June 2003—July 2010
United States Army, 736th TC/ 1st Infantry Division 2004—2005
Operation Iraqi Freedom II

ORAL PRESENTATIONS

Carrik, J., Foley, M, Burton, C., Greenwood, D., **Guzman, A.** Using Twitter to Communicate the Impact of Nursing Science. Symposium: The Western Institute of Nursing's 51st Annual Communicating Nursing Research Conference; April 2016; Spokane, Washington

Guzman, A. Daily Social Media Use and Mental Health Among Older Adults. Symposium: UCLA-CDU Bridges Research Conference—Improving the Health of Ethnically Diverse Elders Through Nursing Research

Guzman, A. Culture: A Missing Piece in the Relationship of Social Engagement to Cognitive Health. Symposium: The Western Institute of Nursing's 49th Annual Communicating Nursing Research Conference; April 2016; Orlando, Florida

Mentes, J., Evers-Manly, S., Ume, E., Cobb, S., **Guzman, A**., Martinez-Hollingsworth, A., Phillips, L. Symposium: Strengthening Educational Leadership in Gerontological Nursing: Mentoring Nurses from Diverse Backgrounds to Pursue a PhD with a Focus on Aging. Symposium: The Association for Gerontology in Higher Education 42nd Annual Meeting and Educational Conference. March 2016; Long Beach, CA

Guzman, A. Understanding the Health Care Needs of Older Immigrants. Abstract—A Review of Grandparenting as Social Engagement in Asian-American Families. Symposium: The Gerontological Society of America's 69th Annual Scientific Meeting. November 2015; Orlando, Florida

POSTER PRESENTATIONS

Guzman, A. A Review of Social Media Use and Depression in Older Adults. Poster Presentation: The Western Institute of Nursing's 51st Annual Communicating Nursing Research Conference; April 2017; Spokane, Washington.

Guzman, A.. Brecht, L., and Mentes, J. Depression, Anxiety and Social Media Use Among Middle Age and Older U.S. Adults. Poster Presentation: International Association of Gerontology and Geriatrics 2017 World Congress; July 2017; San Francisco, CA

Guzman, A. Perceptions of Dementia in the Disaggregated Asian-American community. Poster Presentation: The Gerontological Society of America's Annual Scientific Meeting; November 2016; New Orleans, LA.

Guzman, A. A Review of Social Engagement and Cognitive Health. Poster Presentation: UCLA School of Nursing Research Day; May 2015; Los Angeles, California.

Dzou, T., Sunpongco, M., Zamorano, G., **Guzman, A**. Depression as a risk factor for age-related diseases (hypertension, cardiovascular disease, diabetes, and arthritis) in the aging population 50+ in California. Poster Presentation: National Institute on Minority Health and Health Disparities Grantees' Conference; December 2014. Washington, D.C.

CERTIFICATIONS AND LICENSES

- California Registered Nurse License #95050038, current
- Public Health Nurse License #547694, current
- Advanced Cardiovascular Life Support (ACLS) Certification, American Heart Association, current
- Medical-Surgical Nursing Certified Board, current

AWARDS, HONORS, AND AFFILIATIONS

- Gamma Tau-at-Large Chapter of the Honor Society of Nursing, Sigma Theta Tau International (STTI), current
- Deloras Jones Nursing Scholarship, Winter 2016
- UCLA-CDU Bridges Scholar. Phillips, L.R., Mentes, J., McNeal, G. Co-PIs. UCLA/CDU partnership for enhancing diversity of nurses with research careers, Funded by National Institute of General Medicine, 2012-2017. 1R25 GM102777, 2014.
- California Legislature Assembly Certificate of Recognition for Outstanding Academic Achievement, 2014.
- UCLA Scholarship Recognition Award. University of California, Los Angeles, 2008.
- Long Beach Community College Transfer Recognition Certificate, 2008.
- United States Army 211th Support Group Certificate of Achievement in recognition of an outstanding performance at the Hawthorne Army Depot in support of the Operation Golden Cargo, 2008.
- The Army Commendation Medal for meritorious service while deployed with the unit in support of Operation Iraqi Freedom II, 2005.
- The Army Achievement Medal for meritorious service while deployed with the unit in support of Operation Iraqi Freedom II, 2005.
- United States Army 1st Infantry Division Certificate of Recognition in meritorious service in Task Force Danger during Operation Iraqi Freedom, 2004.
- United States Army 119th Corps Support Battalion Certificate of Achievement for invaluable service and commitment to duty, 2005.

CHAPTER 1

Introduction

Chapter 1. Introduction

Statement of the Problem

The population of the United States is aging. By 2050, the number of adults 65 years and older in the United States is expected to reach nearly 90 million (S. Colby & Ortman, 2015). Depression in older adults has serious consequences, including increased risk for heart disease, dementia, and older adult suicide (Garand et al., 2006; Mirza et al., 2016; Péquignot et al., 2016). Social support has long been established as a beneficial and protective factor against depression (Cohen et al., 1985; Dumont & Provost, 1999; George et al., 1989; Wood et al., 2008). Social media have allowed older adults to connect with their social networks and support systems (Chou et al., 2009; Ngenye & Wright, 2018). The use of social media was further highlighted during the coronavirus disease (COVID-19) pandemic as social distancing and self-quarantine discouraged face-to-face interactions. However, these measures imposed by the COVID-19 pandemic could have also exacerbated the risk of mental health problems such as depression in older adults (Mukhtar, 2020; Pietrabissa & Simpson, 2020). While social media behaviors and their influence on mental health is a growing area of research, the digital behaviors of an aging population specific to the relationship between their social media behavior, social network structures, social support, and depression under the context of COVID-19 is understudied. This dissertation's overall purpose is to explore the relationship between social media use, social support, and depression in older adults.

Depression in Older Adults

Recent actions to mitigate the spread of coronavirus disease 2019 (COVID-19) through self-isolation, mandated quarantine, and social distancing potentially exacerbated the risk of mental health problems and depression (Mukhtar, 2020). The prevalence of depression symptoms was estimated to have tripled in the United States during the COVID-19 pandemic (Ettman et al., 2020). The restrictions placed due to COVID-19 pandemic was associated with increased depression in older adults (Krendl & Perry, 2021; Sepúlveda-Loyola et al., 2020).

Furthermore, synthesis of epidemiological literature showed an increased number of individuals living with some form of depressive disorder in the past decade (World Health Organization, 2017). The same report showed that the prevalence of depression worldwide peaks between the ages of 55 and 74 (World Health Organization, 2017). Reflecting on a global phenomenon, Americans also now report higher levels of depressive symptoms than they had in the past ten years (Twenge, 2015). Data from the National Health and Survey collected from 2009 to 2012 showed that 7.6% of Americans met the criteria for clinical depression, with a higher prevalence in people aged 40 to 59 (Pratt & Brody, 2014). The National Health Survey on Drug Use and Health Survey estimates that 16.1 million adults had at least one major depressive episode in the past year (Center for Behavioral Health Statistics and Quality, 2016). Hasin, Goodwin, Stinson & Grant (2005) previously demonstrated that those aged 45 to 64 years have a significantly higher risk of developing Major Depressive Disorder (MDD) than other age groups. Additional subgroups of the older adult population demonstrate a significantly increased rate of MDD, with estimates ranging from 5% to 10% in medical outpatients, 10% to12% in medical inpatients, and 14–42% in long-term care facilities (Blazer, 2003; Djernes, 2006; Fiske et al., 2009). Undiagnosed depression symptoms are quite common among older people (Meeks et al., 2011; Rodda et al., 2011). The result of Meeks et al.'s (2011) meta-analyses showed that individuals aged 55 and older are two to three times more likely to exhibit subthreshold depressive symptoms than individuals with major depression. The probability of developing depression symptoms is suggested to increase with age (Ferrari et al., 2013; Sutin et al., 2013).

Depression symptoms in old age are attributable to an increase in distress that is not entirely due to physical decline or an increased possibility of mortality (Chui et al., 2015; Sutin et al., 2013). Complex interactions of physical illness, genetic, biological, and social influences are risk factors for developing depressive symptoms in older adults (Fiske et al., 2009). Female gender, disability, social isolation, and the presence of comorbid chronic conditions (diabetes,

heart disease, or cancer) all increase the likelihood of older adults developing depressive symptoms (Cyr, 2007; Fiske et al., 2009; Meeks et al., 2011; Rodda et al., 2011). Depression is not a normal part of aging, despite how it is frequently assumed to be a typical response to physical or functional decline and other life events associated with aging (Cahoon, 2012; Cyr, 2007; Raj, 2004; Szczerbińska et al., 2012; Vink et al., 2008). Because the presentation of depression symptoms in older adults differs from other age groups, a diagnosis of depression and the presence of depressive symptoms in older adults are often unrecognized (Dorfman et al., 1995; Fiske et al., 2009; Gottfries, 1998; Raj, 2004; Wuthrich et al., 2015). Depressive symptoms in older adults have severe consequences. These include an increased risk of heart disease or stroke and an increased risk of dementia or mild cognitive impairment (Mirza et al., 2016; Péquignot et al., 2016; Richard et al., 2013; Wilson et al., 2014). Depressive symptoms also have significant antagonistic effects on quality of life and are associated with older adult suicide (Garand et al., 2006; Hempstead & Phillips, 2015).

Social Support in Older Adults

Social support has been shown in research to be protective of mental health, both directly through the benefits of social relationships and indirectly through its role as a buffer against stressful situations (Cohen & Wills, 1985; Gariépy et al., 2016). Social support research is complicated and has numerous operational definitions (Langford et al., 1997). Social support has been broadly defined in the literature as the protection and assistance given to an individual (Langford et al., 1997; Shumaker & Brownell, 1984; Wortman & Dunkel-Schetter, 1987). Social support has also been defined as the provision of help by others, the perception of the availability of others when needed, and the perceived satisfaction with this support (Parker & Barnett, 1987; Sarason et al., 1983). Social support can be tangible or intangible, from monetary aid to emotional help (Langford et al., 1997). Social support in the literature has been divided into multiple subtypes which include, but are not limited to, the following types of support: emotional, instrumental, appraisal, and informational assistance (Berkman & Thomas, 2000;

House et al., 1988; Langford et al., 1997; Wang et al., 2003). Emotional support refers to actions that provide encouragement, care, empathy, love, and trust (Berkman & Thomas, 2000; House, 1981; Langford et al., 1997). Instrumental/tangible support refers to the provision of tangible goods, aid, and services (House, 1981; Langford et al., 1997; Tilden, 1985). Appraisal support or affirmational support refers to help in decision making and involves the communication of relevant information for self-evaluation over problem-solving (Berkman & Thomas, 2000; House, 1981; Langford et al., 1997). Informational support refers to information given at times of stress (Berkman & Thomas, 2000; Langford et al., 1997). Social supports defining attributes of emotional, instrumental, appraisal, and informational support is often difficult to disaggregate and has various other definitions (tangible, nontangible, affectionate, and positive social interactions) (Berkman & Thomas, 2000).

Established research has shown that social support has a relationship with depression (Cohen et al., 1985; Dumont & Provost, 1999; George et al., 1989; Wood et al., 2008). Numerous studies have established a link between various social support constructs and depression in older adults (Blazer et al., 1998; Blazer & Williams, 1980). Furthermore, a recent meta-analysis by Gariépy et al. (2016) showed how types and sources of social support were associated with protection against depression in older adults aged 50 and older. Gariépy et al.'s (2016) study showed a significant association between some aspects of social support and protection from depression in older adults. Emotional and instrumental support were consistently associated with protection against depression in older adults (Gariépy et al., 2016; Mechakra-Tahiri et al., 2010; Oxman TE et al., 1992; Sonnenberg et al., 2013; Zunzunegui et al., 2001).

The source (family, spouse, friend) of social support is a consistent factor in depression in older adults (Gariépy et al., 2016). Lack of a partner in the household was associated with depression in older men (Sonnenberg et al., 2013). Spousal support is protective against depression, mainly in men (Gariépy et al., 2016). Furthermore, confidant support, especially

from friends, was most consistently associated with protectiveness against depression in older adults (Bisconti & Bergeman, 1999; Choi & Ha, 2011; Gariépy et al., 2016; Mechakra-Tahiri et al., 2010; Wallace et al., 2001). Positive support from friends was significantly associated with less depressive symptoms in older adults (60 and older) but not in younger adult cohorts (35 to 59) (Fiori et al., 2006). In a related study, the support of friends (as opposed to immediate family members, such as spouses or children) was significantly and strongly related to less depressive symptoms in older adults (60 to 92 years of age) but not in younger adults (28 to 59 years of age) (Okun & Keith, 1998). These findings perhaps reflect previous research on network typology that highlights friendship as contributing to the positive mental well-being of older adults more than family relationships (Gupta & Korte, 1994; Nussbaum, 1994). Nussbaum, Pecchioni, Robinson, & Thompson (2000) postulate that friends and neighbors offer a significant role in the informal support systems of older adults, as they often serve as a surrogate family.

For older adults, nontangible social support from relatives and friends provided through phone calls or writing letters was also protective against depression (Oxman TE et al., 1992). A similar study highlights the importance of nontangible support through contact from friends living elsewhere to significantly predict lower levels of depression compared to contact with friends living within the same community (Potts, 1997). A study by Tsai, Tsai, Wang, Chang & Chu (2010), for example, showed how social contact mediated through a video conference intervention provided older adults with emotional and evaluation social support, as well as improved their depressive status over the course of three months. Targeted peer-influenced cognitive behavior informed Internet interventions have also been used successfully to disseminate online treatments for depression and lower depression for older adults (Tomasino et al., 2017).

The past two decades have also shown an increase in online support groups/communities, and growing studies suggest that people are increasingly turning to online networks for social support (Chou et al., 2009; Ngenye & Wright, 2018). Advances in social

technology through the growth of internet adoption have allowed older adults to access their social networks beyond the traditional means of contact through writing letters and telephone communications (Wright, 2000). Technology has provided a new platform to mediate social support and to connect, communicate, and engage with an individual's social network (Choi & Dinitto, 2013; Khosravi et al., 2016; Nef et al., 2013; Sum et al., 2008; Voner et al., 2016). Social media technology, in particular, has the potential to serve as a vehicle for social support. (Cyranowski et al., 2013; McDougall et al., 2016; Nef et al., 2013; Oh et al., 2014; Wangberg et al., 2008; Wright, 2000).

Social Media Conceptualization

Social media is a complex term with multi-layered meanings (Fuchs, 2017). Kaplan & Haenlein (2010) defines social media as “a group of Internet-based applications that build on the ideological and technological foundations of Web 2 and allow the creation and exchange of user-generated content.” Web content in Web 2.0 can be continuously modified, edited, and critiqued by all users in a participatory and collaborative fashion (Kaplan & Haenlein, 2010). Unlike Web 1.0, in which websites were static Hypertext Markup Language (HTML) pages where content was posted by the website owners and content was viewed passively, Web 2.0 also allowed websites to be more dynamic, allowing active participation and interaction from its users (Schnutzel, 2014). Web 2.0 is a social web with distinguishing features of 1) ease of use, 2) ability to facilitate sociality and 3) facilitation of platforms that allow free publishing and uploading of content in any form (pictures, videos, or text) (Lovink, 2011; Tiziana & Donovan, 2013). The staple of Web 2.0 provided social media its defining characteristic, which is in its interactivity (Hall, 2016; Kaplan & Haenlein, 2010; Obar & Wildman, 2015).

Social media has been described as “sites and services that emerged during the early 2000s, including social network sites, video-sharing sites, blogging and microblogging platforms, and related tools that allow participants to create and share their content” (Boyd, 2014). These sites and services facilitate the transmission of social interactions, allowing individuals to

connect, collaborate, and most importantly, exchange information (Boyd & Ellison, 2007; Hall, 2016; Hope et al., 2014; Kaplan & Haenlein, 2010; Ressler & Glazer, 2010). Social media provides the “environment in which information is passed from one person to another, along with social connections, to create distributed discussion or community” (Standage, 2013). Hunsinger & Senft (2014) define social media as “networked information services designed to support in-depth social interaction, community formation, collaborative opportunities, and collaborative work.”

Attempts to categorize the diverse social media landscape have some difficulty, as multiple platforms often share the same characteristics (Baker & Algorta, 2016; Hamm et al., 2013; Korda & Itani, 2011). The variety of ever-evolving social media platforms creates a challenge in narrowing its conceptual definition (Obar & Wildman, 2015). In 2012, the concept of social media was established in PubMed as a Medical Subject Heading, the National Library of Medicine's controlled vocabulary thesaurus used for indexing articles. Social media can be defined by its multiple platforms and categorizations, which include social networking sites such as Facebook and LinkedIn, collaborative projects (Wikipedia, Pinterest), blogs or microblogs (Twitter), content communities (YouTube, Instagram, Tumblr), and short message service/texting (WhatsApp, Viber) (Hamm et al., 2013; Korda & Itani, 2011). Central to the definition of social media is its sociality in that it incorporates engagement, communities, connecting/networking, cooperation/collaboration (Fuchs, 2017).

Social Media in Older Adults

The use of social media has become firmly established across generations (Korda & Itani, 2011). While social media is prevalent among younger adults, people over the age of 50 are the fastest-growing users (Greenwood et al., 2016; Perrin, 2015). In the United States and around the world, social media usage is at an all-time high, with an estimated 4.2 billion users in 2021 (Johnson, 2021). According to a Pew Research survey, approximately two-thirds of American adults now use social media, dramatically increasing from 5% in 2005 to 72% in 2021.

(Pew Research Center, 2021). The primary motivators and incentives to use social media for older adults include enjoyment, engaging in social contact with family, and providing and receiving social support (Coelho & Duarte, 2016; Leist, 2013). Features that encourage message-based interactivity through communication, both in public chat (wall posts) and private chat, draw older adults to use social media platforms such as Facebook (Jung & Sundar, 2016). Social media platforms, such as Facebook, Twitter, and LinkedIn, are used to maintain existing social ties and to facilitate the formation of new ones (Boll & Brune, 2016; Goswami et al., 2010). Social media is inextricably linked to making connections, empowers older adults through a global sense of participation and belonging, and satisfies the need for social contact, extending and maintaining meaningful personal relationships (Barak et al., 2008; Bessière et al., 2008; Chakraborty et al., 2013; Cotten et al., 2013; Leist, 2013; Llorente-Barroso et al., 2015).

Significance of Study

In a moment of growing national concern for how social media can be exploited to influence and change behaviors, it is essential to understand how the digital behaviors of our aging population, specific to their social media use, impact their mental health. Studies on social media and its influence on depression are often focused on the younger generation and not on the aging population (as explained in further detail in Chapter 2). Studies on the digital behaviors of older adults, specific to social media use behaviors and their potential relationship to depression, often lack recognition of the structural and functional aspects of social networks and social support, which are essential constructs for successful aging. This dissertation will examine the relationship between various characteristics of social media use (online/offline social network structure, social network function in terms of social media integration and engagement) with social support and depression in older adults. Specifically, this dissertation will examine the role of social support as a mediating factor between various characteristics of social media (online social network structure, social network function ofsocial media activity) and depression.

Content of the Dissertation

This dissertation is comprised of six chapters, with chapters two, four, and five as original manuscripts that are formatted for potential publication. Chapter 1 (this chapter) presents the background to depression, social support, social media, definition of key research terms, specific aims, hypothesis of each of the original manuscripts, and research significance. Chapter 2 (First Manuscript) is a systematic literature review aimed to identify and synthesize quantitative studies addressing the potential relationship between social media use and depression in older adults. Chapter 3 describes the theoretical framework and orientation of what this paper will call Berkman et al.'s Social Integration Model. This dissertation adopted the Social Integration Model of recognizing the upstream forces (conditions that shape the structure of social networks) and downstream forces (link of social networks to health outcomes through social support). Chapter 4 (Second Manuscript) is an analysis of an older adult's structural social network, both online and offline networks, in its relationship to social support and depression. This manuscript examines the mediating effect of social support in the relation of social network structures (online and offline) and depression in older adults. We hypothesize the following: (H1) Having a larger online social network size increases social support and in turn, greater social support decreases depression in older adults; (H2) Having a larger offline social network size increases social support, and in turn, greater social support decreases depression in older adults. Chapter 5 (Third Manuscript) examines the social network function/activation in terms of accessing social media, a technology to connect to one's social network, relationship to social support and depression. We examine the mediating effect of social support in the relation of social media use and depression in older adults. We hypothesize that having higher social media use increases social support, and in turn, social support decreases depression in older adults. The final, Chapter 6, summarizes the manuscript highlights, implications to clinical practice and health policy, directions to future research, and conclusions.

Chapter Summary

The U.S. population is aging. Within about two decades, older adults will outnumber children for the first time in American history (S. L. Colby & Ortman, 2014). Depression in older adults has severe consequences. Social support has long been established to benefit and protect older adults from depression. Social media has allowed older adults to access their social networks and social support system, however social media's influence on social support and depression is understudied. Considering that the fastest growing social media users are older adults, the impact of social media characteristics and behaviors to social support and depression in older adults warrants research. This dissertation's overall purpose will explore the relationship between social media, social support, and depression in older adults.

References

Baker, D. A., & Algorta, G. P. (2016). The Relationship Between Online Social Networking and Depression: A Systematic Review of Quantitative Studies. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 638–648. https://doi.org/10.1089/cyber.2016.0206

Barak, A., Boniel-Nissim, M., & Suler, J. (2008). Fostering empowerment in online support groups. *Computers in Human Behavior*, *24*(5), 1867–1883. https://doi.org/10.1016/j.chb.2008.02.004

Berkman, L., Glass, T., Brissette, I., & Seeman, T. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine (1982)*, *51*(6), 843–857. https://doi.org/10.1016/S0277-9536(00)00065-4

Berkman, L., & Thomas, G. (2000). Social Integration, Social Networks, Social Support, and Health. In *Social Epidemiology* (p. 416). Oxford University Press. https://books.google.com/books?hl=en&lr=&id=i0qWxy5-X1gC&pgis=1

Bessière, K., Kiesler, S., Kraut, R., & Boneva, B. S. (2008). Effects of Internet Use and Social Resources on Changes in Depression. *Information, Communication & Society*, *11*(1), 47–70. https://doi.org/10.1080/13691180701858851

Bisconti, T. L., & Bergeman, C. S. (1999). Perceived Social Control as a Mediator of the Relationships Among Social Support, Psychological Weil-Being, and Perceived Health. *The Gerontologist*, *39*(1), 94–104. https://doi.org/10.1093/geront/39.1.94

Blazer, D. (2003). Depression in late life: review and commentary. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *58*(3), 249–265.

Blazer, D., Landerman, L., Hays, J. C., Simonsick, E. M., & Saunders, W. B. (1998). Symptoms of depression among community-dwelling elderly African-American and white older adults. *Psychological Medicine*, *28*(6), 1311–1320.

Blazer, D., & Williams, C. (1980). Epidemiology of dysphoria and depression in an elderly population. *The American Journal of Psychiatry*.

Boll, F., & Brune, P. (2016). Online Support for the Elderly – Why Service and Social Network Platforms should be Integrated. *Procedia Computer Science*, *98*(auICTH), 395–400. https://doi.org/10.1016/j.procs.2016.09.060

Boyd, D. (2014). *It's Complicated: The Social Lives of Networked Teens*. Yale University Press.

Boyd, D. m., & Ellison, N. B. (2007). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. https://doi.org/10.1111/j.1083-6101.2007.00393.x

Cahoon, C. G. (2012). Depression in Older Adults. *American Journal of Nursing*, *112*(11), 22–30. https://doi.org/10.1097/01.NAJ.0000422251.65212.4b

Center for Behavioral Health Statistics and Quality. (2016). Key substance use and mental health indicators in the United States: Results from the 2015 national survey on drug use and health. *No.SMA 16-4984, NSDUH Series H-51*.

Chakraborty, R., Vishik, C., & Rao, H. R. (2013). Privacy preserving actions of older adults on social media: Exploring the behavior of opting out of information sharing. *Decision Support Systems*, *55*(4). https://doi.org/10.1016/j.dss.2013.01.004

Choi, N. G., & Dinitto, D. M. (2013). Internet use among older adults: Association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research*, *15*(5), 1–16. https://doi.org/10.2196/jmir.2333

Choi, N. G., & Ha, J.-H. H. (2011). Relationship between spouse/partner support and depressive symptoms in older adults: Gender difference. *Aging and Mental Health*, *15*(3), 307–317. https://doi.org/10.1080/13607863.2010.513042

Chou, W. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P., & Hesse, B. W. (2009). Social Media Use in the United States: Implications for Health Communication. *Journal of Medical Internet Research*, *11*(4), e48. https://doi.org/10.2196/jmir.1249

Chui, H., Gerstorf, D., Hoppmann, C. A., & Luszcz, M. A. (2015). Trajectories of depressive symptoms in old age: Integrating age-, pathology-, and mortality-related changes. *Psychology and Aging*, *30*(4), 940–951. https://doi.org/10.1037/pag0000054

Coelho, J., & Duarte, C. (2016). A literature survey on older adults' use of social network services and social applications. *Computers in Human Behavior*, *58*, 187–205. https://doi.org/10.1016/j.chb.2015.12.053

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support. In *Social support: Theory, research and applications* (pp. 73–94). Springer.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Colby, S. L., & Ortman, J. M. (2014). The Baby Boom Cohort in the United States : 2012 to 2060. *US Census Bureau*, 16. https://doi.org/P25-1141

Colby, S., & Ortman, J. (2015). *Projections of the Size and Composition of the U.S. Population: 2014 to 2060*.

Cotten, S. R., Anderson, W. A., & McCullough, B. M. (2013). Impact of internet use on loneliness and contact with others among older adults: Cross-sectional analysis. *Journal of Medical Internet Research*, *15*(2), 1–13. https://doi.org/10.2196/jmir.2306

Cyr, N. R. (2007). Depression and older adults. *AORN Journal*, *85*(2), 397–401. https://doi.org/10.1016/S0001-2092(07)60050-7

Cyranowski, J. M., Zill, N., Bode, R., Butt, Z., Kelly, M. a R., Pilkonis, P. a, Salsman, J. M., & Cella, D. (2013). Assessing social support, companionship, and distress: National Institute of Health (NIH) Toolbox Adult Social Relationship Scales. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, *32*(3), 293–301. https://doi.org/10.1037/a0028586

Djernes, J. K. (2006). Prevalence and predictors of depression in populations of elderly: a review. *Acta Psychiatrica Scandinavica*, *113*(5), 372–387. https://doi.org/10.1111/j.1600-0447.2006.00770.x

Dorfman, R. A., Lubben, J. E., Mayer-Oakes, A., Atchison, K., Schweitzer, S. O., De Jong, F. J., & Matthias, R. E. (1995). Screening for depression among a well elderly population. *Social Work*, *40*(3), 295–304.

Dumont, M., & Provost, M. A. (1999). Resilience in adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, *28*(3), 343–363.

Ferrari, A. J., Charlson, F. J., Norman, R. E., Patten, S. B., Freedman, G., Murray, C. J. L., Vos, T., & Whiteford, H. A. (2013). Burden of depressive disorders by country, sex, age, and year: findings from the global burden of disease study 2010. *PLoS Med*, *10*(11), e1001547.

Fiori, K., McIlvane, J., Brown, E., & Antonucci, T. (2006). Social relations and depressive symptomatology: Self-efficacy as a mediator. *Aging and Mental Health*, *10*(3), 227–239. https://doi.org/10.1080/13607860500310690

Fiske, A., Wetherell, J., & Gatz, M. (2009). Depression in older adults. *Annual Review of Clinical …*, *112*(11), 363–389. https://doi.org/10.1146/annurev.clinpsy.032408.153621.Depression

Fuchs, C. (2017). *Social media: A critical introduction* (M. Ainsley, Ed.; 2nd ed.). Sage.

Garand, L., Mitchell, A. M., Dietrick, A., Hijjawi, S. P., & Pan, D. (2006). Suicide in Older Adults: Nursing Assessment of Suicide Risk. *Issues in Mental Health Nursing*, *27*(4), 355–370. https://doi.org/10.1080/01612840600569633

Gariépy, G., Honkaniemi, H., Quesnel-Vallée, A., Gariepy, G., Honkaniemi, H., & Quesnel-Vallee, A. (2016). Social support and protection from depression: systematic review of current findings in Western countries. *The British Journal of Psychiatry*, *209*(4), 284–293. https://doi.org/10.1192/bjp.bp.115.169094

George, L., Blazer, D., Hughes, D., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry*, *154*(4), 478–485.

Goswami, S., Kobler, F., Leimeister, J., & Krcmar, H. (2010). Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly. *International Conference on Information System 2010*.

Gottfries, C. G. (1998). Is there a difference between elderly and younger patients with regard to the symptomatology and aetiology of depression? *International Clinical Psychopharmacology*, *13*(SUPPL. 5). https://doi.org/10.1097/00004850-199809005-00004

Greenwood, S., Perrin, A., & Duggan, M. (2016). Social Media Update 2016. *Pew Research Center*, *November*. http://assets.pewresearch.org/wp-content/uploads/sites/14/2016/11/10132827/PI_2016.11.11_Social-Media-Update_FINAL.pdf

Gupta, V., & Korte, C. (1994). The effects of a confidant and a peer group on the well-being of single elders. *The International Journal of Aging & Human Development*, *39*(4), 293–302. https://doi.org/10.2190/4YYH-9XAU-WQF9-APVT

Hall, J. A. (2016). When is social media use social interaction? Defining mediated social interaction. *New Media & Society*, 1–18. https://doi.org/10.1177/1461444816660782

Hamm, M. P., Chisholm, A., Shulhan, J., Milne, A., Scott, S. D., Given, L. M., & Hartling, L. (2013). Social media use among patients and caregivers: a scoping review. *BMJ Open*, *3*(5), 1–10. https://doi.org/10.1136/bmjopen-2013-002819

Hasin, D. S., Goodwin, R. D., Stinson, F. S., & Grant, B. F. (2005). Epidemiology of major depressive disorder: results from the National Epidemiologic Survey on Alcoholism and Related Conditions. *Archives of General Psychiatry*, *62*(10), 1097–1106. https://doi.org/10.1001/archpsyc.62.10.1097

Hempstead, K. A., & Phillips, J. A. (2015). Rising Suicide Among Adults Aged 40–64 Years. *American Journal of Preventive Medicine*, *48*(5), 491–500. https://doi.org/10.1016/j.amepre.2014.11.006

Hope, A., Schwaba, T., & Piper, A. M. (2014). Understanding digital and material social communications for older adults. *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems - CHI '14*, 3903–3912. https://doi.org/10.1145/2556288.2557133

House, J. S. (1981). *Work stress and social support*.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual Review of Sociology*, *14*(1), 293–318.

Hunsinger, J., & Senft, T. (2014). *The Social Media Handbook* (1st ed.). Routledge. https://doi.org/10.1017/CBO9781107415324.004

Johnson, J. (2021). *Number of social media users as of January 2021 (in billions)*. https://www.statista.com/statistics/617136/digital-population-worldwide/

Jung, E. H., & Sundar, S. S. (2016). Senior citizens on Facebook: How do they interact and why? *Computers in Human Behavior*, *61*, 27–35. https://doi.org/10.1016/j.chb.2016.02.080

Kaplan, A., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, *53*(1), 59–68.

Khosravi, P., Rezvani, A., & Wiewiora, A. (2016). The impact of technology on older adults' social isolation. *Computers in Human Behavior*, *63*(July), 594–603. https://doi.org/10.1016/j.chb.2016.05.092

Korda, H., & Itani, Z. (2011). Harnessing Social Media for Health Promotion and Behavior Change. *Health Promotion Practice*, 15–23. https://doi.org/10.1177/1524839911405850

Krendl, A. C., & Perry, B. L. (2021). The Impact of Sheltering in Place During the COVID-19 Pandemic on Older Adults' Social and Mental Well-Being. *The Journals of Gerontology: Series B*, *76*(2), e53–e58. https://doi.org/10.1093/geronb/gbaa110

Langford, C. P. H., Bowsher, J., Maloney, J. P., & Lillis, P. P. (1997). Social support: A conceptual analysis. *Journal of Advanced Nursing*, *25*(1), 95–100. https://doi.org/10.1046/j.1365-2648.1997.1997025095.x

Leist, A. K. (2013). Social media use of older adults: A mini-review. *Gerontology*, *59*(4), 378–384. https://doi.org/10.1159/000346818

Llorente-Barroso, C., Viñarás-Abad, M., & Sánchez-Valle, M. (2015). Internet and the elderly: Enhancing active ageing. *Comunicar*, *23*(45). https://doi.org/10.3916/C45-2015-03

Lovink, G. (2011). *Networks without a cause: A critique of social media*. Polity Press.

McDougall, M. A., Walsh, M., Wattier, K., Knigge, R., Miller, L., Stevermer, M., & Fogas, B. S. (2016). The effect of social networking sites on the relationship between perceived social support and depression. *Psychiatry Research*, *246*, 223–229. https://doi.org/10.1016/j.psychres.2016.09.018

Mechakra-Tahiri, S.-D., Zunzunegui, M. V, Préville, M., & Dubé, M. (2010). Gender, social relationships and depressive disorders in adults aged 65 and over in Quebec. *Chronic Diseases in Canada*, *30*(2), 56–65.

Meeks, T. W., Vahia, I. V., Lavretsky, H., Kulkarni, G., & Jeste, D. V. (2011). A tune in “a minor” can “b major”: A review of epidemiology, illness course, and public health implications of subthreshold depression in older adults. *Journal of Affective Disorders*, *129*(1–3), 126–142. https://doi.org/10.1016/j.jad.2010.09.015

Mirza, S. S., Wolters, F. J., Swanson, S. A., Koudstaal, P. J., Hofman, A., Tiemeier, H., & Ikram, M. A. (2016). 10-year trajectories of depressive symptoms and risk of dementia: a population-based study. *The Lancet Psychiatry*, *3*(7), 628–635. https://doi.org/10.1016/S2215-0366(16)00097-3

Mukhtar, S. (2020). Mental health and emotional impact of COVID-19: Applying Health Belief Model for medical staff to general public of Pakistan. In *Brain, Behavior, and Immunity* (Vol. 87, pp. 28–29). Academic Press Inc. https://doi.org/10.1016/j.bbi.2020.04.012

Nef, T., Ganea, R. L., Müri, R. M., & Mosimann, U. P. (2013). Social networking sites and older users – a systematic review. *International Psychogeriatrics*, *25*(07). https://doi.org/10.1017/S1041610213000355

Ngenye, L., & Wright, K. (2018). Online Social Support Groups/Communities. In *Global Perspectives on Health Communication in the Age of Social Media* (pp. 1–27). IGI Global. https://doi.org/10.4018/978-1-5225-3716-8.ch001

Nussbaum, J. (1994). Friendship in Older Adulthood. In *Interpersonal Communication in Older Adulthood: Interdisciplinary Theory and Research* (pp. 209–225). SAGE Publications, Inc. https://doi.org/10.4135/9781483326832.n10

Nussbaum, J., Pecchioni, L., Robinson, J., & Thompson, T. (2000). *Communication and aging* (Second Edi). Routledge.

Obar, J. A., & Wildman, S. S. (2015). Social media definition and the governance challenge: An introduction to the special issue. *Telecommunications Policy*, *39*(9), 745–750. https://doi.org/10.1016/j.telpol.2015.07.014

Oh, H. J., Ozkaya, E., & Larose, R. (2014). How does online social networking enhance life satisfaction? the relationships among online supportive interaction, affect, perceived social support, sense of community, and life satisfaction. *Computers in Human Behavior*, *30*(January), 69–78. https://doi.org/10.1016/j.chb.2013.07.053

Okun, M. A., & Keith, V. M. (1998). Effects of Positive and Negative Social Exchanges with Various Sources on Depressive Symptoms in Younger and Older Adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *53B*(1), P4–P20. https://doi.org/10.1093/geronb/53B.1.P4

Oxman T.E, Berkman L.F, Kasl S, D.H, F., Oxman, T., Berkman, L., Kasl, S., Freeman, D., & Barett, J. (1992). Social support and depressive symptoms in the elderly. *American Journal of Epidemiology*, *135*(4), 356–368.

Parker, G., & Barnett, B. (1987). A test of the social support hypothesis. *The British Journal of Psychiatry*, *150*(1), 72–77.

Péquignot, R., Dufouil, C., Prugger, C., Pérès, K., Artero, S., Tzourio, C., & Empana, J.-P. (2016). High Level of Depressive Symptoms at Repeated Study Visits and Risk of Coronary Heart Disease and Stroke over 10 Years in Older Adults: The Three-City Study. *Journal of the American Geriatrics Society*, *64*(1), 118–125. https://doi.org/10.1111/jgs.13872

Perrin, A. (2015). Social Media Usage: 2005-2015. In *Pew Research Center* (Issue October). https://doi.org/202.419.4372

Pew Research Center. (2021). *Social Media Fact Sheet*. https://www.pewresearch.org/internet/fact-sheet/social-media/

Pietrabissa, G., & Simpson, S. G. (2020). Psychological Consequences of Social Isolation During COVID-19 Outbreak. *Frontiers in Psychology*, *11*, 2201. https://doi.org/10.3389/FPSYG.2020.02201/BIBTEX

Potts, M. K. (1997). Social support and depression among older adults living alone: the importance of friends within and outside of a retirement community. *Social Work*, *42*(4), 348–362. https://doi.org/10.1093/sw/42.4.348

Pratt, L. A., & Brody, D. J. (2014). Depression in the U.S. Household Population, 2009 – 2012. *NCHS Data Brief*, *172*, 2009–2012.

Raj, A. (2004). Depression in the elderly. *Postgraduate Medicine*, *115*(6), 26–42. https://doi.org/10.3810/pgm.2004.06.1534

Ressler, P., & Glazer, G. (2010). Legislative: Nursing's Engagement in Health Policy and Healthcare Through Social Media. *The Online Journal of Issues in Nursing*, *16*(1). https://doi.org/10.3912/OJIN.Vol16No01LegCol01

Richard, E., Reitz, C., Honig, L. H., Schupf, N., Tang, M. X., Manly, J. J., Mayeux, R., Devanand, D., & Luchsinger, J. A. (2013). Late-Life Depression, Mild Cognitive Impairment, and Dementia. *JAMA Neurology*, *70*(3), 383. https://doi.org/10.1001/jamaneurol.2013.603

Rodda, J., Walker, Z., & Carter, J. (2011). Depression in older adults. *BMJ*, *343*(sep28 1), d5219–d5219. https://doi.org/10.1136/bmj.d5219

Sarason, I. G., Levine, H. M., Basham, R. B., & Sarason, B. R. (1983). Assessing social support: The social support questionnaire. *Journal of Personality and Social Psychology*, *44*(1), 127.

Schnutzel. (2014). *ELI5:Web 1.0 and 2.0*. https://www.reddit.com/r/explainlikeimfive/comments/21nxqc/eli5web_10_and_20/

Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. v., & Rodríguez-Mañas, L. (2020). Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. *The Journal of Nutrition, Health & Aging*, *24*(9), 938. https://doi.org/10.1007/S12603-020-1500-7

Shumaker, S. A., & Brownell, A. (1984). Toward a Theory of Social Suppor: Closing Conceptual Gaps. *Journal of Social Issues*, *40*(4), 11–36.

Sonnenberg, C. M., Deeg, D. J. H., van Tilburg, T. G., Vink, D., Stek, M. L., & Beekman, A. T. F. (2013). Gender differences in the relation between depression and social support in later life. *International Psychogeriatrics*, *25*(01), 61–70. https://doi.org/10.1017/S1041610212001202

Standage, T. (2013). *Writing on the Wall: Social Media - The First 2,000 Years* (1st ed.). Bloomsbury Publishing.

Sum, S., Mathews, R. M., Hughes, I., & Campbell, A. (2008). Internet use and loneliness in older adults. *CyberPsychology & Behavior*, *11*(2), 208–211. https://doi.org/10.1089/cpb.2007.0010

Sutin, A. R., Terracciano, A., Milaneschi, Y., An, Y., Ferrucci, L., & Zonderman, A. B. (2013). The trajectory of depressive symptoms across the adult life span. *JAMA Psychiatry*, *70*(8), 803–811. https://doi.org/10.1001/jamapsychiatry.2013.193

Szczerbińska, K., Hirdes, J. P., & Życzkowska, J. (2012). Good News and Bad News: Depressive Symptoms Decline and Undertreatment Increases With Age in Home Care and Institutional Settings. *The American Journal of Geriatric Psychiatry*, *20*(12), 1045–1056. https://doi.org/10.1097/JGP.0b013e3182331702

Tilden, V. P. (1985). Issues of conceptualization and measurement of social support in the construction of nursing theory. *Research in Nursing & Health*, *8*(2), 199–206. https://doi.org/10.1002/nur.4770080214

Tiziana, T., & Donovan, J. (2013). Occupy social networks: The paradoxes of corporate social media for networked social movements. In G. Lovink & M. Rasch (Eds.), *"Unlike us" reader: Social media monopolies and their alternatives* (pp. 296–311). Institute of Network Cultures.

Tomasino, K. N., Lattie, E. G., Ho, J., Palac, H. L., Kaiser, S. M., & Mohr, D. C. (2017). Harnessing Peer Support in an Online Intervention for Older Adults with Depression. *The American Journal of Geriatric Psychiatry*, *25*(10), 1109–1119. https://doi.org/10.1016/j.jagp.2017.04.015

Tsai, H.-H., Tsai, Y.-F., Wang, H.-H., Chang, Y.-C., & Chu, H. H. (2010). Videoconference program enhances social support, loneliness, and depressive status of elderly nursing home residents. *Aging & Mental Health*, *14*(8), 947–954. https://doi.org/10.1080/13607863.2010.501057

Twenge, J. M. (2015). Time Period and Birth Cohort Differences in Depressive Symptoms in the U.S., 1982–2013. *Social Indicators Research*, *121*(2), 437–454. https://doi.org/10.1007/s11205-014-0647-1

Vink, D., Aartsen, M. J., & Schoevers, R. A. (2008). Risk factors for anxiety and depression in the elderly: A review. *Journal of Affective Disorders*, *106*(1–2), 29–44. https://doi.org/10.1016/j.jad.2007.06.005

Vošner, H. B., Bobek, S., Kokol, P., & Krečič, M. J. (2016). Attitudes of active older Internet users towards online social networking. *Computers in Human Behavior*, *55*, 230–241. https://doi.org/10.1016/j.chb.2015.09.014

Wallace, K. A., Bisconti, T. L., & Bergeman, C. S. (2001). The mediational effect of hardiness on social support and optimal outcomes in later life. *Basic and Applied Social Psychology*, *23*(4), 267–279. https://doi.org/10.1207/153248301753225892

Wang, H.-H., Wu, S.-Z., & Liu, Y.-Y. (2003). Association Between Social Support and Health Outcomes: A Meta-analysis. *The Kaohsiung Journal of Medical Sciences*, *19*(7), 345–350. https://doi.org/10.1016/S1607-551X(09)70436-X

Wangberg, S. C., Andreassen, H. K., Prokosch, H.-U., Santana, S. M. V., Sorensen, T., & Chronaki, C. E. (2008). Relations between Internet use, socio-economic status (SES), social support and subjective health. *Health Promotion International*, *23*(1), 70–77. https://doi.org/10.1093/heapro/dam039

Wilson, R. S., Capuano, A. W., Boyle, P. A., Hoganson, G. M., Hizel, L. P., Shah, R. C., Nag, S., Schneider, J. A., Arnold, S. E., & Bennett, D. A. (2014). Clinical-pathologic study of depressive symptoms and cognitive decline in old age. *Neurology*, *83*(8), 702–709. https://doi.org/10.1212/WNL.0000000000000715

Wood, A. M., Maltby, J., Gillett, R., Linley, P. A., & Joseph, S. (2008). The role of gratitude in the development of social support, stress, and depression: Two longitudinal studies. *Journal of Research in Personality*, *42*(4), 854–871.

World Health Organization. (2017). *Depression and Other Common Mental Disorders Global Health Estimates*.

Wortman, C. B., & Dunkel-Schetter, C. (1987). *Conceptual and methodological issues in the study of social support.*

Wright, K. B. (2000). Computer-mediated social support, older adults, and coping. *Journal of Communication*, *50*(3), 100–118. https://doi.org/10.1111/j.1460-2466.2000.tb02855.x

Wuthrich, V. M., Johnco, C. J., & Wetherell, J. L. (2015). Differences in anxiety and depression symptoms: Comparison between older and younger clinical samples. *International Psychogeriatrics*, *27*(9), 1523–1532. https://doi.org/10.1017/S1041610215000526

Zunzunegui, M., Béland, F., & Otero, A. (2001). Support from children, living arrangements, self-rated health and depressive symptoms of older people in Spain. *International Journal of Epidemiology*, *30*(5), 1090–1099. https://doi.org/10.1093/ije/30.5.1090

CHAPTER 2

Social Media Use and Depression in Older Adults: A Systematic Review

Chapter 2. Social Media Use and Depression in Older Adults: A Systematic Review

Abstract

Introduction: Social media has become an integral part of everyday life and has revolutionized how older adults communicate and interact with others. With the coronavirus disease 2019 (COVID-19) encouraging social distancing to restrain the spread of infections, collective attention turned to social media use to keep older adults connected and informed.

Objective: This review aims to identify quantitative studies addressing the potential relationship between social media use and depression in older adults.

Methods: Four electronic databases (MEDLINE, CINAHL, PsychINFO, and Web of Science) were used to identify studies conducted up to July 2020. Three key concepts identified were depression, social media use, and older adults. The Connected Papers project was also utilized to expand the fifteen selected literature.

Results: Findings of our review showed a paucity of research and a complicated relationship between social media use and depression in older adults. This complexity is possibly due to the notable difference in the agreed conceptualization of social media use. Validated measures of social media use behaviors outside simple frequency of use and binary yes or no measure needs further exploration in studies of social media use and depression in older adults. Our findings also suggest that age-related health variables and social factors influence the relationship between social media use and depression. Age cohort effect might influence the relationship between social media use and depression.

Conclusions: This systematic review revealed mixed findings between social media use and depression in older adults. Age cohort difference, social factors and health variables could partially influence the relationship between social media use and depression in older adults. Future research could benefit from including aging-related covariates to ascertain the effect of social media use on depression in older adults.

Introduction

Social media has become an integral part of everyday life and has revolutionized how older adults communicate and interact with others. With coronavirus disease 2019 (COVID-19) encouraging social distancing to restrain the spread of infections, collective attention turned to the use of social media to keep older adults connected and informed. Social media usage is at an all-time high in the United States and around the world, with an estimated 4.2 billion users in 2021 (Johnson, 2021). A Pew Research survey showed that about two-thirds of American adults now use social media, a dramatic increase from 5% in 2005 to 72% in 2021 (Pew Research Center, 2021). In a moment of growing national concern for how social media can be exploited to influence and change behaviors, it is essential to understand how the digital behaviors of our aging population, specific to their social media use impact their mental health.

Social media Definition, Construct and Categorization

Social media is a complex term with multi-layered meanings (Fuchs, 2017). Social media has been described as “sites and services that emerged during the early 2000s, including social network sites, video-sharing sites, blogging and microblogging platforms, and related tools that allow participants to create and share their content” (Boyd, 2014). These sites and services facilitate the transmission of social interactions, enabling individuals to connect, collaborate, and most importantly, exchange information (Boyd & Ellison, 2007; Hall, 2016; Hope et al., 2014; Kaplan & Haenlein, 2010; Ressler & Glazer, 2010). Attempts to categorize the diverse social media landscape have some difficulty, as multiple platforms often share the same characteristics (Baker & Algorta, 2016; Hamm et al., 2013; Korda & Itani, 2011). The variety of ever-evolving social media platforms creates a challenge in narrowing its conceptual definition (Obar & Wildman, 2015). In 2012, the concept of social media was established in PubMed as a Medical Subject Heading, the National Library of Medicine's controlled vocabulary thesaurus used for indexing articles. Social media can be defined by its multiple platforms and categorizations, which include social networking sites such as Facebook and LinkedIn,

collaborative projects (Wikipedia, Pinterest), blogs or microblogs (Twitter), content communities (YouTube, Instagram, Tumblr), and short message service/texting (WhatsApp, Viber) (Hamm et al., 2013; Korda & Itani, 2011). Central to the definition of social media is its sociality in that it incorporates engagement, communities, connecting/networking, cooperation/collaboration (Fuchs, 2017).

While social media is ubiquitous among younger adults, the fastest-growing group of users is individuals over 50 (Greenwood et al., 2016; Perrin, 2015). Social media use in older adults 65 years and older has grown dramatically to 19% in five years (Pew Research Center, 2021). The primary motivators and incentive to use social media for older adults include enjoyment, engaging in social contact with family, and providing and receiving social support (Coelho & Duarte, 2016; Leist, 2013). Social media platforms specific to social networking sites such as Facebook, Twitter, and LinkedIn are used to maintain existing social ties and allow the creation of new social connections (Boll & Brune, 2016; Goswami et al., 2010). Social media is deeply embedded in making and maintaining connections, providing older adults with a sense of empowerment through a global sense of participation and belonging, as well as satisfying the need for social contact, along with extending and maintaining meaningful personal relationships (Barak et al., 2008; Bessière et al., 2008; Chakraborty et al., 2013; Cotten et al., 2013; Leist, 2013; Llorente-Barroso et al., 2015).

Depression Epidemiology and Consequences

A recent synthesis of epidemiological literature revealed an increase in the number of individuals living with some form of depressive disorder in the past decade (World Health Organization, 2017). The same report showed that the prevalence of depression worldwide peaks between the ages of 55 and 74 (World Health Organization, 2017). Reflecting on a global phenomenon, Americans also now report higher levels of depressive symptoms than they had in the past ten years (Twenge, 2015). Furthermore, recent actions to mitigate the spread of COVID-19 through self-isolation, mandated quarantine, and social distancing potentially

exacerbated the risk of mental health problems and depression (Mukhtar, 2020). The prevalence of depression symptoms was estimated to have tripled in the United States during the COVID-19 pandemic (Ettman et al., 2020).

Depression symptoms in old age are attributed to an increase in distress that is not due solely to physical declines or an increased possibility of mortality (Chui et al., 2015; Sutin et al., 2013). Complex interactions of physical illness, genetic, biological, and social influences are risk factors for developing depressive symptoms in older adults (Fiske et al., 2009). Factors such as being female, having a disability, social isolation, and the presence of comorbid chronic diseases (diabetes, heart disease, or cancer) put older adults at higher risk of developing depressive symptoms (Cyr, 2007; Fiske et al., 2009; Meeks et al., 2011; Rodda et al., 2011). Depression is not a normal part of aging, although it is often assumed to be a typical response to aging, from physical or functional losses and other life events (Cahoon, 2012; Cyr, 2007; Raj, 2004; Szczerbińska et al., 2012; Vink et al., 2008). Depression has significant implications in old age.

Objective

Public health measures imposed by the COVID-19 pandemic through mandated quarantine and social distancing exacerbate the risk of mental health problems such as depression in older adults (Mukhtar, 2020; Pietrabissa & Simpson, 2020). As feelings of loneliness and social isolation can lead to depression, it is essential to explore how social media can help older people feel less depressed and isolated (Herbolsheimer et al., 2018; Khosravi et al., 2016; Nicholson, 2012). Extensive literature has previously explored the relationship between social media use (social networking site use) and its relationship to depression, and the findings are mixed and complex (Baker & Algorta, 2016; Seabrook et al., 2016; Vahedi & Zannella, 2021). These reviews are overwhelmingly focused on young adults and digital natives. The evidence on the causal impact of social media on depression in older adults is limited and relatively unknown. This is potentially due to significant questions around measurement tools

and gaps in data and controlling for variables relevant to aging and depression research. E. Chen et al. (2021) and Wiwatkunupakarn et al. (2021) conducted a review of the literature on the association between social media use and mental health in older adults but were not specific to depression. Considering the fastest growing social media users are older adults, the impact of social media on depression in older adults warrants additional research. The purpose of this review is to identify and synthesize quantitative studies that address the possible relationship between social media use and depression in older adults.

Methods

Search Strategy

Four electronic databases (MEDLINE, CINAHL, PsychINFO, and Web of Science) were used to identify studies conducted up to July 2020. Three key concepts identified were depression, social media use, and older adults. An advanced Boolean search was conducted on each of the databases, and the search strings are presented in Table 1. Further, we opted to make use of only “social media” OR “social networking” as our primary Medical Subject Headings (MeSH) term. We further conceptualized social media as Web 2.0 applications where users can create specific profiles and pages to facilitate online interactions. The search term ‘depression’ was used for itself.

The concept of ‘older adult’ was omitted in this review's key term search, as titles and abstracts often omit age description. Defining ‘old’ or ‘older adults’ is challenging and often requires a complex and multifaceted approach (Hurd, 1999; T. E. Seeman et al., 2001). We broadly defined older adults as adults over 65 years of age. A manual search was performed to look at the recruitment method, inclusion criteria, and descriptive tables of each literature to see if it included a sample of 65 years of age. This is to capture studies that might reveal age cohort differences between social media and depression.

The final selected articles were also searched in the Connected Papers project (https://www.connectedpapers.com/about), a visual tool created by Alex Tarnavsky, Eitan Eddie

Smolyansky, and Itay Knaan Harpaz to help researchers and applied scientists find and explore more relevant papers. Connected Papers' objective is to take a given publication and create a virtual node map of papers that are similar to it, resulting in a collection of papers that are current to the one you searched. Similar papers may include some that are relevant to your work but have a lower visibility because they have not been cited as frequently and would be difficult to find otherwise. Each of the final selected articles was reviewed in Connected Papers to find additional articles that fit the inclusion criteria.

Inclusion and Exclusion Criteria

To be included in this review, the literature had to contain the three concepts of social media use, depression, and older adults. We included quantitative design studies that explores the relationship of measures of social media use to depression or vice versa in participants that included adults over the age of 65. We excluded literature that had no defined measure of social media use and depression. This included studies of information and communication technologies (ICT), general internet use, and email use. Excluded were literature that did not include individuals aged ≥ 65 years in their recruitment, literature specific to social media and adolescents, depression variable only as a control, qualitative studies, and not written in English. The search included articles published up to July 2020. Connected Papers were used on the fifteen articles but did not further add to this literature review as the results did not fit inclusion criteria. Figure 1 shows the flowchart of the search process.

Results

Study Characteristics

Table 2 and Table 3 provide an overview of the characteristics of the fifteen identified studies. The studies were geographically diverse—United States (n=5) (Ang & Chen, 2019; Chopik, 2016; Kim et al., 2020; McDougall et al., 2016; Rosen et al., 2013; Teo et al., 2019; Wu & Chiou, 2020), Netherlands (Aarts et al., 2015), Turkey (Afsar, 2013), Norway (Andreassen et al., 2017), Poland (Błachnio et al., 2015), China (Gao et al., 2020), Korea (Gyeong-Suk et al.,

2020), Hong Kong (Lau et al., 2016), Germany (Reinecke et al., 2017) and Taiwan (Wu & Chiou, 2020). The populations were ethnically diverse adults (n=12) (Aarts et al., 2015; Andreassen et al., 2016; Ang & Chen, 2019; Błachnio et al., 2015; Chopik, 2016; Gao et al., 2020; Gyeong-Suk et al., 2020; Kim et al., 2020; Lau et al., 2016; Reinecke et al., 2017; Teo et al., 2019; Wu & Chiou, 2020), college students (included as it had no age cut-off) (Rosen et al., 2013), inpatient psychiatric patients (McDougall et al., 2016), and patients on a dialysis unit (Afsar, 2013). Of the 15 studies, six were research specific to older adults (Aarts et al., 2015; Ang & Chen, 2019; Chopik, 2016; Gyeong-Suk et al., 2020; Teo et al., 2019; Wu & Chiou, 2020), and the rest were included because older adults were included as participants. The reviewed studies sampled a broad age range from 14 to 65 years of age and older without an explicit age cut-off point. Five of the identified studies had a mean age ≥ 65 (Aarts et al., 2015; Ang & Chen, 2019; Chopik, 2016; Gyeong-Suk et al., 2020; Wu & Chiou, 2020). Participants in the reviewed studies were predominantly women.

Thirteen studies were cross-sectional in design, and two had longitudinal components. Six studies made use of available datasets—Health and Retirement Study (Chopik, 2016; Teo et al., 2019), National Health and Aging Trends Study (Ang & Chen, 2019), Longitudinal Internet Studies for the Social Sciences (Aarts et al., 2015), Living Profiles of Older People Survey (Gyeong-Suk et al., 2020), and Nurse's Health Study II (Kim et al., 2020). Data collection was mixed, with studies using online surveys, phone or face-to-face interviews, or paper-based surveys. Twelve of the 15 had depression as an outcome variable, and three had a measure of social media as an outcome variable. Of the studies reviewed, seven controlled for health variables such as self-rated health, number of diseases, subjective health, chronic illness, psychosocial physical function variables, health conditions and health behaviors, presence of medical conditions, comorbidity, and disability. In addition, six controlled for social variables that include social intimacy, emotional, social support, perceived social support, social contacts, living arrangements, and relationship satisfaction with friends and neighbors.

Social media usage measures

Across the studies, diverse measures of social media usage were employed. Social media was measured as a binary variable of yes or no (familiar or unfamiliar with social media, having social media, including Facebook or Twitter, having used social media to include using social network sites, video chatting, and online chatting). Four studies measured social media in terms of frequency of use (Aarts et al., 2015; Gao et al., 2020; McDougall et al., 2016; Rosen et al., 2013). Two studies used the sum quantity of social technology use, including social media (Chopik, 2016) and communication load (Reinecke et al., 2017). Three studies made use of validated social media scale of the Bergen Social Media Addiction Scale (Andreassen et al., 2016), Facebook Intrusion Questionnaire (Błachnio et al., 2015), and Social Media Use Integration Scale (McDougall et al., 2016). Finally, studies measured social media behavior of social resource loss on social media or being unfriended on social media (Lau et al., 2016) and regular versus unregular Facebook user, where regular are described as an active user who posts updates or information and nonregular are described as passive users who merely view or like posts rather than a comment (Kim et al., 2020).

Depression measures

The measures of depression also varied. Depression was measured using tools such as the Beck Depression Index (Afsar, 2013; McDougall et al., 2016), The Center of Epidemiology Studies Depression Scale (CES-D) (Chopik, 2016; Teo et al., 2019), and its revised version (CES-DR) (Błachnio et al., 2015; Kim et al., 2020), The Geriatric Depression Scale (Gyeong-Suk et al., 2020; Wu & Chiou, 2020), Hospital Anxiety and Depression Scale (Andreassen et al., 2016), Mental Health Index (Aarts et al., 2015), Millon Multiaxial Clinical Inventory (MCMI-III) (Rosen et al., 2013), various versions of Patient Health Questionaire—PHQ-2 (Ang & Chen, 2019), PHQ-4 (Reinecke et al., 2017), PHQ-9 (Lau et al., 2016), and World Health Organization Five Well-Being Index (WHO-5) (Gao et al., 2020).

Social media and depression

The study findings were mixed, depending on how social media use was operationalized or measured. Looking at studies in which social media use was measured as a binary variable of yes or no, Ang & Chen (2019) and Gyeong-Suk et al. (2020) showed an association, but no significant relationship between social media use and depression. The results of the study by Teo et al. (2019) study were mixed, with those who used video chat apps, such as Skype or Facetime, less likely to experience depression compared to those who used social network sites or used online chat/instant messaging. Only Wu & Chiou (2020) showed a positive association with depression when using social media measured by familiarity with social media (yes or no). For Afsar's (2013) study, those having Facebook or Twitter accounts have a lower depression score.

The association of social media uses with depression is also mixed when measured by frequency of use. Aarts et al. (2015) show a nonsignificant relation between social media use (as the frequency of use) and depression. In contrast to studies by Gao et al. (2020), McDougall et al. (2016), and Rosen et al. (2013), which showed the frequency of use associated with increased depression.

More use of social technology as measured by the index sum usage of email, social network use, online video, and phone calls, online chat or instant messaging, and smartphone use, was also associated with lower depression (Chopik, 2016). However, summing the communication load or the measure of the number of daily sent and received private emails and messages from social media shows a significant positive indirect effect on depression in the 50 to 85 age group (Reinecke et al., 2017).

In the study that used social media measurement instrument of Social Media Use Integration Scale (SMUIS), there was no significant relation to depression (McDougall et al., 2016). In the same study, the SMUIS also did not have a significant moderating effect on the relationship between social support and depression (McDougall et al., 2016). For Błachnio et al.

(2015) study, depression positively significantly predicts Facebook Intrusion, in contrast to Andreassen et al. (2016), where depression was negatively associated with addictive social media use as measured by the Bergen Social Networking Addiction Scale.

When social media behavior of being unfriended was measured, a positive association between a loss of social resources on social media and depressive symptoms was significant only among older adults but not young adults (Lau et al., 2016). In addition, social media behavior described as a regular Facebook user is shown to be more depressed compared to a nonregular Facebook user in women (Kim et al., 2020).

Discussion and Further Directions

The purpose of this review is to identify quantitative studies that examine the complex interplay between social media use and depression in older adults. Similar to previous literature reviews, the findings of our review showed the complicated relationship between social media use and depression (Baker & Algorta, 2016; Chen et al., 2021; Seabrook et al., 2016; Vahedi & Zannella, 2021; Wiwatkunupakarn et al., 2021). There is a paucity of research about the relationship of social media use to depression in older adults. Even more about older male social media users as most of the sample in the reviewed studies were predominately females. Further studies on social media use and depression should include exploring gender differences.

The reviewed articles were also mostly cross-sectional in design. Of the studies that made use of longitudinal data set, only Ang & Chen (2019) and Teo et al. (2019) made use of two data points to examine the potential relationships between social media use and depression. Social media activity variables are being added to existing longitudinal studies, thus offering a more effective means of determining social media use patterns in its relation to depression over time compared to cross-sectional studies.

There is also a noted difference in the conceptualization of social media use. Although social media use has long been established, measurement of social media use is in its early

stage in the literature (McDougall et al., 2016). Although frequency and duration measures have been used to quantify social media use, they provide insufficient evidence of how people integrate social media into their daily routines and their emotional attachment to the platform. Of the reviewed studies, only three made use of social media-related instruments: the Bergen Social Media Addiction Scale (Andreassen et al., 2016), Facebook Intrusion Questionnaire (Błachnio et al., 2015), and Social Media Use Integration Scale (McDougall et al., 2016). However, these studies only included a sample of older adults and were not specifically designed for older adults. Further studies should test the validity and reliability of these social media measures and instruments in the older adult population.

Current social media use measurements also omit descriptions of social network characteristics, including social network structure and function. Social networks in social science research include offline person-to-person contacts but can also describe online network characteristics. Established literature shows how larger networks connect individuals to a broader range of social milieus, increased access to social contacts that provide more social support (Burt, 1987; T. Seeman & Berkman, 1988; Wellman & Wortley, 1990). Social media use in terms of structure or size of one's online social network in its relationship to depression is understudied in older adults (Banjanin et al., 2015; Fernandez et al., 2012; Locatelli et al., 2012; Moreno et al., 2011; Tandoc et al., 2015; Wright et al., 2013). More research is needed on social media activity that describes and acknowledges the characteristics of the structure or function of an older adults' online social networks.

Our findings showed potential age variation in the relationship between social media use and depression. When examining social media use in terms of frequency of use, the results of studies that had a nonsignificant association with depression (Aarts et al., 2015) had a sample with a much older mean age compared to studies with a positive association with depression (Gao et al., 2020; McDougall et al., 2016; Rosen et al., 2013). Certain measures of social media use could have a different result for different older age cohorts.

Reviewed studies specific to older adults included variables that controlled for health—from subjective self-rated health, chronic illness, comorbidities, or health conditions and behaviors. In this review, studies specifically designed for older adults showed a nonsignificant association between social media use and depression, included health covariates (Aarts et al., 2015; Ang & Chen, 2019; Teo et al., 2019). Controlling for the combined influence of psychological factors, health-related factors, and the surrounding social environment from the living arrangement, social support, or social contacts is crucial as these characteristics may impact mental well-being specific to depression, especially in older adults (McKenzie et al., 2013; T. E. Seeman et al., 2001; Teo et al., 2013; Zebhauser et al., 2014). Therefore, it is essential to control for variables with known association with depression, such as health and social variables (Cacioppo et al., 2010; Teo et al., 2013). As social media use is inevitably tied to social variables, social support-related variables should be included in studies about social media use and depression in older adults. This is important for future research in the context of the COVID-19 pandemic, as an older adults' social life has changed social media use, possibly complicated their relationship to their social support systems.

The lack of a clear definition of 'media' in studies about social media and depression is also apparent in the articles reviewed. The diversification of social media resulted in an ever-increasing variability of social media platforms (Baker & Algorta, 2016). Although many social media platforms share characteristics, they have differences in design, function, and interface. The presence of 'media' has become embedded in the social media landscape. Facebook, as an example, was a simple social networking site used to connect college students before it had 2.6 billion users (Facebook, 2021). Facebook is now a media platform giant, where companies, celebrities, politicians, news organizations, and other entities are given access to a broad audience and consumers. Facebook has added more features such as live broadcasting, video and music database, online trading for goods and services, and money transaction. Facebook and other similar social media platforms are no longer only social networking sites, meant

simply to connect to individuals, Facebook have now allowed social contacts to be monetized, as they embed content for profit within their interface while we interact with others. Social media has allowed not only social interactions between individuals, families, and friends but also interactions between companies and consumers (De Vries et al., 2012; Gilbody et al., 2007). Social media has evolved from personal exchanges to become outlets and mediums for broadcasting news and marketing brand awareness (De Vries et al., 2012; Hermida et al., 2012). Social media offers companies, celebrities, politicians, and other entities access to consumers and a broad range of audiences. The ease of access to a broad range of audiences has shaped culture, political discourse, and public health, driving the events of the 'Arab Spring' through Twitter, the proliferation of 'fake news' on Facebook about the 2016 US presidential election and misinformation surrounding the COVID-19 pandemic (Allcott & Gentzkow, 2017; Brashier & Schacter, 2020; Bruns et al., 2013; Zarocostas, 2020). Social media not only allows older adults access to their personal social networks but also to media content such as political news, so much so that according to a recent survey from Pew Research Center in 2021 report that two-thirds of Americans report getting at least some of their news on social media (Walker & Matsa, 2021). Social media enables a constant stream of connections, exposing each user to the infinite newsfeed of the 24-hour news networks and eliciting conversations with friends, family, and other connections about issues ranging from the mundane cat videos to thought-provoking discussions about our current political climate. The quality of content and interaction in an older adult's social media network deserves much attention in research. In the context of the COVID-19 pandemic, social media use has been spotlighted as it became a tool to facilitate safe social interaction, communication, and exchange of information for older adults. The pandemic has arguably changed how older adults have used social media; and further studies are needed to investigate not only the quality of interactions in an older adult's social media use in relation to depression but also the relationship between social media use and depression during the COVID-19 pandemic.

Limitation of the review

This literature review focused on social media use in older adults but included studies that sampled older adults, though not specifically designed for older adults. In addition, the studies reviewed sampled mainly females, potentially limiting generalizability to other populations. There is an inability to measure the nature of social media among the respondents of the reviewed studies as there lack an agreed conceptualization on how to measure social media. Further studies should identify and disaggregate social media use characteristics and behaviors to see its relationship to depression in older adults.

Conclusions

The population of the United States is aging. Depression in older adults have severe consequences. Since depression is influenced by the social environment, the social media adoption of older adults may have a positive or negative influence on their mental health. With the increased adoption of social media by older adults, its benefits, and disadvantages to mental health specific to depression need to be explored. This literature review provided insight into the current research on the relationship between social media use and depression in older adults. There is a paucity of research about the relationship of social media use to depression in older adults. Further, the relationship of social media with depression in older adults is complex as age variation and multiple measures of social media use exist. Social factors and health variables could influence the relationship between social media use and depression and should be added when examining their associations. Further research should also explore the interplay between social media use, psychosocial mechanisms (social support, social influence, and social engagement), and depression. Social media has shaped and transformed older adults' relationships to how they live, communicate, and interact. As social media can influence the way we connect, engage, or support one another, these interactions have implications for older adults' mental health.

Tables

Table 1 Search strings of Literature Review

Database	Search Strings
Pubmed	("Social Media"[Mesh] OR "Social Networking"[Mesh]) AND ("Depression"[Mesh])
CINAHL Plus with Full Text	(social media or social networking) AND depression
PsycINFO	(social media OR social networking) AND depression
Web of Science	(TS=(social media OR social networking) AND TS=(depression)) AND LANGUAGE: (English)

Table 2 Table of Evidence by Outcome Variable

Depression as outcome variable										
Direct association		**Year of data collection**	**How data was collected**	**Sample Size**	**Country** **Population**	**Existing Dataset**	**Older Adult Specific**	**Depression Scale**	**Social media measure categorized**	**Confounders**
+	7 (Gao et al., 2020)	2020	online survey	4827	China community	NO	NO mean 32.3 (18 to 85)	WHO-Five Well-Being Index (WHO-5).	Frequency of use	gender, age (10-year categories), educational level (junior high school, senior high school, college and master and higher), marital status (recoded into married and other [including unmarried, divorced, and widowed]), **self-rated health (categorized as excellent, very good and good or low)**, occupation(students/retired, health care worker and others), cities(Wuhan and others), area(urban and rural).
+	10 (Lau et al., 2016)	2015	phone interview	1208	Hong Kong community	NO	NO mean 46.98 (18 to 95)	PHQ-9 Chinese	Social Media behavior	Sex, age, and education level, marital status, employment status, family income Loss of social intimacy (family members)

										Loss of social intimacy (friends) Social resource loss on social media.
+	12 (Reinecke et al., 2017)	2017~	not described	1557	Germany community	NO	NO mean 42.37 (14+)	PHQ-4	Sum quantity of social technology use that includes social media	Not described
+	13 (Rosen et al., 2013)	2012~	online survey	1143	United States college students in Southern California	NO	NO mean 30.74 (18 to 65)	Millon Multiaxial Clinical Inventory (MCMI-III)	Frequency of use	Not described
+	15 (Wu, H. Y., & Chiou, A. F., 2020)	2017-2018	not described	153	Taiwan community	NO	YES mean 71.56 (60+)	Geriatric Depression Scale Chinese	Binary variable Y/N	age, gender, instrumental activities of daily living, **number of diseases**, marital status, living arrangement, equivalized income, educational attainment, current working, the frequency of meeting friends, and **emotional social support.**
-	6 (Chopik, 2016)	2012	not described	591	United States community	Health and Retirement Study	YES mean 68.18 (50+)	CES-D	Sum quantity of social technology use that includes	Age, gender, years of education subjective health, chronic illness,

									social media	loneliness, subjective well-being
mixed	11 (McDougall et al., 2016) + / NS	2014-2015	not described	301	United States inpatient	NO	NO mean 35.7 (18-70)	Beck Depression Index	Frequency of use Score/Scale	Age, gender percieved social support
mixed	14 (Teo et al., 2019) *- for video chat* *NS for SNS and online chatting*	2012/2014	not described	1424	United States community	Health and Retirement Study two waves	YES mean 64.8	CES-D	Binary variable Y/N	Age, gender, education, race and ethnicity, marital status**, impairment in activities of daily living, physical function**
mixed	9 (Kim et al., 2020)	2017-2018	online and paper-and-pencil	49049	United States Nurses / community	Nurses Health Study II (NHS II)	NO mean 58.5 (53 to 70)	CES-DR	Social Media behavior	Sociodemographic factors, psychosocial factors, health conditions, health behaviors
NS	1 (Aarts et al., 2015)	2011/2012	online survey if no computer	626	Netherlands community	Longitudinal Internet Studies for the Social sciences	YES mean 66.94 (60+)	Mental Health Index 5	Frequency of use	Sex, age (60-64, 65-74, 75+), educational level, living arrangements (living together vs. living alone), **presence medical conditions (18 listed, 3 categorizations: none, one, two or**

										more medical conditions), difficulties in ADL, satisfaction with social contacts (0-entirely dissatisfied to 10-entirely satisfied).
NS	4 (Ang, S amd Chen, T.Y, 2019)	2011	not described	3401	United States community	National Health and Aging Trends Study two waves	YES mean 75.2 (65+)	PHQ-2	Binary variable Y/N	**Sleep problems, comorbidity, disability, cognitive function** and other online activities, sociodemographic characteristics and **living arrangements.**
NS	8 (Gyeong-suk et al., 2020)	2017	interviewers	10073	South Korea community	Living Profiles of Older People Survey Q3Y	YES mean women 73.61 mean men 74.07 (65+)	Geriatric Depression Scale-Short Form (SGDS-K)	Binary variable Y/N	Age – three categories (65-74, 75-84, 85 and over), Area of residence, Living Arrangement, Education, Economic Activity, Annual Household Income, **Relationship satisfaction with friends and neighbors.**
Social Media measure as outcome variable										
Direct association		**Year of data collection**	**How data was collected**		**Country** **Population**	**Existing Dataset**	**Older Adult Specific**	**Depression Scale**	**Social media measure categorized**	**Confounders**

+	5 (Błachnio et al., 2015)	2014	online survey online recruitment	672	Poland community	NO	NO mean 27.53 (15 to 75)	CES-DR	Score/Scale	Gender and age
-	2 (Afsar, 2013)	2012~ n/a	n/a	134	Turkey dialysis patients	NO	NO mean 53 sd 13.4	Beck Depression Index	Binary variable Y/N	Age (years), gender (male/female), body mass index (kg/m2), smokers/nonsmokers, educational status (primary-secondary school, high school, university), married/nonmarried, economic status (good/bad), HD access (fistula/graft/catheter), living status (living alone/or with partner),
-	3 (Andreassen et al., 2016)	2014	online survey	23533	Norway community	NO	NO mean 35.8 (16 to 88)	Hospital Anxiety and Depression Scale	Score/Scale	Age, gender, marital status, and education.

Table 3 Extended Table of Evidence

		Sample Size	Mean age	Country	Design	Social Media Measure	Depression Measure	Confounders	Analysis	
1	(Aarts et al., 2015)	626	66.94	Netherlands Community sample	Cross-sectional survey Secondary analysis of Longitudinal Internet studies in the Social Sciences	Frequency of SNS use in the past two months (low, medium, high)	Mental Health Index 5 Past Month	Sex, age (60-64, 65-74, 75+), educational level, living arrangements (living together vs. living alone), presence medical conditions (18 listed, 3 categorizations: none, one, two or more medical conditions), difficulties in ADL, satisfaction with social contacts (0-entirely dissatisfied to 10-entirely satisfied).	Multivariate regression analysis (B)	Frequency of SNS usage not associated to depression.
2	(Afsar, 2013)	134	53	Turkey HD patients	Cross-sectional survey Primary Data	Have Facebook Have Twitter	Beck Depression Index Past Week	Age (years), gender (male/female), body mass index (kg/m2), smokers/nonsmokers, educational status (primary-secondary school, high school, university), married/nonmarried, economic status (good/bad), HD access (fistula/graft/catheter), living status (living alone/or with partner),	Correlation (r) Multivariate regression (B)	Correlation (r) Lower BDI score correlated with having a Facebook account. Lower BDI score correlated with having a Twitter account. Multivariate regression (B) Lower depression score predicts having a Facebook and Twitter account.
3	(Andreassen et al., 2016)	23533	35.8	Norway community	Cross-sectional survey Primary Data	Bergen Social Networking Addiction Scale	Hospital Anxiety and Depression Scale	Age, gender, marital status, and education.	Correlation (r) Hierarchical regression analysis (B)	Correlation (r) - Higher addictive social networking score correlated with higher depression. Hierarchical regression analysis (B) - Depression was negatively associated with addictive SNS use.
4	(Ang, S amd Chen,	3401	75.2	United States	Longitudinal design, two	Online social participation—"in the last	PHQ-2 Past two-weeks	Sleep problems, comorbidity, disability, cognitive function and other online activities,	Logistic Regression with lagged	Online social participation was associated with

	T.Y, 2019)			National Health and Aging Trends Study- medicare benificiaries	wave panel data. Secondary analysis of data from National Health and Aging Trends Study	month, have you gone on the internet or online to visit social network sites?" Past Month		sociodemographic characteristics and living arrangements.	dependent variable. Interaction term for moderating effect of online social participation	lower odds of depression at follow up adjusting for covariates, but this effect was not significant.
5	(Błachnio et al., 2015)	672	27.53	Poland Polish speakers who use Facebook	Cross-sectional Primary Data	Facebook Intrusion Questionnaire. Translated to Polish	CES-DR	Gender and age	Hierarchical regression analysis (B)	Depression significantly predicits Facebook intrusion. Daily internet use time in minutes, gender, and age are predictors of Facebook intrusion. Being male gender, younger age, extensive number of minutes spent online predicts Facebook intrusion.
6	(Chopik, 2016)	591	68.18	United States Representative sample of individuals aged 50+ the United States	Cross-sectional Secondary analysis from the 2012 wave of the Health and Retirement Study	Technology use—sum quantity of social technology used	CES-D Past week	Age, gender, years of education subjective health, chronic illness, loneliness, subjective well-being	Correlation (r) Mediation Analysis (B)	Correlation (r) – Higher technology use significantly less depression. Higher technology use was significantly associated with lower depression when controlling for age, gender, and years of education. The link between technology use and mental and physical health was mediated by loneliness. Higher technology use is associated with fewer depressive symptoms—this relationship is

										mediated by loneliness.
7	(Gao et al., 2020)	4827	32.3	China Chinese citizen, online survey	Cross-sectional Primary Data	Social media exposure was measured by asking how often respondents during the past week were exposed to news and information about COVID-19 on social media, such as Sina weibo, Zhihu, Douban, WeChat and etc.	WHO-Five Well-Being Index (WHO-5).	gender, age (10-year categories), educational level (junior high school, senior high school, college and master and higher), marital status (recoded into married and other [including unmarried, divorced, and widowed]), self-rated health (categorized as excellent, very good and good or low), occupation(students/retired, health care worker and others), cities(Wuhan and others), area(urban and rural).	Logistic Regression	Frequent Social Media Exposure can increase the adjusted odds (OR = 1.91, 95%CI: 1.52–2.41) of combined depression and anxiety compared with less Social Media Exposure after controlling for all covariates.
8	(Gyeong-suk et al., 2020)	10073	73.84	South Korea a nationally representative sample of older men and women in South Korea.	Cross-sectional survey Secondary analysis from Living Profiles of Older People Survey	SNS usage – “Do you use social networking sites such as Band, Kakao, Talk, Twitter, Facebook, Instagram, or Telegram Talk?” Yes/No	Geriatric Depression Scale-Short Form (SGDS-K)	Age – three categories (65-74, 75-84, 85 and over), Area of residence, Living Arrangement, Education, Economic Activity, Annual Household Income, Relationship satisfaction with friends and neighbors.	Chi-square Logistic Regression Wald-chi square test	Older men and women who use SNSs both reported lower depressive symptoms than those who report no to using SNS use. The absence of SNS use was associated with a higher the risk of depressive symptoms among older men (OR = 1.59, 95% CI = 1.13–2.23), but not older women (OR = 1.28, 95% CI = 0.96–1.69). Although gender differences were not statistically significant in the effect of SNS use on depressive

										symptoms after control for covariates, SNS usage was associated with a 60% decrease in the risks of depressive symptoms among older men
9	(Kim et al., 2020)	49049	58.5	United Staes Originally 116,430 female nurses aged 25-42 years at cohort initiation in 1989. 90% follow-up rate	Cross-sectional survey Secondary analysis from the Nurses Health Study II (NHS II)	"Do you regularly post updates or information on social media (rather than just viewing or 'liking' posts)?". Nonregular Facebook vs regular Facebook use.	CESD-R	Sociodemographic factors, psychosocial factors, health conditions, health behaviors	Chi-square T-test	Differences in the number of women who were depressed among regular and nonregular users were somewhat stronger (28% with depression vs. 23% (ϕ = 0.05); OR = 1.27, 95% CI: 1.22, 1.33). Depression - 28% regular vs 23% non-regular Women only. Active vs passive use.
10	(Lau et al., 2016)	1208	46.98	Hong Kong	Cross-sectional survey Primary data A computer-assisted telephone interview (CATI) was used for recruitment and data collection	Social resource loss on social media—intimacy with family or friends on social media	PHQ-9 Chinese Last two weeks	Sex, age, and education level, marital status, employment status, family income Loss of social intimacy (family members) Loss of social intimacy (friends) Social resource loss on social media.	Correlation (r) Heirarchal Multiple regression (B)	Age has a significant moderating effect on the association between social resource loss on social media and depressive symptoms. Positive association between social resource loss on social media and depressive symptoms was significant only among middle-aged and older

										adults but not young adults---simplified, getting "unfriended" or lose people in SM, more depression for older adults. Social resource loss on social media is associated with higher depressive symptoms among middle-aged and older adults, independent of general social resource loss.
11	(McDougall et al., 2016)	301	35.7	United States	Cross-sectional survey Primary data Data was collected from patients admitted on one of the two adult inpatient psychiatric units.	Social Media Use Integration Scale and Hours of SNS use per day	Beck Depression Index	Age, gender percieved social support	Correlation (r) Heirarchal multivariable regression (B)	Correlation (r) – Higher hours of sns use per day significantly correlated to higher BDI total. SMUIS total not significantly correlated to BDI total. Heirarchal multivariable regression (B) SNS use, measured by both SMUIS scores and hours of SNS use per day, did not have a significant moderator effect on the relationship between perceived social support and depression. Block 2 significant association of hours of SNS use to Depression

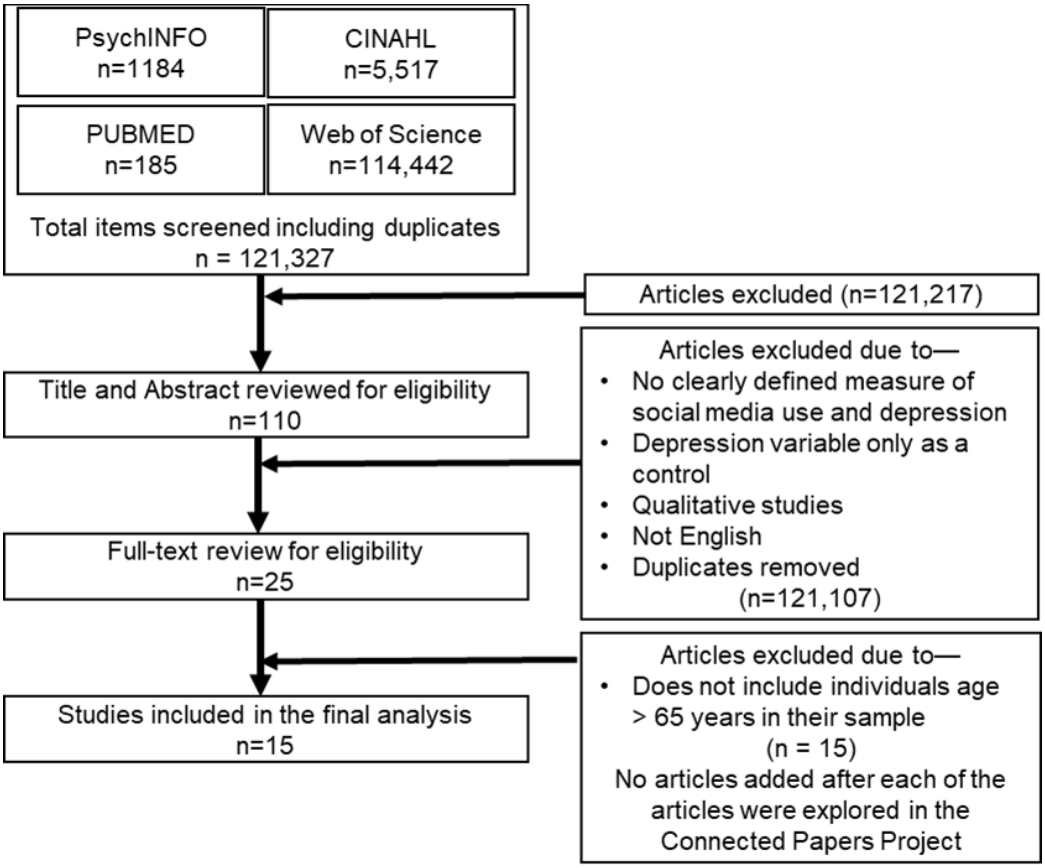
12	(Reineck e et al., 2017)	1557	42.37	Germany	Cross-sectional survey Primary data German Market research institute USUMA	communication load, messages from social media	PHQ-4	N/A	Correlation (r) Structural Equation Model	Correlation (r) – significant association messeges sent, messeges received, urge to check messages, internet multi-tasking to depression There is a significant indirect effect of communication load on burnout and depression/anxiety.
13	(Rosen et al., 2013)	1143	30.74	United States	Cross-sectional study Primary data Participants were given web address to complete the survey	Daily media, technology and Facebook usage and Technology related anxiety 1. ypical usage in a day 0 to more than 8 hrs a day 2. ow often they used Facebook 3. ow often they did 15 different facebook activities 4. stimate of number of Facebook friends they have met, never met but have a close	Millon Multiaxial Clinical Inventory (MCMI-III)	N/A	Heirarchichal Regression Analysis (B)	Facebook impression management predicted more signs of major depression. Having positive attitude toward technology predicted fewer signs of major depression. Preference to multi-task is a strong predictor for major depression Major depression is a strong predictor of anxiety about checking text messages and anxiety about checking Facebook/social networking. Facebook use accounted for major depression with FB general

						personal relationship Frequency of impression/profile management on SNS				use, impression management. More daily use of other media such as more time spent online predicted more signs of major depression. More time spent talking on the telephone predicted fewer signs of major depression. More friends predict diminished signs of major depression.
14	(Teo et al., 2019)	1424	64.8	United States	Longitudinal Secondary analysis of 2012 and 2014 wave of Health Retirement Study	Communication Technology Use •Email (Do you use email?) •Social networks (do you use social networks such as Facebook or Twitter?" •Video chat (Do you use online (or internet based) video or phone calls such as Skype?" •Online chatting or instant messaging ("do you use online chatting or instant messaging"?	CES-D	Age, gender, education, race and ethnicity, marital status, impairment in activities of daily living, physical function	Logistic multivariate regression (B) Wald-chi square test	Those who use three or four technologies had a significantly lower odds of developing depressive symptom (AOR: 0.40; 95% CI: 0.16-0.98; Wald test, $F(1,56)=4.20$, $p=0.045$) Older adults that regularly use video chatting apps—such as Skype or FaceTime were less likely to experience symptoms associated with depression when compared to those who used other social media apps.
15	(Wu, H. Y., & Chiou, A. F., 2020)	153	71.56	Taiwan	Cross-sectional survey Primary data	Unfamiliarity or familiarity with the use of social media, as well as determining the	Geriatric Depression Scale Chinese	age, gender, instrumental activities of daily living, number of diseases, marital status, living arrangement, equivalized income, educational attainment, current working, the frequency of	Correlation (r) Heirarchal regression (B)	The use of social media, intergenerational relationships, and social support were significant

					Convenience sample of 158-community-dwelling older adults from community activity centers in northern Taiwan	frequency and types of social media use.		meeting friends, and emotional social support.		predictors of depressive symptoms, after controlling for other variables. (B = 2.25, p = .004)

Figures

Figure 1 Flowchart of search process



References

Aarts, S., Peek, S. T. M., & Wouters, E. J. M. (2015). The relation between social network site usage and loneliness and mental health in community-dwelling older adults. *International Journal of Geriatric Psychiatry*, *30*(9), 942–949. https://doi.org/10.1002/gps.4241

Afsar, B. (2013). The relation between Internet and social media use and the demographic and clinical parameters, quality of life, depression, cognitive function and sleep quality in hemodialysis patients. *General Hospital Psychiatry*, *35*(6), 625–630. https://doi.org/10.1016/j.genhosppsych.2013.05.001

Allcott, H., & Gentzkow, M. (2017). Social Media and Fake News in the 2016 Election. *Journal of Economic Perspectives*, *31*(2), 211–236. https://doi.org/10.1257/jep.31.2.211

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors*, *30*(2), 252–262. https://doi.org/10.1037/adb0000160

Andreassen, C. S., Pallesen, S., & Griffiths, M. D. (2017). The relationship between addictive use of social media, narcissism, and self-esteem: Findings from a large national survey. *Addictive Behaviors*, *64*, 287–293. https://doi.org/10.1016/j.addbeh.2016.03.006

Ang, S., & Chen, T.-Y. (2019). Going Online to Stay Connected: Online Social Participation Buffers the Relationship Between Pain and Depression. *The Journals of Gerontology: Series B*, *74*(6), 1020–1031. https://doi.org/10.1093/geronb/gby109

Baker, D. A., & Algorta, G. P. (2016). The Relationship Between Online Social Networking and Depression: A Systematic Review of Quantitative Studies. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 638–648. https://doi.org/10.1089/cyber.2016.0206

Banjanin, N., Banjanin, N., Dimitrijevic, I., & Pantic, I. (2015). Relationship between internet use and depression: Focus on physiological mood oscillations, social networking and online addictive behavior. *Computers in Human Behavior*, *43*, 308–312. https://doi.org/10.1016/J.CHB.2014.11.013

Barak, A., Boniel-Nissim, M., & Suler, J. (2008). Fostering empowerment in online support groups. *Computers in Human Behavior*, *24*(5), 1867–1883. https://doi.org/10.1016/j.chb.2008.02.004

Bessière, K., Kiesler, S., Kraut, R., & Boneva, B. S. (2008). Effects of Internet Use and Social Resources on Changes in Depression. *Information, Communication & Society*, *11*(1), 47–70. https://doi.org/10.1080/13691180701858851

Błachnio, A., Przepiórka, A., & Pantic, I. (2015). Internet use, Facebook intrusion, and depression: Results of a cross-sectional study. *European Psychiatry*, *30*(6), 681–684. https://doi.org/10.1016/j.eurpsy.2015.04.002

Boll, F., & Brune, P. (2016). Online Support for the Elderly – Why Service and Social Network Platforms should be Integrated. *Procedia Computer Science*, *98*(auICTH), 395–400. https://doi.org/10.1016/j.procs.2016.09.060

Boyd, D. (2014). *It's Complicated: The Social Lives of Networked Teens*. Yale University Press.

Boyd, D. m., & Ellison, N. B. (2007). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. https://doi.org/10.1111/j.1083-6101.2007.00393.x

Brashier, N. M., & Schacter, D. L. (2020). Aging in an Era of Fake News. *Current Directions in Psychological Science*, *29*(3), 316–323. https://doi.org/10.1177/0963721420915872

Bruns, A., Highfield, T., & Burgess, J. (2013). The Arab Spring and Social Media Audiences: English and Arabic Twitter Users and Their Networks. *American Behavioral Scientist*, *57*(7), 871–898. https://doi.org/10.1177/0002764213479374

Burt, R. S. (1987). A note on strangers, friends and happiness. *Social Networks*, *9*(4), 311–331. https://doi.org/10.1016/0378-8733(87)90002-5

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. a. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging*, *25*(2), 453–463. https://doi.org/10.1037/a0017216

Cahoon, C. G. (2012). Depression in Older Adults. *American Journal of Nursing*, *112*(11), 22–30. https://doi.org/10.1097/01.NAJ.0000422251.65212.4b

Centers for Disease Control. (2013). The State of Aging and Health in America 2013. In *Centers for Disease Control and Prevention US Dept of Health and Human Services*. https://doi.org/10.2217/1745509X.3.2.139

Chakraborty, R., Vishik, C., & Rao, H. R. (2013). Privacy preserving actions of older adults on social media: Exploring the behavior of opting out of information sharing. *Decision Support Systems*, *55*(4). https://doi.org/10.1016/j.dss.2013.01.004

Chen, E., Wood, D., & Ysseldyk, R. (2021). Online Social Networking and Mental Health among Older Adults: A Scoping Review. In *Canadian Journal on Aging*. Cambridge University Press. https://doi.org/10.1017/S0714980821000040

Chopik, W. J. (2016). The Benefits of Social Technology Use Among Older Adults Are Mediated by Reduced Loneliness. *Cyberpsychology, Behavior, and Social Networking*, *19*(9), 551–556. https://doi.org/10.1089/cyber.2016.0151

Chui, H., Gerstorf, D., Hoppmann, C. A., & Luszcz, M. A. (2015). Trajectories of depressive symptoms in old age: Integrating age-, pathology-, and mortality-related changes. *Psychology and Aging*, *30*(4), 940–951. https://doi.org/10.1037/pag0000054

Coelho, J., & Duarte, C. (2016). A literature survey on older adults' use of social network services and social applications. *Computers in Human Behavior*, *58*, 187–205. https://doi.org/10.1016/j.chb.2015.12.053

Colby, S. L., & Ortman, J. M. (2014). The Baby Boom Cohort in the United States : 2012 to 2060. *US Census Bureau*, 16. https://doi.org/P25-1141

Cotten, S. R., Anderson, W. A., & McCullough, B. M. (2013). Impact of internet use on loneliness and contact with others among older adults: Cross-sectional analysis. *Journal of Medical Internet Research*, *15*(2), 1–13. https://doi.org/10.2196/jmir.2306

Cyr, N. R. (2007). Depression and older adults. *AORN Journal*, *85*(2), 397–401. https://doi.org/10.1016/S0001-2092(07)60050-7

De Vries, L., Gensler, S., & Leeflang, P. S. H. (2012). Popularity of Brand Posts on Brand Fan Pages: An Investigation of the Effects of Social Media Marketing. *Journal of Interactive Marketing*, *26*(2), 83–91. https://doi.org/10.1016/j.intmar.2012.01.003

Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of Depression Symptoms in US Adults Before and During the COVID-19 Pandemic. *JAMA Network Open*, *3*(9). https://doi.org/10.1001/JAMANETWORKOPEN.2020.19686

Fernandez, K. C., Levinson, C. A., & Rodebaugh, T. L. (2012). Profiling: Predicting Social Anxiety From Facebook Profiles. *Http://Dx.Doi.Org/10.1177/1948550611434967*, *3*(6), 706–713. https://doi.org/10.1177/1948550611434967

Fiske, A., Wetherell, J., & Gatz, M. (2009). Depression in older adults. *Annual Review of Clinical …*, *112*(11), 363–389. https://doi.org/10.1146/annurev.clinpsy.032408.153621.Depression

Fuchs, C. (2017). *Social media: A critical introduction* (M. Ainsley, Ed.; 2nd ed.). Sage.

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during COVID-19 outbreak. *PLOS ONE*, *15*(4). https://doi.org/10.1371/journal.pone.0231924

Gilbody, S., Richards, D., Brealey, S., & Hewitt, C. (2007). Screening for depression in medical settings with the Patient Health Questionnaire (PHQ): A diagnostic meta-analysis. *Journal of General Internal Medicine*, *22*(11), 1596–1602. https://doi.org/10.1007/s11606-007-0333-y

Goswami, S., Kobler, F., Leimeister, J., & Krcmar, H. (2010). Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly. *International Conference on Information System 2010*.

Greenwood, S., Perrin, A., & Duggan, M. (2016). Social Media Update 2016. *Pew Research Center*, *November*. http://assets.pewresearch.org/wp-content/uploads/sites/14/2016/11/10132827/PI_2016.11.11_Social-Media-Update_FINAL.pdf

Gyeong-Suk, J., Kyung-Won, C., & Kwang-Sim, J. (2020). Social networking site usage and its' impact on depressive symptoms among older men and women in south korea. *International Journal of Environmental Research and Public Health*, *17*(8). https://doi.org/10.3390/ijerph17082670

Hall, J. A. (2016). When is social media use social interaction? Defining mediated social interaction. *New Media & Society*, 1–18. https://doi.org/10.1177/1461444816660782

Hamm, M. P., Chisholm, A., Shulhan, J., Milne, A., Scott, S. D., Given, L. M., & Hartling, L. (2013). Social media use among patients and caregivers: a scoping review. *BMJ Open*, *3*(5), 1–10. https://doi.org/10.1136/bmjopen-2013-002819

Herbolsheimer, F., Ungar, N., & Peter, R. (2018). Why Is Social Isolation Among Older Adults Associated with Depressive Symptoms? The Mediating Role of Out-of-Home Physical Activity. *International Journal of Behavioral Medicine*, *25*(6), 649–657. https://doi.org/10.1007/S12529-018-9752-X/TABLES/2

Hermida, A., Fletcher, F., Korell, D., & Logan, D. (2012). Share, Like, Recommend. *Journalism Studies*, *13*(5–6), 815–824. https://doi.org/10.1080/1461670X.2012.664430

Hope, A., Schwaba, T., & Piper, A. M. (2014). Understanding digital and material social communications for older adults. *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems - CHI '14*, 3903–3912. https://doi.org/10.1145/2556288.2557133

Hurd, L. C. (1999). We're not old!: Older Women's Negotiation of Aging and Oldness. *Journal of Aging Studies*, *13*(4), 419–439. https://doi.org/10.1016/S0890-4065(99)00019-5

Johnson, J. (2021). *Number of social media users as of January 2021 (in billions)*. https://www.statista.com/statistics/617136/digital-population-worldwide/

Kaplan, A., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, *53*(1), 59–68.

Khosravi, P., Rezvani, A., & Wiewiora, A. (2016). The impact of technology on older adults' social isolation. *Computers in Human Behavior*, *63*, 594–603. https://doi.org/10.1016/J.CHB.2016.05.092

Kim, E. S., James, P., Zevon, E. S., Trudel-Fitzgerald, C., Kubzansky, L. D., & Grodstein, F. (2020). Social Media as an Emerging Data Resource for Epidemiologic Research: Characteristics of Regular and Nonregular Social Media Users in Nurses' Health Study II. *American Journal of Epidemiology*, *189*(2). https://doi.org/10.1093/aje/kwz224

Korda, H., & Itani, Z. (2011). Harnessing Social Media for Health Promotion and Behavior Change. *Health Promotion Practice*, 15–23. https://doi.org/10.1177/1524839911405850

Lau, K. M., Hou, W. K., Hall, B. J., Canetti, D., Ng, S. M., Lam, A. I. F., & Hobfoll, S. E. (2016). Social media and mental health in democracy movement in Hong Kong: A population-based study. *Computers in Human Behavior*, *64*, 656–662. https://doi.org/10.1016/j.chb.2016.07.028

Leist, A. K. (2013). Social media use of older adults: A mini-review. *Gerontology*, *59*(4), 378–384. https://doi.org/10.1159/000346818

Llorente-Barroso, C., Viñarás-Abad, M., & Sánchez-Valle, M. (2015). Internet and the elderly: Enhancing active ageing. *Comunicar*, *23*(45). https://doi.org/10.3916/C45-2015-03

Locatelli, S., Kluwe, K., & Bryant, F. (2012). Facebook Use and the Tendency to Ruminate among College Students: Testing Mediational Hypotheses: *Http://Dx.Doi.Org/10.2190/EC.46.4.d*, *46*(4), 377–394. https://doi.org/10.2190/EC.46.4.D

Luppa, M., Sikorski, C., Motzek, T., Konnopka, A., König, H., & Riedel-Heller, S. (2012). Health Service Utilization and Costs of Depression in Late Life – A Systematic Review. *DMW - Deutsche Medizinische Wochenschrift*, *137*(S 03), A205. https://doi.org/10.1055/s-0032-1323368

McDougall, M. A., Walsh, M., Wattier, K., Knigge, R., Miller, L., Stevermer, M., & Fogas, B. S. (2016). The effect of social networking sites on the relationship between perceived social support and depression. *Psychiatry Research*, *246*, 223–229. https://doi.org/10.1016/j.psychres.2016.09.018

McKenzie, L. E., Polur, R. N., Wesley, C., Allen, J. D., McKeown, R. E., & Zhang, J. (2013). Social contacts and depression in middle and advanced adulthood: Findings from a US national

survey, 2005-2008. *International Journal of Social Psychiatry*, *59*(7), 627–635. https://doi.org/10.1177/0020764012463302

Meeks, T. W., Vahia, I. V., Lavretsky, H., Kulkarni, G., & Jeste, D. V. (2011). A tune in “a minor” can “b major”: A review of epidemiology, illness course, and public health implications of subthreshold depression in older adults. *Journal of Affective Disorders*, *129*(1–3), 126–142. https://doi.org/10.1016/j.jad.2010.09.015

Moreno, M. A., Jelenchick, L. A., Egan, K. G., Cox, E., Young, H., Gannon, K. E., & Becker, T. (2011). Feeling bad on Facebook: depression disclosures by college students on a social networking site. *Depression and Anxiety*, *28*(6), 447–455. https://doi.org/10.1002/DA.20805

Mukhtar, S. (2020). Mental health and emotional impact of COVID-19: Applying Health Belief Model for medical staff to general public of Pakistan. In *Brain, Behavior, and Immunity* (Vol. 87, pp. 28–29). Academic Press Inc. https://doi.org/10.1016/j.bbi.2020.04.012

Nef, T., Ganea, R. L., Müri, R. M., & Mosimann, U. P. (2013). Social networking sites and older users – a systematic review. *International Psychogeriatrics*, *25*(07). https://doi.org/10.1017/S1041610213000355

Nicholson, N. R. (2012). A review of social isolation: an important but underassessed condition in older adults. *The Journal of Primary Prevention*, *33*(2–3), 137–152. https://doi.org/10.1007/S10935-012-0271-2

Obar, J. A., & Wildman, S. S. (2015). Social media definition and the governance challenge: An introduction to the special issue. *Telecommunications Policy*, *39*(9), 745–750. https://doi.org/10.1016/j.telpol.2015.07.014

Perrin, A. (2015). Social Media Usage: 2005-2015. In *Pew Research Center* (Issue October). https://doi.org/202.419.4372

Pew Research Center. (2021). *Social Media Fact Sheet*. https://www.pewresearch.org/internet/fact-sheet/social-media/

Pietrabissa, G., & Simpson, S. G. (2020). Psychological Consequences of Social Isolation During COVID-19 Outbreak. *Frontiers in Psychology*, *11*, 2201. https://doi.org/10.3389/FPSYG.2020.02201/BIBTEX

Raj, A. (2004). Depression in the elderly. *Postgraduate Medicine*, *115*(6), 26–42. https://doi.org/10.3810/pgm.2004.06.1534

Reinecke, L., Aufenanger, S., Beutel, M. E., Dreier, M., Quiring, O., Stark, B., Wölfling, K., & Müller, K. W. (2017). Digital Stress over the Life Span: The Effects of Communication Load and Internet Multitasking on Perceived Stress and Psychological Health Impairments in a German Probability Sample. *Media Psychology*, *20*(1), 90–115. https://doi.org/10.1080/15213269.2015.1121832

Ressler, P., & Glazer, G. (2010). Legislative: Nursing’s Engagement in Health Policy and Healthcare Through Social Media. *The Online Journal of Issues in Nursing*, *16*(1). https://doi.org/10.3912/OJIN.Vol16No01LegCol01

Rodda, J., Walker, Z., & Carter, J. (2011). Depression in older adults. *BMJ*, *343*(sep28 1), d5219–d5219. https://doi.org/10.1136/bmj.d5219

Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior*, *29*(3), 1243–1254. https://doi.org/10.1016/j.chb.2012.11.012

Seabrook, E. M., Kern, M. L., & Rickard, N. S. (2016). Social Networking Sites, Depression, and Anxiety: A Systematic Review. *JMIR Mental Health*, *3*(4), e50. https://doi.org/10.2196/mental.5842

Seeman, T., & Berkman, L. (1988). Structural characteristics of social networks and their relationship with social support in the elderly: who provides support. *Social Science & Medicine*, *26*(7), 737–749. https://doi.org/10.1016/0277-9536(88)90065-2

Seeman, T. E., Lusignolo, T. M., Albert, M., & Berkman, L. (2001). Social relationships, social support, and patterns of cognitive aging in healthy, high-functioning older adults: MacArthur Studies of Successful Aging. *Health Psychology*, *20*(4), 243–255. https://doi.org/10.1037//0278-6133.20.4.243

Sutin, A. R., Terracciano, A., Milaneschi, Y., An, Y., Ferrucci, L., & Zonderman, A. B. (2013). The trajectory of depressive symptoms across the adult life span. *JAMA Psychiatry*, *70*(8), 803–811. https://doi.org/10.1001/jamapsychiatry.2013.193

Szczerbińska, K., Hirdes, J. P., & Życzkowska, J. (2012). Good News and Bad News: Depressive Symptoms Decline and Undertreatment Increases With Age in Home Care and Institutional Settings. *The American Journal of Geriatric Psychiatry*, *20*(12), 1045–1056. https://doi.org/10.1097/JGP.0b013e3182331702

Tandoc, E. C., Ferrucci, P., & Duffy, M. (2015). Facebook use, envy, and depression among college students: Is facebooking depressing? *Computers in Human Behavior*, *43*, 139–146. https://doi.org/10.1016/J.CHB.2014.10.053

Teo, A. R., Choi, H. J., & Valenstein, M. (2013). Social Relationships and Depression: Ten-Year Follow-Up from a Nationally Representative Study. *PLoS ONE*, *8*(4), 1–8. https://doi.org/10.1371/journal.pone.0062396

Teo, A. R., Markwardt, S., & Hinton, L. (2019). Using Skype to Beat the Blues: Longitudinal Data from a National Representative Sample. *American Journal of Geriatric Psychiatry*, *27*(3), 254–262. https://doi.org/10.1016/j.jagp.2018.10.014

Tomasino, K. N., Lattie, E. G., Ho, J., Palac, H. L., Kaiser, S. M., & Mohr, D. C. (2017). Harnessing Peer Support in an Online Intervention for Older Adults with Depression. *The American Journal of Geriatric Psychiatry*, *25*(10), 1109–1119. https://doi.org/10.1016/j.jagp.2017.04.015

Twenge, J. M. (2015). Time Period and Birth Cohort Differences in Depressive Symptoms in the U.S., 1982–2013. *Social Indicators Research*, *121*(2), 437–454. https://doi.org/10.1007/s11205-014-0647-1

Vahedi, Z., & Zannella, L. (2021). The association between self-reported depressive symptoms and the use of social networking sites (SNS): A meta-analysis. *Current Psychology*, *40*(5), 2174–2189. https://doi.org/10.1007/s12144-019-0150-6

Vink, D., Aartsen, M. J., & Schoevers, R. A. (2008). Risk factors for anxiety and depression in the elderly: A review. *Journal of Affective Disorders*, *106*(1–2), 29–44. https://doi.org/10.1016/j.jad.2007.06.005

Walker, M., & Matsa, K. E. (2021). *News Consumption Across Social Media in 2021*. Pew Research Center. https://www.pewresearch.org/journalism/2021/09/20/news-consumption-across-social-media-in-2021/

Wellman, B., & Wortley, S. (1990). Different Strokes from Different Folks: Community Ties and Social Support. *American Journal of Sociology*, *96*(3), 558–588. https://doi.org/10.1086/229572

Wiwatkunupakarn, N., Pateekhum, C., Aramrat, C., Jirapornchaoren, W., Pinyopornpanish, K., & Angkurawaranon, C. (2021). Social networking site usage: A systematic review of its relationship with social isolation, loneliness, and depression among older adults. In *Aging and Mental Health*. Routledge. https://doi.org/10.1080/13607863.2021.1966745

World Health Organization. (2017). *Depression and Other Common Mental Disorders Global Health Estimates*.

Wright, K. B., Rosenberg, J., Egbert, N., Ploeger, N. A., Bernard, D. R., & King, S. (2013). Communication Competence, Social Support, and Depression Among College Students: A Model of Facebook and Face-to-Face Support Network Influence. *Http://Dx.Doi.Org/10.1080/10810730.2012.688250*, *18*(1), 41–57. https://doi.org/10.1080/10810730.2012.688250

Wu, H. Y., & Chiou, A. F. (2020). Social media usage, social support, intergenerational relationships, and depressive symptoms among older adults. *Geriatric Nursing*, *41*(5), 615–621. https://doi.org/10.1016/j.gerinurse.2020.03.016

Zarocostas, J. (2020). How to fight an infodemic. *The Lancet*, *395*(10225), 676. https://doi.org/10.1016/S0140-6736(20)30461-X

Zebhauser, A., Hofmann-Xu, L., Baumert, J., Häfner, S., Lacruz, M. E., Emeny, R. T., Döring, A., Grill, E., Huber, D., Peters, A., & Ladwig, K. H. (2014). How much does it hurt to be lonely? Mental and physical differences between older men and women in the KORA-Age Study. *International Journal of Geriatric Psychiatry*, *29*(3), 245–252. https://doi.org/10.1002/gps.3998

CHAPTER 3

Theoretical Framework

Chapter 3. Theoretical Framework

Introduction

The word ‘social’ in social networks is inevitably tied to terms of community, connectivity, and relationships (Fuchs, 2017; Gillespie, 2013). Therefore, it is relevant to explore the phenomenon of this dissertation using a model that presents a conceptualization of how health is affected by social relationships. Social relationships have been considered a significant predictor of mental well-being (Antonucci et al., 2010; Fiori et al., 2006; Kawachi & Berkman, 2001). Berkman et al.'s (2000) conceptual model illustrates how social networks are part of a large chain that cascades from the macro social-structural context to a psycho-biological process to form a process by which psychosocial mechanisms impacts health (Figure 1). Berkman et al. (2000) recognized the need for an overarching model, as many terms related to social relationships, such as social networks, social support, social ties, and social integration, are loosely and interchangeably used.

The theoretical framework and orientation of what this paper will call Berkman et al.’s Social Integration Model comes from an eclectic mix of theoretical approaches, from sociology, anthropology, psychology, and epidemiology. The Social Integration Model integrates theories and empirical evidence across multiple disciplines. They include influence from Emile Durkheim, father of sociology and his work understanding how social integration influences mortality; John Bowlby, a psychoanalyst who proposed the attachment theory, which suggests how the environment in early childhood is critical to the cause of neurosis. The framework is also influenced by anthropologist John Barnes, Elizabeth Bott, Clyde Mitchel, and quantitative sociologist Claude Fischer, Edward Laumann, Barry Wellman, and Peter Marsden for their work developing and expanding studies on social network analysis (Berkman et al., 2000).

The Social Integration Model

The Social Integration Model embeds the social network between two factors of upstream forces and downstream forces. Berkman et al. (2000) acknowledged that the

upstream forces identify conditions that influence the development and shape the structure of social networks, while the downstream forces link social networks to health outcomes through social support functions. Upstream forces include the macro (social-structural conditions) and mezzo (social networks) level concepts, while the downstream forces are micro (psychosocial mechanisms), which cascade to the pathways of health.

Macro-level social-structural conditions

The macro-level concepts in the Berkman et al. (2000) model are the broader social and cultural forces that may condition and shape the nature and structure of the social networks. Berkman et al. (2000) recognize that this larger macro-social context, which conditions and sustains social networks, is primarily absent on social networks and health studies. These macro-level sociostructural conditions include concepts such as culture (the language, norms, and values), socioeconomic factors (related to the presence of inequality, discrimination, conflict), sociodemographic factors (urban/rural, neighborhood characteristics), and sociodemographic factors (presence of war and civil unrest, economic depression, urbanization).

Mezzo level – social networks

The macro-level concepts shape the mezzo-level concepts. The mezzo level includes the network structure (structure of social networks) and the network function (interaction between members of that social network). Within network structure and network function, what Berkman et al. (2000) identify as the critical domains of social networks. For network structure, these include size (quantity of network members), density (the extent to which these numbers are connected), boundedness (the degree of definition - from kin, work, neighborhood), and homogeneity (the extent of similarity between individuals). For network function, characteristics of individual ties include frequency of contact (face-to-face or mediated by other means), multiplexity (quantity of types of transaction or support flowing through a set of ties), duration (length of time known each other), and reciprocity (to the extent exchanges are equal or

reciprocated). As Berkman recognize that terms related to social relationships, such as social networks, social support, social ties, and social integration, are loosely and interchangeably used, this dissertation took liberty to put the domain of social media here as it loosely fit the function or activation of social networks.

Micro-level forces – psychosocial mechanisms

The downstream forces are the micro-level and health pathways. The micro-level forces are the psychosocial mechanism which operates under the five types—social support, social influence, social engagement, person-to-person contact, and access to resources and material goods. Social support, one of the fundamental concepts of this dissertation, is further distinguished by this framework as instrumental and financial support, informational support, appraisal support, and emotional support. Social influence or how the presence, actions, or expectations of others influence behavior is distinguished into constraining/enabling influences on health behaviors, norms towards seeking/adherence, peer pressure, and social comparison process. Social engagement is recognized through physical/cognitive exercise, reinforcement of meaningful social roles, bonding/interpersonal attachment, 'handling effects' (for children), and "grooming effects" (for adults). Person-to-person contact is the pathway identified in regards to promoting or restricting exposure, identified as either close personal contact or intimate contact. Access to resources and material goods includes access to material sources such as healthcare, jobs, housing, or human capital. These five microlevel psychosocial mechanisms are not mutually exclusive and, in many cases, operate simultaneously (Berkman et al., 2000).

Health behavioral, psychological, and physiological pathways

These mechanisms are then hypothesized to shape or impact the health of individuals through downstream factors via health behavioral, psychological, and physiological routes. Health behavior pathways include but are not limited to health-promoting or health-damaging behaviors such as cancer screenings, tobacco or alcohol consumption, physical activity, or medication adherence. Physiological pathways include mechanisms related, but not limited to,

allostatic load, salivary osmolality, salivary cortisol, or hypothalamic-pituitary-adrenal (HPA axis), immune system function, cardiovascular reactivity, and transmission of HIV infection. Examples of psychological pathways are self-efficacy, self-esteem, coping effectiveness, self-well-being, and depression.

Summary

The Berkman et al. (2000) conceptual model is an adequate fit in examining the phenomenon of social media, social support and depression in the older adult population. The model provides a comprehensive view to exploring not only offline social relationships but also social relationships through technology such as social media. Depression is the final health pathway to be examined in this dissertation, and the varying operationalization of social media integrates well to many of the model's domains, from network structure (with social media offering a quantifiable number of friends and family), network function/activation (the use of social media to access social netowrk), and social support.

The Berkman et al. (2000) model has been used to analyze the influence of social networks on health outcomes in the general population, from examining the influence of social networks on health-related quality of life among breast cancer survivors to examining the relationships of social resource variables and health promotion behaviors and HIV medication adherence among individuals living with HIV (Michael et al., 2002; Webel et al., 2016). However, to our knowledge, no empirical research has used this model to look at social media use, online social networks, social support, and its relationship with depression in the older adult population. For this dissertation, we will adapt the Social Integration Model and explore the mezzo level of social networks in terms of network structure and network function. Specific to the network structure, only the network size will be explored. Network function/activation is social media. Only social support will be explored for the micro-level psychosocial, and our final pathway to be examined is depression. Figure 2 shows how this dissertation adopted the Social

Integration Model, showing the use of social media to share some aspects of the mezzo and microlevel of the theoretical framework.

References

Antonucci, T., Fiori, K., Birditt, K., & Jackey, L. (2010). Convoys of Social Relations: Integrating Life-Span and Life-Course Perspectives. In *The Handbook of Life-Span Development* (Vol. 2, pp. 434–473). https://doi.org/10.1002/9780470880166

Berkman, L., Glass, T., Brissette, I., & Seeman, T. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine (1982)*, *51*(6), 843–857. https://doi.org/10.1016/S0277-9536(00)00065-4

Fiori, K., Antonucci, T., & Cortina, K. (2006). Social Network Typologies and Mental Health Among Older Adults. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *61*(1), P25–P32. https://doi.org/10.1093/geronb/61.1.P25

Fuchs, C. (2017). *Social media: A critical introduction* (M. Ainsley, Ed.; 2nd ed.). Sage.

Gillespie, T. (2013). The Politics of “Platforms.” *A Companion to New Media Dynamics*, 407–416. https://doi.org/10.1002/9781118321607.ch28

Kawachi, I., & Berkman, L. (2001). Social ties and mental health. *J Urban Health*, *78*(3), 458–467. https://doi.org/10.1093/jurban/78.3.458

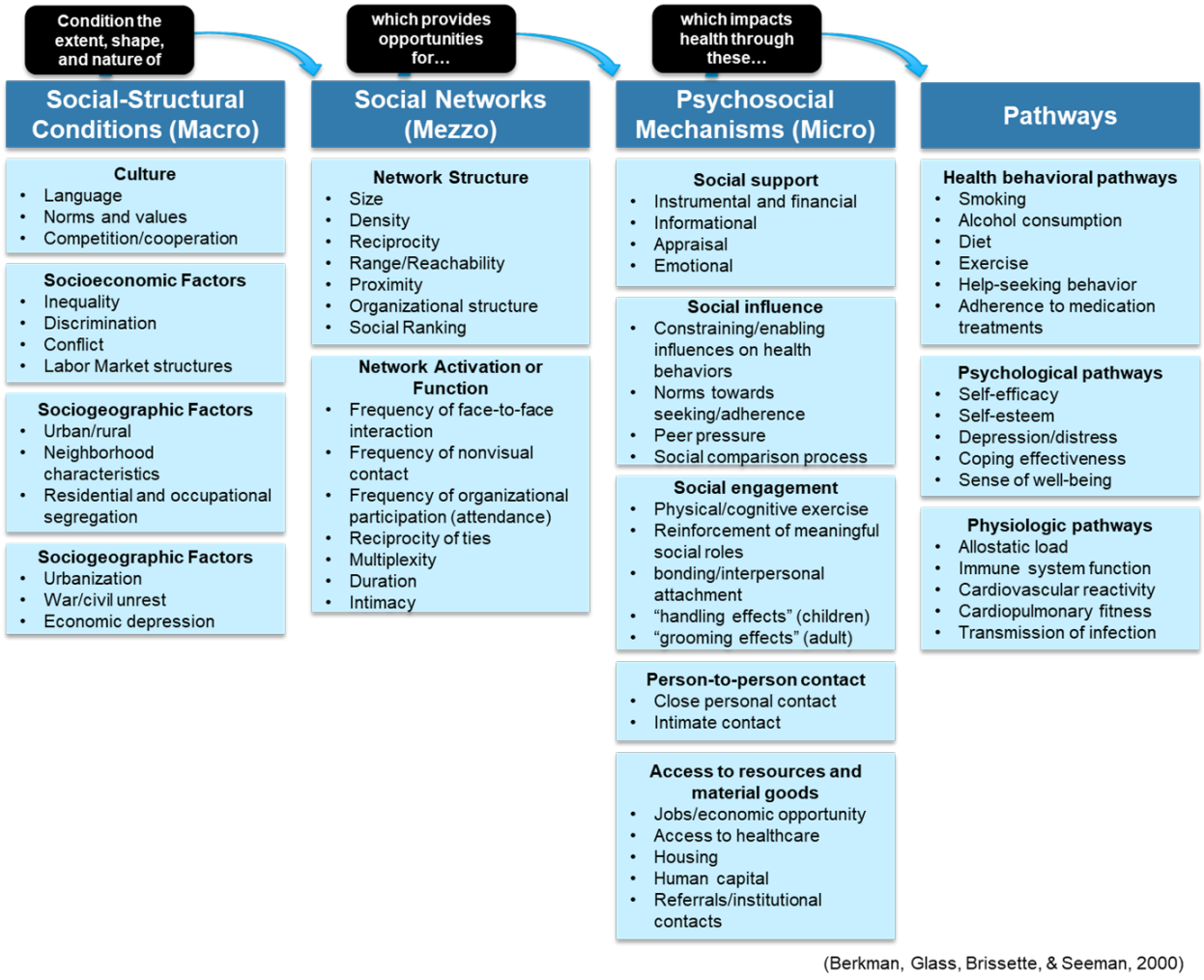
Michael, Y. L., Berkman, L. F., Colditz, G. A., Holmes, M. D., & Kawachi, I. (2002). Social networks and health-related quality of life in breast cancer survivors: a prospective study. *Journal of Psychosomatic Research*, *52*(5), 285–293.

Smith, K. P., & Christakis, N. A. (2008). Social Networks and Health. *Annual Review of Sociology*, *34*(1), 405–429. https://doi.org/10.1146/annurev.soc.34.040507.134601

Webel, A. R., Sattar, A., Schreiner, N., & Phillips, J. C. (2016). Social resources, health promotion behavior, and quality of life in adults living with HIV. *Applied Nursing Research*, *30*, 204–209.

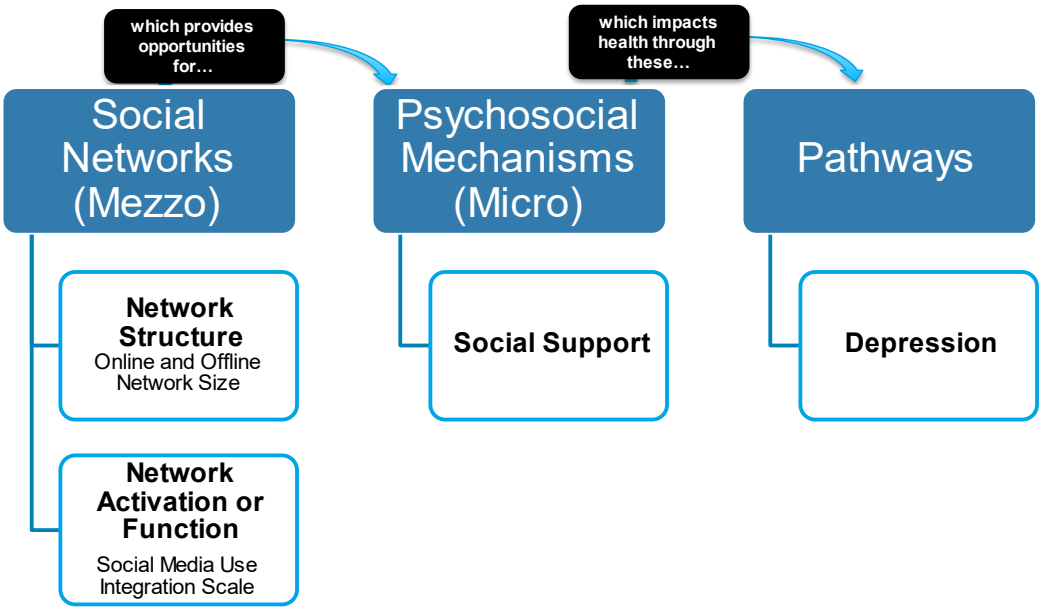
Figures

Figure 1 Berkman et al.'s (2000) conceptual model of how social networks affect health



(Berkman, Glass, Brissette, & Seeman, 2000)

Figure 2 Dissertation Theoretical Framework



CHAPTER 4

The Mediating Effect of Social Support on the Relation of Social Network Structures and Depression in Older Adults

Chapter 4. The Mediating Effect of Social Support on the Relation of Social Network Structures and Depression in Older Adults

Abstract

Objectives: The current study examines the mediating effect of social support in the relationship of social network structures (online and offline) and depression in older adults. We hypothesize the following: (H1) Having a larger online social network size increases social support, and in turn, greater social support decreases depression in older adults; (H2) Having a larger offline social network size increases social support, and in turn, greater social support decreases depression in older adults.

Research Design and Methods: The study employed a cross-sectional design conducted between March and April 2021 of 371 older adults in the Los Angeles metropolitan and surrounding areas. Mediation analysis using the PROCESS macro investigated whether social support mediates the effects of a predictor variable (online and offline social network size) on the outcome variable (depression) while controlling for demographic and health variables.

Results: Social support does not significantly mediate the relationship between online social network size and depression. For offline network size, only tangible and emotional/informational social support domains did not mediate the relationship between offline social network size and depression in older adults. Offline social network size, not online social network size, was associated with higher levels of social support. Higher total social support scores predict lower depression scores in both online and offline network size models. Online and offline social network size models showed that increased social support predicts lower depression scores on all social support scales except emotional/informational subscale.

Conclusions: The precautions established by the COVID-19 pandemic may have challenged the provision of tangible support and emotional/informational support in older adults. From the perspective of reducing depression in older adults, the present findings suggest further exploration of online social networks and their influence on social support and depression.

Further, the pandemic and an older adults' use of social media might have complicated and redefined the meaning of social networks, and social support in older adults, and further studies are needed.

Introduction

Although existing research has examined how network characteristics are associated with depression and social support in older adults, the extent to which both online and offline network size influences social support and protects against depression remains understudied. Predicting health and well-being outcomes within the older adult population requires the examination of social networks and social support (Caetano et al., 2013). A social network aggregates an individual's ties and is defined as a web of social relationships (Berkman et al., 2000; Weenig, 2004). Social networks are antecedents of social support, providing the structure for social support to exist (Berkman & Thomas, 2000; Langford et al., 1997). Social network characteristics include structure or size (quantity of network members) (Berkman & Thomas, 2000). Extensive literature establishes that social networks considerably influence physical and mental health (Israel, 1982; Litwin, 2006; Smith & Christakis, 2008; Thoits, 2011; K. Wright, 2016).

Additionally, social networks allow access to social relationships, which have been considered a significant predictor of mental well-being (Antonucci et al., 2010; Fiori et al., 2006; Kawachi & Berkman, 2001; Smith & Christakis, 2008). Reduced social relationships through a smaller social network are linked to increased mortality (Berkman & Thomas, 2000; T. E. Seeman, 1996). Larger networks connect older adults to a broader range of social milieus, increased access to information, and social contacts, which provide more social support (Burt, 1987; T. Seeman & Berkman, 1988; Wellman & Wortley, 1990). Having a large, dense social network size has been linked to more social support (Bui, 2020; S. Lee et al., 2018) while having a small social network has been linked to less social support (Harasemiw, Newall, Shooshtari, et al., 2018). Larger social networks often imply better access to social support and

more resources (Rohr et al., 2017). The number of close social ties and the size of the total network are associated with increased levels of perceived social support (Lu & Hampton, 2016). To date, research on older adults' social networks and depression has focused on the offline component of their social network structure and not on their online component. Further, studies about the size of the online social network and how it influences depression are mostly done on younger adults and the digital natives (Huang, 2021). Most studies on an older adult's social network structure have overlooked their online social network structure and its relation to social support and depression.

Research on social support shows that it protects mental health both directly through the benefits of social relationships and indirectly as a buffer against stressful circumstances (Cohen & Wills, 1985; Gariépy et al., 2016). Established evidence has shown that social support is protective against depression (Cohen et al., 1985; Dumont & Provost, 1999; George et al., 1989; Wood et al., 2008). Moreover, certain types and sources of social support are essential for older adults and are protective against depression (Gariépy et al., 2016). Technology such as the internet and social media has provided new ways to engage one's social networks and access one's social support systems (Choi & Dinitto, 2013; Khosravi et al., 2016; Nef et al., 2013; Sum et al., 2008; Vošner et al., 2016). This is especially important since recent actions to mitigate the spread of coronavirus disease 2019 (COVID-19) pandemic through self-quarantine and social distancing have not only exacerbated the risk of mental health problems and depression in older adults (Pfefferbaum & North, 2020) but could have potentially complicated their access to their social support systems. The current study examines the mediating effect of social support in relation to social network structures (online and offline) and depression in older adults. We hypothesize the following: (H1) Having a larger online social network size increases social support, and in turn, social support decreases depression scores in older adults; (H2) Having a larger offline social network size increases social support, and in turn, social support decreases depression scores in older adults.

Methods

Study Design and Procedures

This study was approved by the South General Institutional Review Board of the University of California, Los Angeles (IRB#18-001872). Data for this cross-sectional study design were collected between March 2021 and April 2021. A convenience sample of community-dwelling older adults aged 55 and older, living in Los Angeles metropolitan and surrounding areas, was recruited through flyers posted and displayed in public areas, with permission from senior centers, senior housing, community centers, clinics, and homes health agencies. Digital versions of the flyers were also circulated in the primary investigator's social and professional networks. Due to the COVID-19 pandemic, recruitment procedures were modified to include targeted Facebook ads. Inclusion criteria were as follows: (1) 55 and older; (2) live in Los Angeles, and surrounding areas (verified through zip code); (3) must have their own internet account and use some form of social media platform within at least the past two weeks. The participants answered a self-administered anonymous web-based questionnaire (averaged 10-15 minutes in length) collected using Qualtrics. As an incentive for completing the survey, all participants were entered into a $250 gift card lottery. A total of 371 older adults participated in the survey.

Measures

Depression. The primary outcome variable of depression was measured with the Patient Health Questionnaire Nine Symptom Depression Checklist (PHQ-9). The PHQ-9 is a short, nine-item, self-administered questionnaire used for criteria-based diagnosis of depressive disorders in different healthcare and community settings (Kroenke et al., 2001). The PHQ-9 is used to detect, monitor, and measure the severity of depression. Each of the nine items of the PHQ-9 is scored as 0 (not at all), 1 (several days), 2 (more than half the days), or 3 (nearly every day). When used as a screening tool, a score is calculated as the sum of the nine items (score range 0-27), with 0 indicating that no depressive symptoms exist and 27 indicating that

all symptoms occur nearly daily. Although the PHQ-9 was initially developed to be applied in primary care settings, the instrument is valid and reliable in multiple populations and settings (Kroenke et al., 2001), including for use in the general and elderly population, with an internal consistency of 0.87 (Kocalevent et al., 2013; Phelan et al., 2010). In this study, the reliability of the PHQ-9 is α = .82.

Social Support. The mediating variable of social support was assessed using the Medical Outcomes Study Social Support Survey (MOS-SSS)**.** The MOS-SSS distinguishes social support into four 18-item subscales (emotional/informational, tangible, affectionate, and positive social interactions) and as a total social support score. Responses are scored on a 5-point scale from 1 (none of the time) to 5 (all of the time). A higher score for each subscale or a higher score for total social support indicates more social support. MOS-SSS was initially developed for a diverse patient population in Los Angeles, Chicago, and Boston who had preventable and treatable chronic conditions (hypertension, diabetes, coronary heart disease, and depression) (Sherbourne & Stewart, 1991). The MOS-SSS has high internal consistency for the sum total social support of alpha 0.97 and test-retest reliability (one-year stability coefficient) of 0.78 (Sherbourne & Stewart, 1991). The MOS-SSS has been used in studies with a diverse group of community-dwelling older adults (Hand et al., 2012; Krousel-Wood et al., 2010; Ruggiero et al., 2009; Sherman, 2003). For this study, this scale showed good internal consistency of α = .97 for the total social support, α = .98 for emotional/information, α = .97 for tangible support, α = .93 for affectionate support, and α = .97 for positive social interaction.

Social Network Structure. Social Network Structure is measured as the estimated size of the combined friends and family either online or offline. For the purpose of this study, we distinguish online social network structure as online social network size and offline social network structure as offline social network size. Participants were asked to estimate how many family/friends they have on their most used social media account. They were encouraged to check their social media account on their own device if available to accurately quantify their

estimate to the best of their ability. For offline social network size, they were asked to estimate how many family/friends they stay in touch with outside of social media. Both the size of the online social network and the offline social network were measured on an eight-point ordinal scale: 1 (0-25), 2 (26-50), 3 (51-100), 4 (100-125), 5 (126-150), 6 (151-176), 7 (176-200), 8 (>201). The reliability for the total scale of 10-items was α = .83, social integration/emotional connection subscale of 6-items at α = .81, and the integration into the social routines subscale at α = .76.

Covariates. Covariates were selected based on their known association with depression (Cacioppo et al., 2010; Teo et al., 2013). They include demographic and health characteristics: age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions. Chronological age was calculated from the respondent's year of birth. Gender was coded female and male, education into Graduated College and Not Graduated College, ethnicity as White only vs. Non-White, marital status as Married and Not Married, and employment as Not Retired and Retired. Household income categorized as less than $10,000 to $49,000, $50,000 to $99,000, $100,000 to $149,000, and $150,000 or more. Self-reported physical health used a 5-point response asking participants to choose whether their physical health was excellent, very good, good, fair or poor. Total Chronic Conditions was the sum of yes responses to questions on ten chronic conditions, where the respondents were asked whether they have ever been told by a doctor or health care provider that they had hypertension, coronary heart disease, stroke, diabetes, cancer, arthritis, or hepatitis, weak or failing kidneys, during the past 12 months; currently have asthma; or congestive obstructive pulmonary disease (Ward et al., 2014).

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 28. Descriptive statistics were used to examine the social network structure (offline and online) and the demographics of the respondents. Continuous data were summarized using

means and standard deviations (sd), while categorical data were summarized using frequencies and percentages. Bivariate Pearson's correlation was used to test the correlations among age, depression, social support, and social network structure (online and offline). Two mediation models were constructed and analyzed to examine H1 and H2. For each hypothesis, separate models were estimated for each social support subscale and the total social support score as possible mediators.

Mediation models attempt to explain whether and why a relationship exists between antecedents and outcomes. Mediation is a hypothesized causal chain in which one variable affects a second variable that, in turn, affects a third variable. In the current study, we hypothesize that social network characteristics of structure or size affect the psychosocial mechanism of social support, which then affects the depression pathway. Mediation analysis facilitates the exploration of both direct and indirect effects of the independent variable(s) on the mediator and the dependent outcome variable. MacKinnon (2008) describes a mediator as an intermediate in the causal sequence between the independent and dependent variables. Based on the diagram (Figure 1), where X is the online social network structure), M is the social support measure and Y is depression, and where *a, b, and c* represent direct effects, c' is a direct effect controlling for the mediator, and *a*b is the* indirect effect. These four steps described by Baron & Kenny (1986) use several regressions to test for direct effects and partial or full mediation, with the significance of the coefficients examined at each step. Steps 1 to 3 establish that direct relationships among the variables exist. If one or more of these relationships are not significant, mediation may not be possible or likely. Assuming there are significant relationships in Step 1 through 3, from Step 4 results one can infer full or partial mediation. We used Andrew Hayes' PROCESS 4 Macro for SPSS (Preacher & Hayes, 2004). This macro estimates social network characteristics' direct and indirect effects on depression through social support. Estimating for small sample size and making no assumptions about the shape of the distributions, we used a nonparametric bootstrapping procedure (n=5000) to yield

the bias-corrected 95% confidence interval and a more valid estimate of indirect effects while controlling for covariates (Preacher & Hayes, 2004).

Results

Descriptive Characteristics

Table 1 presents the demographics of our study sample. The 371 participants' ages ranged from 55 to 96, with a mean age of 70.20 ± sd of 8.12 years. More than half of the participants were female (85.2%), white (84.9%), college-educated (79.5%), and retired (62.3%). Half (50.4%) were married. Furthermore, many participants reported having at least one chronic condition (30.8%), while most reported good physical health (43.0%). The mean depression score was 3.96 (sd = 3.86), and social support was 62.50 (sd=19.47). The estimated online network size varied considerably, with some participants describing the size of their most-used online social network as relatively small at 1-25 (19.4%) or 26-50 (16.4%) or large at more than 200 (22.0%). In contrast, participants kept their offline social network size much smaller, with a majority indicating less than 25 people (64.7%).

Mediation by Online Social Network Size

The results of the mediation models with online social network size are shown in Table 3, and Figure 2 shows the path diagram for online social network size, total social support, and depression. Models 1 to 5 (Table 3) show the mediation models of online social network size, social support, and depression for the total social support scale and each of the four social support subscales. Online social network size by itself and in the presence of total social support and among each of its subscales did not predict lower depression scores. In addition, there were no significant direct effects of online social network size on total social support score and within its subscales. However, in models 1 to 5, increased social support predicts lower depression scores for all social support scales except emotional/informational (β=-0.024, se=.021, *p=.242)*—total social support (β=-.024, se=.010, *p*=.021), tangible social support (β=.-

.081, se=.036, *p*=.024), affectionate social support (β=-.148, se=.054, *p*=.007), positive social support (β=-.166, se=.057, *p*=.004).

The indirect effect through total social support is not statistically significant (IE=-.010; 95% CI: [-.036, .009]). Similar nonsignificant results were seen for all social support subscales. Therefore, our mediation analysis did not reveal any significant indirect effect of online social network size on depression scores via the pathway of social support (total social support and among its subscales). Our findings did not support hypothesis H1.

Mediation by Offline Social Network Size

Models 6 to 10 (results in Table 4) explore whether social support mediates the relationship between offline social network size and depression. Figure 3 visualizes the pathway of offline social network size, total social support, and depression. Offline social network size by itself and in the presence of total social support, and each of its subscales did not predict depression. The direct effect of offline social network size, however, was associated with higher levels of total social support (β=2.771, se=1.042, *p*=.008) and also within each of its subscales—tangible social support (β=.620, se=.306, *p*=.044), affectionate social support (β=.488, se=.202, *p*=.016), positive social interactions (β=.485, se=.193, *p*=.013), emotional/informational social support (β=1.178, se=.527, *p*=.026). Our findings indicate that persons with a larger offline social network size are more likely to express higher social support scores. Higher total social support (β=-.024, se=.011, *p*=.027) and its subscales tangible social support (β=-.079, se=.036, *p*=.028), affectionate social support (β=-.142, se=.054, *p*=.009), positive social interactions (β=-.158, se=.057, *p*=.006) predicted a decrease in depression, but not emotional/informational social support. The results indicate that higher total social support, tangible support, affectionate social support, and positive social interaction are likely to have lower depression scores.

Our mediation analysis indicated a significant negative total indirect effect of offline social network size on depression through the pathway of total social support (IE = -0.065; 95%

CI: [-.152, -.001]), its subscale affectionate social support (IE = -0.069; 95% CI: [-.164, -.002]) and positive social interactions (IE = -0.077; 95% CI: [-.170, -.012]), but not in the tangible and emotional/informational social support subscales. Total social support mediated about 49% of the total effect of offline social support on depression. Our results partly supported hypothesis H2.

Discussion

The purpose of the study was to investigate the mediating effect of social support on the relationship between social network structure (offline and online) and depression. We hypothesized that having a larger social network structure (offline social network size and online social network size) increases social support, and in turn, social support decreases depression in older adults. Our findings failed to support the hypotheses for online network size but partly supported the hypothesis for offline network size.

To our knowledge, this is the first study to examine an older adults' online social network structure to include the size of their friends/families in their most-used social network platform. The online network size of older adults varies as some report having a larger online network size of over 200, and others report a smaller online network size of fewer than 50 friends and family. In contrast, an older adult's offline network size tends to be small as most participants report keeping in touch with less than 25 individuals. When it comes to offline networks, previous research has shown that, though older adults have smaller networks, they are much more intimate (Bruine de Bruin et al., 2020). In our study, the difference between online social network size and offline social network size is perhaps a difference in the quality of the two types of social network structure—where those belonging to their offline social network structure are considered close ties where online network structure is not. Although we differentiated online social network size from offline social network size, it is important to acknowledge that this is not an either/or distinction. Studies have shown a general tendency toward a smaller social network size throughout the course of a person's life (Lang et al., 1998; D. J. Lee &

Markides, 1990; Wrzus et al., 2013). This decline in the size of the social network is primarily the result of life events such as loss of social roles, retirement, physical limitations, or the death of family members or friends (Kemperman et al., 2019; Pinquart & Sörensen, 2010). Our correlation analysis found that older age was significantly correlated with smaller online social network sizes. This was also seen in offline social network size, but our results were not statistically significant. Although we did not explore the reasons, it is possible that the smaller online social network size of our sample of older adults is due to them being late adopters of social media technology. Many older adults could also have physical limitations and disabilities that prevent them from actively using the technology to access their online social networks. Future studies should explore the social media platform and what device these platforms are accessed as accessibility in terms of user interface or user experience that might inhibit or encourage the use of social media to access older adults' online social networks. As the adoption of social media by older adults continues to grow, there is potential that their online social network size will also increase.

Social Network Structure and Social Support

In our unmediated model, we found that only offline social network size, not online social network size, predicted higher levels of social support. We could only assume that an older adult's online social network structure consists not only of close friends and family but also of weak ties, as they include acquaintances, long-lost friends or family, people they rarely have contact with, or even individuals they have never met in person. It cannot be ruled out that even profiles of the dead could potentially still be present on their online social networks (Öhman & Watson, 2019). These weak ties are perceived as not supportive (Krämer et al., 2021). It is also important to recognize how an older adult's social life has changed due to the COVID-19 pandemic. We assume that to most older adults, social media was used to augment their existing social interactions and relationships with their network of friends and family, but due to the pandemic, social media became their prominent, if not only safe, means of accessing their

social support system. Using social media to interact with their online social networks arguably was much safer than their offline social network. However, there might be doubts about the quality of their online social network structure compared to their immediate offline social network structure. Social media has helped older adults interact with their network of friends and family, but these interactions could have become challenged when individuals in their own online social network structure voice and post unfiltered divergent opinions on topics such as COVID-19, vaccine mandates, and sensitive political issues. Further, negative online interactions were not included in our analysis, and the quality of these social interactions could have eroded or influenced an older adults' social support system.

Social Network Structure and Depression

In our unmediated model, the structural size of older adults' online and offline social networks did not show any significant relationship to depression. However, previous research on younger cohorts provides a different perspective, as they are members of a generation that grew up with technology. Surprisingly, our findings are consistent with previous research done on a younger cohort of adults where there was a nonsignificant relationship between online social network structural size and depression (Banjanin et al., 2015; Fernandez et al., 2012; Locatelli et al., 2012; Moreno et al., 2011; Tandoc et al., 2015; K. B. Wright et al., 2013).

Our findings on the offline social network size contrast previous research on the importance of network size to depression (Domènech-Abella et al., 2017). The association between social network size and depression can be nuanced, as those with larger network size are favorable for those under the age of 80 but unfavorable for those over 80 (Litwin et al., 2015). Our findings are possibly due to our measure of offline social network size as to be an estimate of how many family/friends older adults stay in touch with outside of social media, rather than an estimate of close and strong ties.

Social Support and Depression

In our study, the direct effects of higher social support predicted lower depression scores, both for the total social support scale and for all subscales except emotional/informational. The Medical Outcomes Study Social Support Survey defines the domain of emotional/informational support as the availability of someone to confide in, to listen to you, and to provide advice and information, while tangible support as some to help with daily chores, prepare meals, or drive you if needed. Tangible support is questionably uncommon in online environments. In the measure of emotional/informational domain, emotional and informational support were not distinguished from each other. In the context of the pandemic, COVID-19 came with an infodemic of misinformation and disinformation (Chong et al., 2020). The social support that includes the giving of information could have been impacted, as the topic of COVID-19 posed several unknowns, most notably when older adults are likely to seek out information on the epidemiology of the virus and its impact on people (Jong et al., 2021). Misinformation disguised as emotional/informational social support could have been complicated the relationship to depression as an older adult has to filter facts from opinions about COVID-19 vaccines and mandates. Additionally, the precautions established by COVID-19 may challenge the provision of tangible support older adults receive in managing their health (O'Conor et al., 2021).

Social Support as Mediator of Relationship between Social Network Structure and Depression

In looking at only online network structures, our findings did not confirm the mediating effect of social support on the relationship between online social network size to depression in older adults. Having a larger online social network size did not increase social support, and in turn, social support did not decrease depression scores in older adults. Several possibilities exist, though it cannot be ruled out that social support does not mediate the relationship between online social network size and depression in older adults. Studies on social support

acknowledge how sources of support should be considered, as spousal support and support from friends have been shown to have a consistent protective factor against depression (Gariépy et al., 2016). Our measure of online social network size did not distinguish between friends and family or between weak and strong close ties. It is likely that current online network structure would often include not only close friends and family but also old friends, acquaintances, and distant family members. We also did not distinguish online friend/virtual friends versus real-life friends in measuring online social network size. In addition, the word 'friend' has changed meaning and has expanded in an online context. Traditionally, the word 'friend' refers to someone with whom you shared experiences or someone who knew a great deal about you. Establishing friendship used to take time and trust. Social media has redefined what it means to be a 'friend' by making it easy to add friends. *Friending* on Facebook is as easy as a click of a button as opposed to establishing trust. Facebook mentions that Friending helps you "stay connected with people you care about," but not necessarily people who care about you. Social media has allowed older adults to add friends in their network whom they met only once or even add friends whom they never met in person at all. Quality descriptions of an older adult's online social network structural characteristics could provide more insight into its relationship with social support and depression.

However, our study confirmed a mediating effect of social support on the relationship between offline social network size and depression. Having a larger offline social network size predicted increased social support and, in turn, social support decreased depression scores in older adults. Our findings are similar to previous studies that explored the relationship between social network types, depression, and perceived social support (Harasemiw, Newall, Mackenzie, et al., 2018). However, when considering social support's subscales, only affectionate social support and positive social interactions mediated the total effect of offline social network size on depression. Certain domains of social support could have been challenged during the pandemic and could have influenced the outcome of our study. The pandemic created several

uncertainties, which resulted in an increased need for social support (Chew et al., 2020). However, this need for social support can be complicated, as emotional/informational social support can include misinformation, ambiguous information, or disinformation. It may have been difficult for older adults to filter false from factual information in their social network structure, both offline and online. Although false news was propagated on social media sites long before the COVID-19 pandemic, the consequences of misinformation and disinformation are still dangerous (Grinberg et al., 2019). The COVID-19 pandemic sparked a pandemic search for information, which resulted in the dissemination of false or misleading health information (Cuan-Baltazar et al., 2020). It can be argued that certain domains of social support, such as emotional/informational support and tangible support, may not have a protective influence on depression in the context of COVID-19, as managing information in a time where misinformation is prevalent and avoiding tangible support is necessary to avoid the risk of getting infected.

Limitations and Future Research

While this investigation extends previous research and contributes to the discussion on social network structure (online and offline), social support, and depression in older adults, some limitations should be considered. Although cross-sectional research may indicate possible connections between variables, it cannot conclusively establish causality. Since the information gathered through an online survey is entirely self-reported, estimated size of social networks and health-related responses may be under or overreported. Our advertisement method included using the researcher's own online social network and targeted Facebook ads, which may have led to the overrepresentation of academics and healthcare professionals. Although the sample was augmented with Facebook ads that targeted our recruitment in and around Los Angeles, one of the most ethnically diverse counties in the United States, there was an over-representation of white (84.1%), college-educated (79.8%), women (84.9%) in our sample.

Our measure of social network structure as defined by online and offline network size might not capture some important characteristics. Offline social network size was an estimate of

how many family/friends do you stay in touch with outside of social media, rather than a measure of close ties, close confidants, or contacts which tend to have more impact on social support and depression (Oxman T.E et al., 1992). This study focused on the structural size of an older adult's online and offline social network and not the quality of the relationship within these networks. The quality of an older adults' online social network and its relationship to social support and depression, along with its structural size, needs further exploration.

It is plausible that the COVID-19 pandemic influenced our findings. Attempts to contain the spread of COVID-19 arguably have had a profound effect on the social lives of older adults. An older adult's social network structure, social support, and mental health have been affected by the restrictions of social distancing, stay-at-home orders, and COVID-19 related stressors such as exposures to infected sources, infected family members, loss of loved ones, and economic loss (Pfefferbaum & North, 2020). The precautions established by the COVID-19 pandemic may have challenged the availability of tangible support and informational support in older adults. In addition, the quality of social support given by an older adults' online social network structure could have been impacted by an infodemic of misinformation and disinformation about the COVID vaccines, mandates, and other politically sensitive topics. Further research should explore how specific covid-related stressors, online disinformation, and misinformation influence the mental health of older adults. Further research should also re-evaluate the different domains of social support in the context of the pandemic.

Conclusions

The present study extended the existing literature on social network structure, social support, and depression among older adults. To our knowledge, ours is the first study to specifically examine an older adults' online social network structure along with its offline network structure in its relationship to social support and depression under the context of a modern pandemic. This study found that social support does not significantly mediate the relationship between online social network size and depression. However, social support mediated the

relationship between offline social network structure and depression to some extent. The tangible and emotional/informational social support domains did not mediate the known relationship between network structure and depression in older adults. The precautions established by the COVID-19 pandemic may have challenged the availability of tangible support and informational support in older adults. Both structural sizes of online and offline social network size did not show any significant relationship to depression. Offline social network size, not online social network size, predicted higher levels of social support. Higher total social support scores predicted lower depression scores in both online and offline network size models. Online and offline social network size models showed that increased social support predicts lower depression scores on all social support scales except emotional/informational subscale. Online disinformation or misinformation might have influenced the domain of emotional/informational support, thus future studies are needed to explore their impact to the perceived social support and depression in older adults. From the perspective of reducing depression in older adults, the present findings suggest further exploration of online social networks and their influence on social support and depression. The pandemic and social media might have complicated and redefined the meaning of friendship, social networks, and social support in older adults, and further studies are needed.

References

Antonucci, T., Fiori, K., Birditt, K., & Jackey, L. (2010). Convoys of Social Relations: Integrating Life-Span and Life-Course Perspectives. In *The Handbook of Life-Span Development* (Vol. 2, pp. 434–473). https://doi.org/10.1002/9780470880166

Banjanin, N., Banjanin, N., Dimitrijevic, I., & Pantic, I. (2015). Relationship between internet use and depression: Focus on physiological mood oscillations, social networking and online addictive behavior. *Computers in Human Behavior*, *43*, 308–312. https://doi.org/10.1016/J.CHB.2014.11.013

Baron, R., & Kenny, D. (1986). The Moderator-Mediator Variable Distinction in Social The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Berkman, L., Glass, T., Brissette, I., & Seeman, T. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine (1982)*, *51*(6), 843–857. https://doi.org/10.1016/S0277-9536(00)00065-4

Berkman, L., & Thomas, G. (2000). Social Integration, Social Networks, Social Support, and Health. In *Social Epidemiology* (p. 416). Oxford University Press. https://books.google.com/books?hl=en&lr=&id=i0qWxy5-X1gC&pgis=1

Bruine de Bruin, W., Parker, A. M., & Strough, J. N. (2020). Age differences in reported social networks and well-being. *Psychology and Aging*, *35*(2), 159–168. https://doi.org/10.1037/PAG0000415

Bui, B. K. H. (2020). The relationship between social network characteristics and depressive symptoms among older adults in the United States: differentiating between network structure and network function. *Psychogeriatrics*, *20*(4). https://doi.org/10.1111/psyg.12530

Burt, R. S. (1987). A note on strangers, friends and happiness. *Social Networks*, *9*(4), 311–331. https://doi.org/10.1016/0378-8733(87)90002-5

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. a. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging*, *25*(2), 453–463. https://doi.org/10.1037/a0017216

Caetano, S. C., Silva, C. M., & Vettore, M. v. (2013). Gender differences in the association of perceived social support and social network with self-rated health status among older adults: A population-based study in Brazil. *BMC Geriatrics*, *13*(1), 1–14. https://doi.org/10.1186/1471-2318-13-122/TABLES/4

Chew, Q. H., Wei, K. C., Vasoo, S., Chua, H. C., & Sim, K. (2020). Narrative synthesis of psychological and coping responses towards emerging infectious disease outbreaks in the general population: Practical considerations for the COVID-19 pandemic. *Singapore Medical Journal*, *61*(7), 350–356. https://doi.org/10.11622/SMEDJ.2020046

Choi, N. G., & Dinitto, D. M. (2013). Internet use among older adults: Association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research*, *15*(5), 1–16. https://doi.org/10.2196/jmir.2333

Chong, Y. Y., Cheng, H. Y., Chan, H. Y. L., Chien, W. T., & Wong, S. Y. S. (2020). COVID-19 pandemic, infodemic and the role of eHealth literacy. *International Journal of Nursing Studies*, *108*, 103644. https://doi.org/10.1016/J.IJNURSTU.2020.103644

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support. In *Social support: Theory, research and applications* (pp. 73–94). Springer.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Cuan-Baltazar, J. Y., Muñoz-Perez, M. J., Robledo-Vega, C., Pérez-Zepeda, M. F., & Soto-Vega, E. (2020). Misinformation of COVID-19 on the Internet: Infodemiology Study. *JMIR Public Health Surveill 2020;6(2):E18444 Https://Publichealth.Jmir.Org/2020/2/E18444*, *6*(2), e18444. https://doi.org/10.2196/18444

Domènech-Abella, J., Lara, E., Rubio-Valera, M., Olaya, B., Moneta, M. V., Rico-Uribe, L. A., Ayuso-Mateos, J. L., Mundó, J., & Haro, J. M. (2017). Loneliness and depression in the elderly: the role of social network. *Social Psychiatry and Psychiatric Epidemiology*, *52*(4), 381–390. https://doi.org/10.1007/S00127-017-1339-3/FIGURES/2

Dumont, M., & Provost, M. A. (1999). Resilience in adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, *28*(3), 343–363.

Fernandez, K. C., Levinson, C. A., & Rodebaugh, T. L. (2012). Profiling: Predicting Social Anxiety From Facebook Profiles. *Http://Dx.Doi.Org/10.1177/1948550611434967*, *3*(6), 706–713. https://doi.org/10.1177/1948550611434967

Fiori, K., Antonucci, T., & Cortina, K. (2006). Social Network Typologies and Mental Health Among Older Adults. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *61*(1), P25–P32. https://doi.org/10.1093/geronb/61.1.P25

Gariépy, G., Honkaniemi, H., Quesnel-Vallée, A., Gariepy, G., Honkaniemi, H., & Quesnel-Vallee, A. (2016). Social support and protection from depression: systematic review of current findings in Western countries. *The British Journal of Psychiatry*, *209*(4), 284–293. https://doi.org/10.1192/bjp.bp.115.169094

George, L., Blazer, D., Hughes, D., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry*, *154*(4), 478–485.

Grinberg, N., Joseph, K., Friedland, L., Swire-Thompson, B., & Lazer, D. (2019). Political science: Fake news on Twitter during the 2016 U.S. presidential election. *Science*, *363*(6425), 374–378. https://doi.org/10.1126/SCIENCE.AAU2706/SUPPL_FILE/AAU2706_GRINBERG_SM.PDF

Hand, C., Law, M., Hanna, S., Elliott, S., & McColl, M. A. (2012). Neighbourhood influences on participation in activities among older adults with chronic health conditions. *Health and Place*, *18*(4), 869–876. https://doi.org/10.1016/j.healthplace.2012.03.004

Harasemiw, O., Newall, N., Mackenzie, C. S., Shooshtari, S., & Menec, V. (2018). Is the association between social network types, depressive symptoms and life satisfaction mediated by the perceived availability of social support? A cross-sectional analysis using the Canadian Longitudinal Study on Aging. *Https://Doi.Org/10.1080/13607863.2018.1495176*, *23*(10), 1413–1422. https://doi.org/10.1080/13607863.2018.1495176

Harasemiw, O., Newall, N., Shooshtari, S., Mackenzie, C., & Menec, V. (2018). From Social Integration to Social Isolation: The Relationship Between Social Network Types and Perceived Availability of Social Support in a National Sample of Older Canadians. *Research on Aging*, *40*(8), 715–739. https://doi.org/10.1177/0164027517734587

Huang, C. (2021). Correlations of online social network size with well-being and distress: A meta-analysis. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *15*(2), 3. https://doi.org/10.5817/CP2021-2-3

Israel, B. A. (1982). Social networks and health status: Linking theory, research, and practice. *Patient Counselling and Health Education*, *4*(2), 65–79. https://doi.org/10.1016/S0190-2040(82)80002-5

Jong, W., Liang, O. S., & Yang, C. C. (2021). The Exchange of Informational Support in Online Health Communities at the Onset of the COVID-19 Pandemic: Content Analysis. *Jmirx Med*, *2*(3), e27485. https://doi.org/10.2196/27485

Kawachi, I., & Berkman, L. (2001). Social ties and mental health. *J Urban Health*, *78*(3), 458–467. https://doi.org/10.1093/jurban/78.3.458

Kemperman, A., van den Berg, P., Weijs-Perrée, M., & Uijtdewillegen, K. (2019). Loneliness of Older Adults: Social Network and the Living Environment. *International Journal of Environmental Research and Public Health*, *16*(3). https://doi.org/10.3390/IJERPH16030406

Khosravi, P., Rezvani, A., & Wiewiora, A. (2016). The impact of technology on older adults' social isolation. *Computers in Human Behavior*, *63*(July), 594–603. https://doi.org/10.1016/j.chb.2016.05.092

Kocalevent, R. D., Hinz, A., & Brähler, E. (2013). Standardization of the depression screener Patient Health Questionnaire (PHQ-9) in the general population. *General Hospital Psychiatry*, *35*(5), 551–555. https://doi.org/10.1016/j.genhosppsych.2013.04.006

Krämer, N. C., Sauer, V., & Ellison, N. (2021). The Strength of Weak Ties Revisited: Further Evidence of the Role of Strong Ties in the Provision of Online Social Support. *Social Media + Society*, *7*(2), 205630512110249. https://doi.org/10.1177/20563051211024958

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9. *Journal of General Internal Medicine*, *16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Krousel-Wood, M., Islam, T., Muntner, P., Holt, E., Joyce, C., Morisky, D. E., Webber, L. S., & Frohlich, E. D. (2010). Association of Depression with Antihypertensive Medication Adherence

in Older Adults: Cross-Sectional and Longitudinal Findings from CoSMO. *Annals of Behavioral Medicine*, *40*(3), 248–257. https://doi.org/10.1007/s12160-010-9217-1

Lang, F. R., Staudinger, U. M., & Carstensen, L. L. (1998). Perspectives on socioemotional selectivity in late life: How personality and social context do (and do not) make a difference. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *53*(1). https://doi.org/10.1093/GERONB/53B.1.P21

Langford, C. P. H., Bowsher, J., Maloney, J. P., & Lillis, P. P. (1997). Social support: A conceptual analysis. *Journal of Advanced Nursing*, *25*(1), 95–100. https://doi.org/10.1046/j.1365-2648.1997.1997025095.x

Lee, D. J., & Markides, K. S. (1990). Activity and mortality among aged persons over an eight-year period. *Journals of Gerontology*, *45*(1). https://doi.org/10.1093/GERONJ/45.1.S39

Lee, S., Chung, J. E., & Park, N. (2018). Network Environments and Well-Being: An Examination of Personal Network Structure, Social Capital, and Perceived Social Support. *Health Communication*, *33*(1), 22–31. https://doi.org/10.1080/10410236.2016.1242032

Litwin, H. (2006). Social networks and self-rated health: a cross-cultural examination among older Israelis. *Journal of Aging and Health*, *18*(3), 335–358. https://doi.org/10.1177/0898264305280982

Litwin, H., Stoeckel, K. J., & Schwartz, E. (2015). Social networks and mental health among older Europeans: are there age effects? *European Journal of Ageing*, *12*(4), 299–309. https://doi.org/10.1007/S10433-015-0347-Y/FIGURES/1

Locatelli, S., Kluwe, K., & Bryant, F. (2012). Facebook Use and the Tendency to Ruminate among College Students: Testing Mediational Hypotheses: *Http://Dx.Doi.Org/10.2190/EC.46.4.d*, *46*(4), 377–394. https://doi.org/10.2190/EC.46.4.D

Lu, W., & Hampton, K. N. (2016). Beyond the power of networks: Differentiating network structure from social media affordances for perceived social support: *Http://Dx.Doi.Org/10.1177/1461444815621514*, *19*(6), 861–879. https://doi.org/10.1177/1461444815621514

Moreno, M. A., Jelenchick, L. A., Egan, K. G., Cox, E., Young, H., Gannon, K. E., & Becker, T. (2011). Feeling bad on Facebook: depression disclosures by college students on a social networking site. *Depression and Anxiety*, *28*(6), 447–455. https://doi.org/10.1002/DA.20805

Nef, T., Ganea, R. L., Müri, R. M., & Mosimann, U. P. (2013). Social networking sites and older users – a systematic review. *International Psychogeriatrics*, *25*(07). https://doi.org/10.1017/S1041610213000355

O'Conor, R., Opsasnick, L., Pack, A., Yoshino Benavente, J., Curtis, L. M., Lovett, R. M., Luu, H., Wismer, G., Kwasny, M. J., Federman, A. D., Bailey, S. C., & Wolf, M. S. (2021). Perceived Adequacy of Tangible Support during Stay-at-Home Orders in Chicago and New York. *Journal of Primary Care and Community Health*, *12*. https://doi.org/10.1177/21501327211024411

Öhman, C. J., & Watson, D. (2019). Are the dead taking over Facebook? A Big Data approach to the future of death online: *Https://Doi.Org/10.1177/2053951719842540*, *6*(1). https://doi.org/10.1177/2053951719842540

Oxman T.E, Berkman L.F, Kasl S, D.H, F., Oxman, T., Berkman, L., Kasl, S., Freeman, D., & Barett, J. (1992). Social support and depressive symptoms in the elderly. *American Journal of Epidemiology*, *135*(4), 356–368.

Pfefferbaum, B., & North, C. S. (2020). Mental Health and the Covid-19 Pandemic. *New England Journal of Medicine*, *383*(6), 510–512. https://doi.org/10.1056/NEJMP2008017/SUPPL_FILE/NEJMP2008017_DISCLOSURES.PDF

Phelan, E., Williams, B., Meeker, K., Bonn, K., Frederick, J., Logerfo, J., & Snowden, M. (2010). A study of the diagnostic accuracy of the PHQ-9 in primary care elderly. *BMC Family Practice*, *11*, 63. https://doi.org/10.1186/1471-2296-11-63

Pinquart, M., & Sörensen, S. (2010). Influences on Loneliness in Older Adults: A Meta-Analysis. *Https://Doi.Org/10.1207/S15324834BASP2304_2*, *23*(4), 245–266. https://doi.org/10.1207/S15324834BASP2304_2

Preacher, K., & Hayes, A. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, *36*(4), 717–731. https://doi.org/10.3758/BF03206553

Rohr, M. K., John, D. T., Fung, H. H., & Lang, F. R. (2017). A Three-Component model of future time Perspective across Adulthood. *Psychology and Aging*, *32*(7), 597–607. https://doi.org/10.1037/PAG0000191

Ruggiero, K. J., Armstadter, A. B., Acierno, R., Kilpatrick, D. G., Resnick, H. S., Tracy, M., & Galea, S. (2009). Social and Psychological Resources Associated with Health Status in a Representative Sample of Adults Affected by the 2004 Florida Hurricanes. *Psychiatry: Interpersonal and Biological Processes*, *72*(2), 195–210. https://doi.org/10.1521/psyc.2009.72.2.195

Seeman, T., & Berkman, L. (1988). Structural characteristics of social networks and their relationship with social support in the elderly: who provides support. *Social Science & Medicine*, *26*(7), 737–749. https://doi.org/10.1016/0277-9536(88)90065-2

Seeman, T. E. (1996). Social ties and health: The benefits of social integration. *Annals of Epidemiology*, *6*(5), 442–451. https://doi.org/10.1016/S1047-2797(96)00095-6

Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social Science and Medicine*, *32*(6), 705–714. https://doi.org/10.1016/0277-9536(91)90150-B

Sherman, A. M. (2003). Social relations and depressive symptoms in older adults with knee osteoarthritis. *Social Science & Medicine*, *56*(2), 247–257. https://doi.org/10.1016/S0277-9536(02)00023-0

Smith, K. P., & Christakis, N. A. (2008). Social Networks and Health. *Annual Review of Sociology*, *34*(1), 405–429. https://doi.org/10.1146/annurev.soc.34.040507.134601

Sum, S., Mathews, R. M., Hughes, I., & Campbell, A. (2008). Internet use and loneliness in older adults. *CyberPsychology & Behavior*, *11*(2), 208–211. https://doi.org/10.1089/cpb.2007.0010

Tandoc, E. C., Ferrucci, P., & Duffy, M. (2015). Facebook use, envy, and depression among college students: Is facebooking depressing? *Computers in Human Behavior*, *43*, 139–146. https://doi.org/10.1016/J.CHB.2014.10.053

Teo, A. R., Choi, H. J., & Valenstein, M. (2013). Social Relationships and Depression: Ten-Year Follow-Up from a Nationally Representative Study. *PLoS ONE*, *8*(4), 1–8. https://doi.org/10.1371/journal.pone.0062396

Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior*, *52*(2), 145–161. https://doi.org/10.1177/0022146510395592

Vošner, H. B., Bobek, S., Kokol, P., & Krečič, M. J. (2016). Attitudes of active older Internet users towards online social networking. *Computers in Human Behavior*, *55*, 230–241. https://doi.org/10.1016/j.chb.2015.09.014

Ward, B. W., Schiller, J. S., & Goodman, R. A. (2014). Multiple Chronic Conditions Among US Adults: A 2012 Update. *Preventing Chronic Disease*, *11*(3), 130389. https://doi.org/10.5888/pcd11.130389

Weenig, M. W. H. (2004). Social Networks. *Encyclopedia of Applied Psychology, Three-Volume Set*, 421–426. https://doi.org/10.1016/B0-12-657410-3/00096-9

Wellman, B., & Wortley, S. (1990). Different Strokes from Different Folks: Community Ties and Social Support. *American Journal of Sociology*, *96*(3), 558–588. https://doi.org/10.1086/229572

Wood, A. M., Maltby, J., Gillett, R., Linley, P. A., & Joseph, S. (2008). The role of gratitude in the development of social support, stress, and depression: Two longitudinal studies. *Journal of Research in Personality*, *42*(4), 854–871.

Wright, K. (2016). Social Networks, Interpersonal Social Support, and Health Outcomes: A Health Communication Perspective. *Frontiers in Communication*, *1*, 10. https://doi.org/10.3389/FCOMM.2016.00010/BIBTEX

Wright, K. B., Rosenberg, J., Egbert, N., Ploeger, N. A., Bernard, D. R., & King, S. (2013). Communication Competence, Social Support, and Depression Among College Students: A Model of Facebook and Face-to-Face Support Network Influence. *Http://Dx.Doi.Org/10.1080/10810730.2012.688250*, *18*(1), 41–57. https://doi.org/10.1080/10810730.2012.688250

Wrzus, C., Hänel, M., Wagner, J., & Neyer, F. J. (2013). Social network changes and life events across the life span: A meta-analysis. *Psychological Bulletin*, *139*(1), 53–80. https://doi.org/10.1037/A0028601

Tables

Table 1 Demographic Characteristics *(N = 371)*

Characteristics		Frequency	(%)
Gender	Male	55	14.6%
	Female	320	84.9%
Education	Not Graduated College	76	20.2%
	Graduated College	301	79.8%
Ethnicity	Non-white	60	15.9%
	White only	317	84.1%
Marital Status	Not married	187	49.6%
	Married	190	50.4%
Employment	Not retired	144	38.2%
	Retired	233	61.8%
Income	Less than $10,000 to $49,000	122	32.4%
	$50,000 to $99,000	79	21.0%
	$100,000 to $149,000	94	24.9%
	$150,000 or more	72	19.1%
Physical Health	Poor	8	2.1%
	Fair	54	14.3%
	Good	162	43.0%
	Very Good	124	32.9%
	Excellent	29	7.7%
Total Chronic Conditions	0	96	25.5%
	1	116	30.8%
	2	89	23.6%
	3	47	12.5%
	4	14	3.7%
	5	10	2.7%
	6	4	1.1%
	7	1	0.3%
	8	0	0.0%
	9	0	0.0%
	10	0	0.0%
Estimated Online Social Network Size	1-25	73	19.4%
	26-50	62	16.4%
	51-100	56	14.9%
	100-125	30	8.0%
	126-150	29	7.7%
	151-175	15	4.0%
	176-200	28	7.4%
	More than 200	83	22.0%
Estimated Offline Social Network Size	1-25	244	64.7%
	26-50	100	26.5%
	51-100	21	5.6%
	100-125	5	1.3%
	126-150	0	0.0%
	151-175	1	0.3%
	176-200	3	0.8%
	More than 200	0	0.0%

**9 missing from income, 2 missing from gender, 1 missing from estimated online social network size, 2 missing from estimated offline network size*

Table 2 Bivariate Correlations

		0	1	2	3	4	5	6	7	8	means	SD
0	Age *range (55-96)*	-									70.20	8.116
1	PHQ9	-.219**	-								3.96	3.86
2	Medical Outcome Social Support Survey	-.053	-.164**	-							62.50	19.47
3	*Tangible*	-.086	-.134**	.860**	-						13.93	5.70
4	*Affectionate*	-.060	-.179**	.843**	.737**	-					10.55	3.94
5	*Positive Interaction*	-.079	-.195**	.829**	.695**	.754**	-				10.44	3.61
6	*Emotional Informational*	-.002	-.109*	.888**	.605**	.597**	.603**	-			27.58	9.31
7	Online Social Network Structure	-.266**	0.052	0.087	0.050	0.031	.111*	0.096	.230**	-	-	-
8	Offline Social Network Structure	-.025	-0.086	.159**	.122*	.144**	.159**	.137**	-0.012	.253**	-	-

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3 Mediation Model of online network size

	β	se	*p*	LLCI	ULCI
Direct Effects					
online social network size → depression	0.022	0.074	0.770	-0.124	0.167
Model 1: MOSS-SSS					
online social network size → social support	0.393	0.376	0.297	-0.347	1.133
social support → depression	-0.024	0.010	**0.021	-0.045	-0.004
online social network size + social support → depression	0.031	0.074	0.672	-0.113	0.176
Model 2: Tangible Social Support					
online social network size → tangible social support	0.018	0.110	0.874	-0.199	0.235
tangible social support → depression	-0.081	0.036	**0.024	-0.151	-0.011
online social network size + tangible social support → depression	0.023	0.073	0.754	-0.121	0.168
Model 3: Affectionate Social Support					
online social network size → affectionate social support	-0.004	0.073	0.962	-0.147	0.140
affectionate social support → depression	-0.148	0.054	***0.007	-0.254	-0.041
online social network size + affectionate social support → depression	0.021	0.073	0.773	-0.123	0.165
Model 4: Positive Social Interactions					
online social network size → positive social interactions	0.104	0.069	0.133	-0.032	0.241
positive social interactions → depression	-0.166	0.057	***0.004	-0.277	-0.054
online social network size + positive social interactions → depression	0.039	0.073	0.596	-0.105	0.183
Model 5: Emotional Informational Social Support					
online social network size → emotional informational	0.275	0.190	0.149	-0.099	0.648
emotional informational → depression	-0.024	0.021	0.242	-0.065	0.017
online social network size + emotional informational → depression	0.028	0.074	0.702	-0.117	0.174

Indirect Effects	**Effect**	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Model 1: online social network size → social support → depression	-0.010	0.011	-0.036	0.009
Model 2: online social network size → tangible social support → depression	-0.001	0.010	-0.024	0.018
Model 3: online social network size → affectionate social support → depression	0.001	0.012	-0.024	0.027
Model 4: online social network size → positive social interactions → depression	-0.017	0.014	-0.048	0.005
Model 5: online social network size → emotional informational → depression	-0.007	0.008	-0.027	0.006

Mediation Models 1 to 5: Mediation models adjusted for demographic controls of age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions

** p<.10, ** p<.05, *** p<.01*

N=359, missing 9 from income, 2 from gender, 1 online network size.

LLCI–Lower limit confidence interval; ULCI—Upper limit confidence interval

Table 4 Mediation Model of offline network size

	β	se	*p*	LLCI	ULCI
Direct Effects					
offline social network size → depression	-0.132	0.206	0.522	-0.536	0.272
Model 6: MOSS-SSS					
offline social network size → social support	2.771	1.042	***0.008	0.721	4.820
social support → depression	-0.024	0.011	**0.027	-0.044	-0.023
offline social network size + social support → depression	-0.067	0.206	0.746	-0.473	0.339
Model 7: Tangible Social Support					
offline social network size → tangible social support	0.620	0.306	**0.044	0.017	1.223
tangible social support → depression	-0.079	0.036	**0.028	-0.149	-0.009
offline social network size + tangible social support → depression	-0.083	0.206	0.687	-0.487	0.322
Model 8: Affectionate Social Support					
offline social network size → affectionate social support	0.488	0.202	**0.016	0.091	0.885
affectionate social support → depression	-0.142	0.054	***0.009	-0.249	-0.036
offline social network size + affectionate social support → depression	-0.063	0.206	0.761	-0.467	0.342
Model 9: Positive Social Interactions					
offline social network size → positive social interactions	0.485	0.193	**0.013	0.105	0.864
positive social interactions → depression	-0.158	0.057	***0.006	-0.269	-0.047
offline social network size + positive social interactions → depression	-0.055	0.205	0.788	-0.459	0.349
Model 10: Emotional Informational Social Support					
offline social network size → emotional informational	1.178	0.527	**0.026	0.141	2.215
emotional informational → depression	-0.023	0.021	0.273	-0.064	0.018
offline social network size + emotional informational → depression	-0.105	0.207	0.613	-0.512	0.302

Indirect Effects	**Effect**	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Model 6: offline social network size → social support → depression	-0.065	0.039	-0.152	-0.001
Model 7: offline social network size → tangible social support → depression	-0.049	0.033	-0.126	0.000
Model 8: offline social network size → affectionate social support → depression	-0.069	0.042	-0.164	-0.002
Model 9: offline social network size → positive social interactions → depression	-0.077	0.041	-0.170	-0.012
Model 10: offline social network size → emotional informational → depression	-0.027	0.030	-0.095	0.027

Mediation Models 6 to 10: Mediation models adjusted for demographic controls of age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions

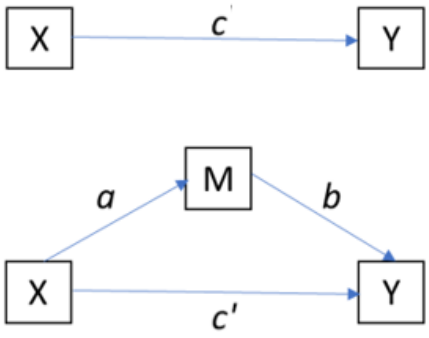
** p<.10, ** p<.05, *** p<.01*

N=358, missing 9 from income, 2 from gender, 2 offline network size

LLCI–Lower limit confidence interval; ULCI—Upper limit confidence interval

Figures

Figure 1 Mediation Diagram



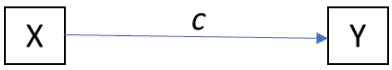
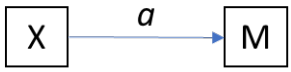
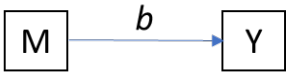
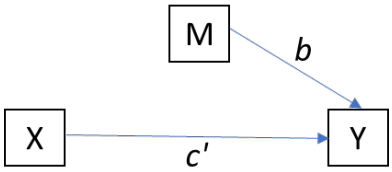
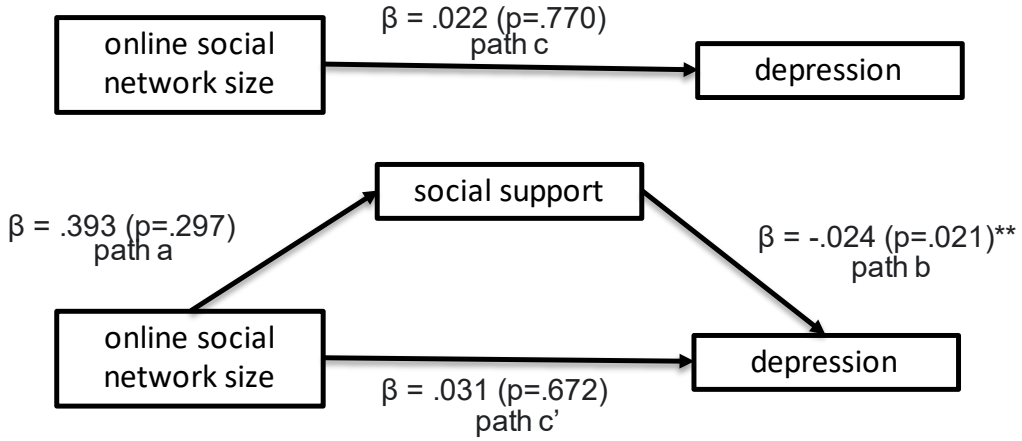
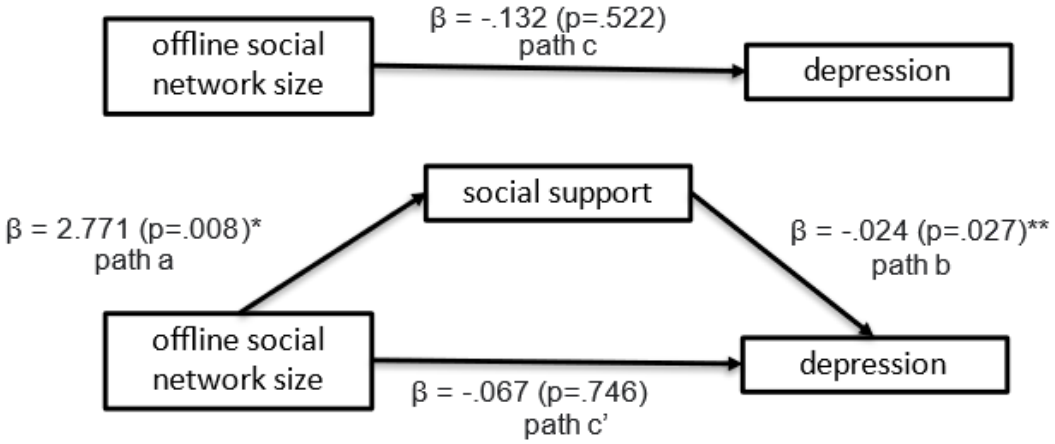
	Analysis	Visual Depiction
Step 1	Conduct a simple regression analysis with X predicting Y to test for path *c* alone, $Y=B_0+B_1X+e$	
Step 2	Conduct a simple regression analysis with X predicting M to test for the path *a*, $M=B_0+B_1X+e$	
Step 3	Conduct a simple regression analysis with M predicting Y to test the significance of path *b* alone, $Y=B_0+B_1M+e$	
Step 4	Conduct a multiple regression analysis with X and M predicting Y, $Y=B_0+B_1X+B_2M+e$	

Figure 2 Mediating effect of online social network on the relationship between social media and depression adjusting for age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions



* p<.1, ** p<.05, *** p<.01

Figure 3 Mediating effect of offline social network on the relationship between social media and depression adjusting for age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions



* p<.1, ** p<.05, *** p<.01

CHAPTER 5

Digital Behaviors of Older Adults: The Mediating Role of Social Support to Social Media Use and Depression during the COVID-19 Pandemic

Chapter 5. Digital Behaviors of Older Adults: The Mediating Role of Social Support to Social Media Use and Depression during the COVID-19 Pandemic

Abstract

Objectives: We examine the mediating effect of social support in the relation of social media use and depression in older adults. We hypothesize that having higher social media use increases social support, and in turn, social support decreases depression in older adults.

Research Design and Methods: The study used a cross-sectional design conducted between March and April 2021 with 371 older adults in the Los Angeles metropolitan and surrounding areas. Mediation analysis using a PROCESS macro was used to investigate whether the mediator variable (social support) transmits the effects of a predictor variable (social media use) on the outcome variable (depression) while controlling for demographic and health variables.

Results: Social support did not mediate the relationship between social media use and depression in older adults. Social media use significantly predicts higher depression scores when controlling demographic covariates (β=.070, se=.333, *p*=.037), but not when health covariates are added (β=.046, se=.032, *p*=.146). Social media use showed no significant relationship to total social support scores and within each of its subscales in all our models. Increased social support predicts lower depression on all social support scales except emotional/informational subscale.

Conclusions: Inclusion of health variables in studies of social media use and depression could influence the identified relationship between social media use and depression outcomes for older adults. The COVID-19 pandemic may have influenced the results of this study, as older adults' social life changed—from their social media use, social support, and uncertainties brought about by the pandemic. Exploring the complexity of social media use and social media behaviors of older adults could allow us to further ascertain its relationship to social support and depression.

Introduction

Depression symptoms in old age have been attributed to an increase in distress that is not due solely to physical decline or an increased possibility of mortality (Chui et al., 2015; Sutin et al., 2013). Complex interactions of physical illness, genetic, biological, and social influences are the risk factors for developing depressive symptoms in older adults (Fiske et al., 2009). Recent actions to mitigate the spread of coronavirus disease 2019 (COVID-19) through self-isolation, mandated quarantine, and social distancing exacerbates the risk of mental health problems like depression (Mukhtar, 2020). The prevalence of depressive symptoms in the United States was estimated to have increased threefold during the COVID-19 pandemic (Ettman et al., 2020). The impact of social isolation or sheltering in place was associated with higher depression in older adults (Krendl & Perry, 2021; Sepúlveda-Loyola et al., 2020). Further, social isolation and disconnectedness have a negative association with physical and mental health, especially in older adults (Cornwell & Waite, 2009).

A large body of established research has demonstrated social support to offset depression (Cohen et al., 1985; Dumont & Provost, 1999; George et al., 1989; Wood et al., 2008). Numerous studies have established a beneficial relationship between social support and depression in older adults (Blazer et al., 1998; Blazer & Williams, 1980). Common types of social support are informational support (the provision of advice, information, guidance, or feedback), tangible support (the provision of material aid or behavioral assistance), positive social interaction (the availability of other people to engage in enjoyable activities with you), and affectionate support (involving expressions of love and affection) (Sherbourne & Stewart, 1991). For older adults, social support from relatives and friends provided through phoning or writing letters showed protective against depression (Oxman T.E et al., 1992). A similar study highlights the importance of social support through contact from friends living elsewhere to significantly predict lower levels of depression compared to contact with friends living within the same community (Potts, 1997). Furthermore, a study by Tsai, Tsai, Wang, Chang, & Chu (2010)

showed how social contact through video conference provided older adults with emotional and appraisal social support and improved their depressive status over the course of three months. Technology has made an older adult's social network more accessible as they can connect, communicate, and engage with their social support systems (Choi & Dinitto, 2013; Khosravi et al., 2016; Nef et al., 2013; Sum et al., 2008; Vošner et al., 2016).

Social media are web 2.0 applications where users can create specific profiles and pages to facilitate online interactions (Kaplan & Haenlein, 2010; Schnutzel, 2014). Social media use in older adults aged 65 and older has grown dramatically in the last few years (Pew Research Center, 2021). The primary motivators which incentivize an older adult to use social media are enjoyment, social contact with family, and providing and receiving social support (Coelho & Duarte, 2016; Leist, 2013). Social media platforms specific to social networking sites such as Facebook, Twitter, and LinkedIn are used to maintain existing social ties and allow the creation of new social connections (Boll & Brune, 2016; Goswami et al., 2010). Previous research found that social media have a positive association with perceived social support, as they provide the means for older adults to stay connected with their close social ties (Chen & Schulz, 2016). Social media is profoundly embedded in making connections, providing older adults with a sense of empowerment through a global sense of participation and belonging, satisfying the need for social contact, extending and maintaining meaningful personal relationships (Barak et al., 2008; Bessière et al., 2008; Chakraborty et al., 2013; Cotten et al., 2013; Leist, 2013; Llorente-Barroso et al., 2015). During the COVID-19 pandemic, social distancing and mandated quarantines may have increased the risk of depression among older adults (Pietrabissa & Simpson, 2020). These restrictions may have propelled older adults' use of social media to connect with their network of family and friends. Collective attention has turned to social media use as it allows its users to be connected to their social support systems, but its influence on social support and depression among older adults is understudied. Studies about social media and depression are focused mainly on adolescents and young adults, and

these studies do not account for health-related variables that are important for older adults. The current study examines the mediating effect of social support in the relation of social media use and depression in older adults, while accounting for demographic and health covariates. We hypothesize that having a higher social media use score increases social support, and in turn, social support decreases depression.

Research Design and Methods

This study used a cross-sectional design, and recruited a convenience sample of older adults. Recruitment had an offline and online component. Flyers were circulated with permission from private venues as well as cold calling/emailing senior centers, senior housing, community centers, home health agencies, and clinics to see if our flyers can be distributed through the mailing lists. The flyers were also distributed electronically through the principal investigator's social and professional networks. Procedures were adjusted in response to the COVID-19 pandemic, and a targeted Facebook campaign was used for recruitment from March 2 to April 2, 2021. To participate in the study, participants must be (1) 55 years of age and older; (2) live in Los Angeles, and surrounding areas (verified by zip code); (3) must have their own Internet account and use some form of social media platform (such as Facebook, Instagram, Twitter, YouTube, LinkedIn, Reddit, Direct-messenger applications (WhatsApp, Viber, Skype) or others not listed) within at least the past two weeks. Participants answered an online self-administered anonymous questionnaire (approximately 10-15 minutes in length) collected using Qualtrics. As an incentive to complete the survey, all participants were entered into a $250 gift card lottery. This study received approval from the University of California, Los Angeles's South General Institutional Review Board (IRB#18-001872).

Measures

Depression. The Patient Health Questionnaire Nine Symptom Depression Checklist (PHQ-9) assessed this study’s depression scores. PHQ-9 is a brief, nine-item self-administered questionnaire used to screen and monitor depression and quantify its severity in various

healthcare and community settings (Kroenke, Spitzer, & Williams, 2001). Each of the nine items is scored as 0 (not at all), 1 (several days), 2 (more than half the days), or 3 (more than half the days) (nearly every day). As a screening tool, the sum of the nine items (score range 0-27), with a score of 0 indicating no depressive symptoms and a score of 27 indicating that all symptoms occur nearly daily. Although PHQ-9 was initially designed for use in primary care settings, it is valid and reliable across a wide variety of populations and settings (Kroenke et al., 2001). With an internal consistency of 0.87, the instrument is also reliable for use in general and elderly populations (Kocalevent et al., 2013; Phelan et al., 2010). In this study, the reliability of the 9-item PHQ-9 is α = .82.

Social Support. The Medical Outcomes Study Social Support Survey was used to assess the mediating variable of social support (MOS-SSS). The MOS-SSS categorizes social support into four 18-item subscales (emotional/informational, tangible, affectionate, and positive social interactions) and a composite index of functional social support. Responses were classified on a five-point scale ranging from 1 (none of the time) to 5 (all of the time). A higher score on each subscale or the total social support index indicates a higher level of social support. MOS-SSS was developed initially for a diverse patient population in Los Angeles, Chicago, and Boston who suffered from preventable and treatable chronic conditions (hypertension, diabetes, coronary heart disease, and depression) (Sherbourne & Stewart, 1991). The MOS-SSS has a high level of internal consistency (alpha 0.97 for the total social support score) and test-retest reliability (one-year stability coefficient of 0.78 for the total social support score (Sherbourne & Stewart, 1991). The MOS-SSS has been applied to a diverse group of community-dwelling older adults in various studies (Hand et al., 2012; Krousel-Wood et al., 2010; Ruggiero et al., 2009; Sherman, 2003). For this study, the reliability of the scales was high, the total social support scale (α = .97), emotional/information (α = .98), tangible support (α = .97), affectionate support (α = .93), and positive social interaction (α = .97).

Social Media Use. Social Media Use Integration Scale (SMUIS) was used to measure the engaged use of social media activity or social media use (Jenkins-Guarnieri et al., 2012). Although the development of the SMUIS was focused on Facebook, Jenkins-Guarnieri et al. (2012) acknowledged how the instrument is flexible enough to be adapted for use to the multiple manifestations of general online social media use (Asghar, 2015; Berryman et al., 2017; Hou, 2017; Maree, 2017; McDougall et al., 2016; Weisen, 2016). For this study, we followed Jenkins et al.'s (2012) recommendations of replacing the word "Facebook" in the item statements with the word "social media." The SMUIS has two subscales, Social Integration/Emotional Connection and Integration into Social Routines. The Social Integration/Emotional Connection subscale considers the degree to which social media use is a habit. The Integration into Social Routines subscale assesses an individual's preference for communication through social media. The scale has a Likert response to indicate the level of agreement or disagreement from 1 strongly disagree to 6 strongly agree, with higher scores indicating a more engaged use and integration of social media. (Jenkins-Guarnieri et al., 2012) also reported reliability of.91 for the total scale, .80 for the first subscale, and.67 for the second subscale. The SMUIS has a good reported internal consistency of 0.83 (Jenkins-Guarnieri et al., 2012). For this study, the reliability for the total scale of 10-items (α = .83), social integration/emotional connection subscale of 6-items (α = .81), and the integration into the social routines subscale (α = .76).

Social Media Activity Questions. Respondents were asked about their social media activity for descriptive purposes. The respondents were asked to select all the social media services they are actively using to contact friends or family, given the following choices: Facebook, Instagram, Twitter, YouTube, Reddit, LinkedIn, Direct-messenger applications (WhatsApp, Viber, Skype) and Other, with a space to input what is not listed. As we operationally defined social media as web 2.0 applications where users can create specific profiles and pages to facilitate online interactions, responses in the *others* were manually reviewed for similarity to previous options and for accuracy (as some wrote e-mails and text

messages). The number of social media was summed so that higher values reflected more social media platforms used. The participants were also prompted to select their most used social media service and identify the device they use most often to access their most used social media service—whether it be a laptop, desktop, tablet, smartphone, or another device. Finally, the participants were asked how often they 'encounter negative interactions while using social media—this includes being bothered by, offended, or having negative exchanges while on any of your social media platforms. Responses were on a 5-point Likert scale from 1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (always).

Demographic and health covariates. Covariates were selected based on their known association with depression (Cacioppo et al., 2010; Teo et al., 2013). They include demographic and health data from age, gender, education, ethnicity, marital status, employment, income, total chronic conditions, and physical health. Chronological age was calculated from the respondent's year of birth. Gender was coded, female and male. Education was coded as Graduated College and Not Graduated College. Ethnicity was classified as White and Non-White. Marital status was coded Married and Not Married. Employment asked not Retired and Retired. Household income categorized as less than $10,000 to $49,000, $50,000 to $99,000, $100,000 to $149,000, and $150,000 or more. Physical health used a 5-point self-report asking participants to choose whether their physical health was excellent, very good, good, fair, or poor. Total chronic conditions were the sum of seven chronic conditions, in which respondents were asked whether they have ever been told by a doctor or health care provider that they had hypertension, coronary heart disease, stroke, diabetes, cancer, arthritis, or hepatitis, weak or failing kidneys, during the past 12 months (Ward et al., 2014).

Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 28. Descriptive statistics were used to examine the demographics of participants and social media use. Pearson's correlations were used to test the relationship

between age, social media use, social support, and depression. Multiple mediation models were constructed to examine whether social support (total score and each of its subscales) mediates the relationship of social media use and depression while controlling for known covariates of age, gender, education, ethnicity, marital status, employment, income, and health variables of physical health rating and total chronic conditions. Models 1 to 5 included only the basic demographic covariates, while Models 6 to 10 also added health covariates of physical health rating and total chronic conditions. Subsequent models were then created for each social support subscale. Mediation analysis was used to investigate whether the mediator variable (social support) transmits the effects of a predictor variable (social media use) on an outcome variable (depression). Rather than run several regressions to test for partial or complete mediation, with the significance of the coefficients examined at each step as described by Baron & Kenny (1986), we used a 5000 nonparametric bootstrapping technique and evaluated our mediation models using the Model 4 Process Macro in SPSS as defined by (Preacher & Hayes, 2004).

Results

The characteristics of the study participants are listed in Table 1 and their characteristics of social media activities in Table 2. Table 3 shows Pearson's correlation analysis. Figures 1 and 2 visualize the mediation model pathway of social media use, total social support, and depression. Models 1 to 5 controlled for the basic demographics of age, gender, education, ethnicity, marital status, employment, and income (Table 4). In contrast, Models 6 to 10 included the health covariates of physical health rating and total chronic conditions (Table 5).

The 371 participants had a mean age of 70.20 ±8.12 years, ranging from 55 to 96 years. Most participants were female (85.2%), white (84.9%), college-educated (79.5%), and retired (62.3%). The sample is somewhat even when it comes to marital status—married (50.9%) and not married (49.1%). Additionally, participants reported having at least one chronic condition (30.7%), and most reported having good physical health (43.4%). The mean score was 3.96

(sd=3.86), total social support was 62.50 (sd=19.48), and social media use at 33.08 (sd=5.91). Facebook is the most frequently used social media platform (65.8%), followed by others (16.7%), then direct messengers (15.6%). Manual review of others includes platforms such as Neighbors, Microsoft Teams, and Zoom. Our sample's main form of access to their social media account is through a smartphone (44.2%). Most participants actively use two (31.3%) to three (28.0%) social media platforms. When asked about negative social media exposure, most of our sample answered sometimes (57.6%).

Table 3 reports the bivariate correlations between continuous variables. In our sample, age is negatively correlated with depression (r = -.22, $p < .01$). Depression is negatively correlated with total social support score *(*r = -.16, $p < .01$) and all its subscales—tangible social support (r = -.13, p = .01), affectionate social support (r = -.18, $p < .01$), positive interaction social support (r = -.20, p < .01), emotional/informational social support (r = -.11, $p < .05$). Social media use was not correlated to social support or any of its subscales. Social media use was positively correlated with depression (r = .14, $p < .01$).

Social Media and Depression

In our unmediated regression model, social media use significantly predicts higher depression scores when controlling for the basic demographics of age, gender, education, ethnicity, marital status, employment, and income (β=.070, se=.333, p=.037). These findings are also seen when controlling for total social support (β=.066, se=.033, p=.044) and all its subscales—tangible support (β=.062, se=.033, p=.062), affectionate support (β=.066, se=.033, p=.044), positive social interactions (β=.060, se=.033, p=.068), and emotional/informational support (β=.072, se=.033, p=.031).

However, when health covariates of physical health and sum chronic conditions were included, the direct effect of social media use on depression did not show a significant relationship (β=.046, se=.032, p=.146). These findings are also present when controlling for total social support and its subscales—total social support (β=.045, se=.031, p=.149), tangible

support (β=.041, se=.031, *p*=.192), affectionate support (β=.045, se=.031, *p*=.148), positive social interactions (β=.042, se=.031, *p*=.181), and emotional/informational support (β=.048, se=.032, *p*=.132).

Social Media and Social Support

The results of our mediation analysis showed that social media use is not significantly associated with total social support and with each of its subscales. Social media use predicted lower total social support and with its subscales in models that controlled only demographic covariates (Models 1 to 5)—total support (β=-.090, se=.163, *p*=.583), tangible support (β=-.073, se=.047, *p*=.120), affectionate support (β=-.016, se=.032, *p*=.604), positive social interactions (β=-.041, se=.031, *p*=.183), but these were not significant. However, social media use predicted higher emotional/informational support (β=.040, se=.082, *p*=.062), but its direct effect was also not significant.

Similar findings are on models that controlled for health covariates (Models 6 to 10)—social media use predicted lower total support (β=-.025, se=.161, *p*=.875), tangible support (β=-.063, se=.047, *p*=.180), affectionate support (β=-.004, se=.031, *p*=.904), positive social interactions (β=-.026, se=.030, *p*=.390), but were not significant. Only in the emotional/informational support domain where social media use predicted higher emotional/informational support (β=.067, se=.081, *p*=.408), but this was also not significant in models where health covariates are included.

Social Support and Depression

In our unmediated models, social support and its subscales were significant negative predictors of depression when accounting for only demographic covariates (Model 1 to 5)—total social support score (β=-.0378, se=.011, *p*=.001), tangible social support (β=-.103, se=.038, *p*=.007), affectionate social support (β=-.211, se=.056, *p*=.000), positive social interactions (β=-.244, se=.057, *p*=.000), and emotional/informational social support (β=-.051, se=.022, *p*=.018).

In models that only included demographic covariates, higher total social support and its respective subscales significantly predict lower depression scores.

The findings in models in which health covariates are included only show Model 6 to 9 to be significant negative predictors of lower depression scores—total social support (β=-.024, se=.010, *p*=.023), tangible social support (β=-.076, se=.036, *p*=.033), affectionate social support (β=-.144, se=.054, *p*=.007), and positive social interactions (β=-.157, se=.056, *p*=.005). Although the emotional/informational support domain negatively predicts lower depression scores, it was not significant in our analysis (β=-.025, se=.021, *p*=.224). In models that included health covariates, higher total social support and domains of tangible support, affectionate support, and positive social interactions significantly predicted lower depression scores.

Mediation Effects

In all our mediation models, the indirect effects of social media use on depression through social support were not significant. This is seen in models that controlled only demographic covariates and those that included health covariates. Social support and each of its subscales did not mediate the relationship between social media and depression. Therefore, our findings did not support our main hypothesis that having a higher social media use score increases social support and, in turn, social support decreases depression in older adults.

Discussion

The purpose of this study was to investigate the mediating effect of social support on the relationship between adults (aged 55 and older) social media use and depression of older adults. Our findings did not support our hypothesis that higher social media use increases social support and, in turn, social support decreases depression in older adults.

Social Media and Depression

Our findings were mixed when we explored the relationship between social media use and depression. In our correlational analysis, social media use was significantly associated with depression. In our unmediated models, which controlled for basic demographic covariates

(Models 1 to 5), a higher social media use score significantly predicted higher depression scores. These findings without health covariates aligned with previous research that shows a significant association between social media use and depression in young adults (Keles et al., 2020; Marino et al., 2018; McCrae et al., 2017; Yoon et al., 2019). Our results also aligned with studies that included older adults, but it is essential to recognize that these previous studies had a much younger mean age, were not designed specifically for older adults, and most importantly, did not include health covariates (Andreassen et al., 2016; Błachnio et al., 2015; Lau et al., 2016; Reinecke et al., 2017; Rosen et al., 2013).

In our unmediated models that controlled for health covariates of physical health and total sum chronic conditions (Models 6 to 10), social media use did not significantly predict depression. These findings with health covariates corroborated studies that indicated a lack of a substantial relationship between aspects of social media use and depression (Aarts et al., 2015; Ang & Chen, 2019; McDougall et al., 2016). However, these findings contrast with the results of studies that controlled for health covariates and showed how other measures of social media use reduce depression among older adults (Chopik, 2016; Mete et al., 2018; Nakagomi et al., 2020; Teo et al., 2019). These previous studies that contrasted our results did not use the social media use integration scale, a social media instrument designed to capture how people incorporate social media into their daily routines and emotional attachment to the platform. Furthermore, we assume that including health variables in studies of social media use and depression in older adults is essential, as physical disabilities and chronic conditions might influence motivations to use social media technology and depression outcomes. Social media use measurements cannot be generalized as attempts to categorize the diverse social media landscape have some difficulty, as multiple platforms often share the same characteristics (Baker & Algorta, 2016; Hamm et al., 2013; Korda & Itani, 2011). Though we measured social media use by means of the respondents' use, engagement, and integration into daily life, it is essential to consider specific platforms with specific use as the use of direct messengers and

video calls, as they have been shown to provide social support and improve depression (Tsai, Tsai, Wang, Chang, Chu, et al., 2010). Furthermore, it is also essential to recognize that previously available literature on social media and depression was conducted prior to the COVID-19 pandemic. Therefore, we cannot rule out how the relationship of social media use with depression has been complicated by the COVID-19 pandemic and the infodemic (the overabundance of health information, misinformation, and disinformation during a public health crisis) that came with it.

Social Media and Social Support

Social media use did not significantly predict social support and each of its subscales in all our models (Models 1 to 10). Our findings contrasted previous research indicating how certain characteristics of social media were associated with increased social support (Chen & Schulz, 2016; Lee & Cho, 2019; Nam, 2021; H. Y. Wu & Chiou, 2020; Zhang et al., 2021). Studies of social media and social support that included health covariates found social media to impact social support in older adults with hearing impairment and physical disabilities (Lee & Cho, 2019; Ma et al., 2021). Albeit speculative, the previous association between social media use and social support is also complicated in the time of COVID-19 and social distancing. It is critical to recognize how the COVID-19 pandemic has impacted an older adult's social life—where once social media augments an older adult's social support system, COVID-19 encouraged non-physical interactions and social support to limit the spread of the virus. The quality of these non-physical social support and interactions was never accounted for in our mediation models. During data collection, disinformation and misinformation online were rampant, ranging from bogus COVID-19 remedies to erroneous voter fraud. Although the targets of fake news are not age-specific, older people were most impacted by online fake news (Brashier & Schacter, 2020). Social media allowed older adults to connect to their social support system, but the quality of these interactions, whether negative or positive, could have a potential influence on social support, thus further studies are needed.

Social Support and Depression

Social support and most of its subscales were significant negative predictors of lower depression scores in all our unmediated models, except the emotional/informational social support domain. There was no distinction between emotional and informational support when measuring the emotional/informational social support domain. The COVID-19 pandemic came with an infodemic of misinformation and disinformation (Chong et al., 2020). We cannot rule out how misinformation disguised as emotional/informational social support may have complicated the relationship to depression.

Mediation Effects

Our study did not confirm the mediating effect of social support on the relationship between social media and depression in older adults. A higher social media use score did not increase social support, and in turn, social support did not decrease depression scores in our sample of older adults. Several plausible explanations could be suggested. However, it cannot be ruled out that social support does not mediate the relationship between social media use and depression. Perhaps more complex serial mediation is present or unaccounted variables that moderate instead of mediating the relationship between social media use and depression in older adults.

Most importantly, the COVID-19 pandemic was accompanied by an infodemic which arguably further complicated the previous relationship of older adults with social media, their social support systems, and mental health, specific to depression. Our findings suggest that social media do not significantly affect the total social support score and its subscales or alter its protective benefit on depression in older adults. This finding is important, as social media use was previously highlighted to benefit older adults, as it allowed them to engage their social contacts to provide and receive social support (Coelho & Duarte, 2016; Leist, 2013). In the context of the COVID-19 pandemic, social media debatably took center stage in arguably influencing emotions, behaviors, and the mental health of older adults (Allington et al., 2021).

We cannot rule out how though social media enabled older adults to connect with their friends and family members, the quality of these connections and interactions became complicated when their friends and family posts to express their disparate views on COVID vaccines and mandates.

Limitations, Strengths, and Further Research

The present study extended the existing literature about social media, social support, and depression among older adults (McDougall et al., 2016; H.-Y. Wu & Chiou, 2020). Our study also adds to the dearth of literature about social media use and depression in older adults, as few studies included adults over the age of 70 (Ang & Chen, 2019; Gyeong-Suk et al., 2020; Wong et al., 2021). Our primary data included a relatively large sample size compared to previous primary data studies on social media, depression, and older adults. To our knowledge, this was the first study about older adults to examine social media use, social support, and depression in a primary data set collected during the COVID-19 pandemic. Our study is also unique, as previous studies were limited by a simple measure of frequency of social media use or simple yes or no to social media use. While frequency and duration measurements have been used to quantify social media use, they do not capture how people incorporate the site into their daily routines or their emotional commitment to the platform. Prior measures of assessing social media use tend to suffer from a lack of methodological rigor, and the use of the Social Media Use Integration Scale (SMUIS) provided a more robust measure of social media use with detailed psychometric evidence (Jenkins-Guarnieri et al., 2012). Though the instrument has its limitations in that it does not specify or identify a social media platform, as some measures of social media usage, such as social media behavior or being passive or active users, or the specific use of video-chatting in direct messengers have protective benefits against depression and provide some form of social support (Kim et al., 2020; Teo et al., 2019).

Although the findings of this study contribute to the knowledge about the relationship between social media use, social support, and depression in older adults, some limitations must

be considered. First, there is a lack of diversity, as there was an overrepresentation of female respondents (85.2%). Our study, however, reflects the gender difference in the Pew Research survey on social media use in the general population, where females are the majority of social media users (Greenwood et al., 2016). Similar studies on social media and depression showed an overrepresentation of female subjects (Lin et al., 2021; McDougall et al., 2016; Wong et al., 2021). Furthermore, due to the restrictions of COVID-19, our study was primarily online recruitment, and similar to previous studies where data was collected online, most participants tended to be women (Bendau et al., 2021; Gao et al., 2020; Meshi et al., 2020; Mongkhon et al., 2021). Descriptively, our study adds to the previous literature to show how women are more inclined to participate and engage in online recruitment. Though our target Facebook advertisement was open recruitment, engagement (clicks to the survey website) was primarily females. This limitation further becomes a discussion of active versus passive use of social media. More research should explore gender differences in passive versus active social media use when exploring the association of social media with social support and depression in older adults. Further studies should include a diverse sample, as our study potentially lacks generalizability. Second, this study used a cross-sectional design, so the correlation between social media use and depression or social media use and social support does not imply causation. Third, the information collected using an online survey included exclusively self-reported data, so health-related responses can be underreported or overreported. Fourth, we did not include the effects of their online and offline social network structure in these analyses. The social network characteristics in terms of structural size must also be considered in exploring social media, social support, and depression, as online network structure in terms of size has correlations to well-being and distress (Huang, 2021). Further studies about social media and older adults should account for their social network structure and function to see their relationship to social support and depression. Finally, our fifth limitation may affect the direction of future studies about social media use in the older population. In our study, we collected

numerous social media activity questions for descriptive purposes, and these were not included in our mediation analysis to keep the mediation models simple. The danger of including multiple predictors in the mediation model, as when including statistical controls, is the possibility that highly correlated predictors cancel out each other's effects, standard concern for linear models involving correlated predictors. Future analysis and studies are needed to expand the simple mediation model to include/combine social network structure, social media use integration scale**,** specific types of platforms (Facebook, Twitter, Direct Messengers, etc.), total social media platform used, frequency of use, length of use, negative social media exposure - level of social media interaction, passive versus active use. Further studies should also explore the quality of interaction within an older adult's use of social media and how managing multiple social media platforms influence social support and depression. Social media use redefining the concept of social support has yet to be explored. Future studies are also needed to explore whether social media behaviors, be it active or passive such as the *likes* 

, the *comments* 

, the *shares* 

, the *subscribes* 

, the *follow* 

, and the *retweets*  counts or encourages certain type of social support and see whether it influences the outcomes of depression in older adults.

Conclusions

Despite these limitations, to our knowledge, this study was the first to explore the relationship between social media use, social support, and depression in older adults during a pandemic and infodemic. This study examined the mediating effect of social support on the relationship between social media use and depression. Our findings show that social media use did not increase social support, and in turn, social support did not decrease depression. In examining our mediation models, we found that higher social media use integration scores significantly predicted higher depression scores in models that did not include health covariates. Social media use did not significantly predict depression scores when health covariates were

included. Social media use did not show a significant relationship to total social support scores and within each of its subscales. Increased social support predicts lower depression on all social support scales except emotional/informational subscale. The inclusion of health covariates in social media use and depression studies could influence the relationship between social media use and depression outcomes for older adults. Further, the COVID-19 pandemic, along with an infodemic, may have shaped this study's results as actions to mitigate the spread of the disease might have influenced an older adult's relationship to the social media, their access to their social support system, and may have brought forth uncertainties that impact mental health and depression. Further studies are needed to examine the intricacies of social media use and social media behaviors of older adults and how it relates to social support and depression during and without a pandemic.

References

Aarts, S., Peek, S. T. M., & Wouters, E. J. M. (2015). The relation between social network site usage and loneliness and mental health in community-dwelling older adults. *International Journal of Geriatric Psychiatry*, *30*(9), 942–949. https://doi.org/10.1002/gps.4241

Allington, D., Duffy, B., Wessely, S., Dhavan, N., & Rubin, J. (2021). Health-protective behaviour, social media usage and conspiracy belief during the COVID-19 public health emergency – CORRIGENDUM. *Psychological Medicine*, *51*(10), 1770–1770. https://doi.org/10.1017/S0033291721000593

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors*, *30*(2), 252–262. https://doi.org/10.1037/adb0000160

Ang, S., & Chen, T.-Y. (2019). Going Online to Stay Connected: Online Social Participation Buffers the Relationship Between Pain and Depression. *The Journals of Gerontology: Series B*, *74*(6), 1020–1031. https://doi.org/10.1093/geronb/gby109

Asghar, H. M. (2015). Measuring Information Seeking through Facebook: Scale development and initial evidence of Information Seeking in Facebook Scale (ISFS). *Computers in Human Behavior*, *52*(October), 259–270. https://doi.org/10.1016/j.chb.2015.06.005

Baker, D. A., & Algorta, G. P. (2016). The Relationship Between Online Social Networking and Depression: A Systematic Review of Quantitative Studies. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 638–648. https://doi.org/10.1089/cyber.2016.0206

Barak, A., Boniel-Nissim, M., & Suler, J. (2008). Fostering empowerment in online support groups. *Computers in Human Behavior*, *24*(5), 1867–1883. https://doi.org/10.1016/j.chb.2008.02.004

Bendau, A., Petzold, M. B., Pyrkosch, L., Mascarell Maricic, L., Betzler, F., Rogoll, J., Große, J., Ströhle, A., & Plag, J. (2021). Associations between COVID-19 related media consumption and symptoms of anxiety, depression and COVID-19 related fear in the general population in Germany. *European Archives of Psychiatry and Clinical Neuroscience*, *271*(2), 283–291. https://doi.org/10.1007/s00406-020-01171-6

Berryman, C., Ferguson, C. J., & Negy, C. (2017). Social Media Use and Mental Health among Young Adults. *Psychiatric Quarterly*, 1–8. https://doi.org/10.1007/s11126-017-9535-6

Bessière, K., Kiesler, S., Kraut, R., & Boneva, B. S. (2008). Effects of Internet Use and Social Resources on Changes in Depression. *Information, Communication & Society*, *11*(1), 47–70. https://doi.org/10.1080/13691180701858851

Błachnio, A., Przepiórka, A., & Pantic, I. (2015). Internet use, Facebook intrusion, and depression: Results of a cross-sectional study. *European Psychiatry*, *30*(6), 681–684. https://doi.org/10.1016/j.eurpsy.2015.04.002

Blazer, D., Landerman, L., Hays, J. C., Simonsick, E. M., & Saunders, W. B. (1998). Symptoms of depression among community-dwelling elderly African-American and white older adults. *Psychological Medicine*, *28*(6), 1311–1320.

Blazer, D., & Williams, C. (1980). Epidemiology of dysphoria and depression in an elderly population. *The American Journal of Psychiatry*.

Boll, F., & Brune, P. (2016). Online Support for the Elderly – Why Service and Social Network Platforms should be Integrated. *Procedia Computer Science*, *98*(auICTH), 395–400. https://doi.org/10.1016/j.procs.2016.09.060

Brashier, N. M., & Schacter, D. L. (2020). Aging in an Era of Fake News. *Current Directions in Psychological Science*, *29*(3), 316–323. https://doi.org/10.1177/0963721420915872

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. a. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging*, *25*(2), 453–463. https://doi.org/10.1037/a0017216

Chakraborty, R., Vishik, C., & Rao, H. R. (2013). Privacy preserving actions of older adults on social media: Exploring the behavior of opting out of information sharing. *Decision Support Systems*, *55*(4). https://doi.org/10.1016/j.dss.2013.01.004

Chen, Y.-R. R., & Schulz, P. J. (2016). The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly: A Systematic Review. *Journal of Medical Internet Research*, *18*(1), e18. https://doi.org/10.2196/jmir.4596

Choi, N. G., & Dinitto, D. M. (2013). Internet use among older adults: Association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research*, *15*(5), 1–16. https://doi.org/10.2196/jmir.2333

Chong, Y. Y., Cheng, H. Y., Chan, H. Y. L., Chien, W. T., & Wong, S. Y. S. (2020). COVID-19 pandemic, infodemic and the role of eHealth literacy. *International Journal of Nursing Studies*, *108*, 103644. https://doi.org/10.1016/J.IJNURSTU.2020.103644

Chopik, W. J. (2016). The Benefits of Social Technology Use Among Older Adults Are Mediated by Reduced Loneliness. *Cyberpsychology, Behavior, and Social Networking*, *19*(9), 551–556. https://doi.org/10.1089/cyber.2016.0151

Chui, H., Gerstorf, D., Hoppmann, C. A., & Luszcz, M. A. (2015). Trajectories of depressive symptoms in old age: Integrating age-, pathology-, and mortality-related changes. *Psychology and Aging*, *30*(4), 940–951. https://doi.org/10.1037/pag0000054

Coelho, J., & Duarte, C. (2016). A literature survey on older adults' use of social network services and social applications. *Computers in Human Behavior*, *58*, 187–205. https://doi.org/10.1016/j.chb.2015.12.053

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support. In *Social support: Theory, research and applications* (pp. 73–94). Springer.

Cornwell, E. Y., & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, *50*(1), 31–48. https://doi.org/10.1177/002214650905000103

Cotten, S. R., Anderson, W. A., & McCullough, B. M. (2013). Impact of internet use on loneliness and contact with others among older adults: Cross-sectional analysis. *Journal of Medical Internet Research*, *15*(2), 1–13. https://doi.org/10.2196/jmir.2306

Dumont, M., & Provost, M. A. (1999). Resilience in adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, *28*(3), 343–363.

Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of Depression Symptoms in US Adults Before and During the COVID-19 Pandemic. *JAMA Network Open*, *3*(9). https://doi.org/10.1001/JAMANETWORKOPEN.2020.19686

Fiske, A., Wetherell, J., & Gatz, M. (2009). Depression in older adults. *Annual Review of Clinical …*, *112*(11), 363–389. https://doi.org/10.1146/annurev.clinpsy.032408.153621.Depression

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during COVID-19 outbreak. *PLOS ONE*, *15*(4). https://doi.org/10.1371/journal.pone.0231924

George, L., Blazer, D., Hughes, D., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry*, *154*(4), 478–485.

Goswami, S., Kobler, F., Leimeister, J., & Krcmar, H. (2010). Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly. *International Conference on Information System 2010*.

Greenwood, S., Perrin, A., & Duggan, M. (2016). Social Media Update 2016. *Pew Research Center*, *November*. http://assets.pewresearch.org/wp-content/uploads/sites/14/2016/11/10132827/PI_2016.11.11_Social-Media-Update_FINAL.pdf

Gyeong-Suk, J., Kyung-Won, C., & Kwang-Sim, J. (2020). Social networking site usage and its' impact on depressive symptoms among older men and women in south korea. *International Journal of Environmental Research and Public Health*, *17*(8). https://doi.org/10.3390/ijerph17082670

Hamm, M. P., Chisholm, A., Shulhan, J., Milne, A., Scott, S. D., Given, L. M., & Hartling, L. (2013). Social media use among patients and caregivers: a scoping review. *BMJ Open*, *3*(5), 1–10. https://doi.org/10.1136/bmjopen-2013-002819

Hand, C., Law, M., Hanna, S., Elliott, S., & McColl, M. A. (2012). Neighbourhood influences on participation in activities among older adults with chronic health conditions. *Health and Place*, *18*(4), 869–876. https://doi.org/10.1016/j.healthplace.2012.03.004

Hou, S.-I. (2017). Measuring Social Media Active Level (Smactive) and Engagement Level (Smengage) Among Professionals in Higher Education. *International Journal of Cyber Society and Education*, *10*(1), 1–16. https://doi.org/10.7903/ijcse.1520

Huang, C. (2021). Correlations of online social network size with well-being and distress: A meta-analysis. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *15*(2), 3. https://doi.org/10.5817/CP2021-2-3

Jenkins-Guarnieri, M. a., Wright, S. L., & Johnson, B. (2012). Development and Validation of a Social Media Use Integration Scale. *Psychology of Popular Media Culture*, *2*(July 2015), 37–50. https://doi.org/10.1037/a0030277

Kaplan, A., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, *53*(1), 59–68.

Keles, B., McCrae, N., & Grealish, A. (2020). A systematic review: the influence of social media on depression, anxiety and psychological distress in adolescents. *International Journal of Adolescence and Youth*, *25*(1), 79–93. https://doi.org/10.1080/02673843.2019.1590851

Khosravi, P., Rezvani, A., & Wiewiora, A. (2016). The impact of technology on older adults' social isolation. *Computers in Human Behavior*, *63*(July), 594–603. https://doi.org/10.1016/j.chb.2016.05.092

Kim, E. S., James, P., Zevon, E. S., Trudel-Fitzgerald, C., Kubzansky, L. D., & Grodstein, F. (2020). Social Media as an Emerging Data Resource for Epidemiologic Research: Characteristics of Regular and Nonregular Social Media Users in Nurses' Health Study II. *American Journal of Epidemiology*, *189*(2). https://doi.org/10.1093/aje/kwz224

Kocalevent, R. D., Hinz, A., & Brähler, E. (2013). Standardization of the depression screener Patient Health Questionnaire (PHQ-9) in the general population. *General Hospital Psychiatry*, *35*(5), 551–555. https://doi.org/10.1016/j.genhosppsych.2013.04.006

Korda, H., & Itani, Z. (2011). Harnessing Social Media for Health Promotion and Behavior Change. *Health Promotion Practice*, 15–23. https://doi.org/10.1177/1524839911405850

Krendl, A. C., & Perry, B. L. (2021). The Impact of Sheltering in Place During the COVID-19 Pandemic on Older Adults' Social and Mental Well-Being. *The Journals of Gerontology: Series B*, *76*(2), e53–e58. https://doi.org/10.1093/geronb/gbaa110

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9. *Journal of General Internal Medicine*, *16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Krousel-Wood, M., Islam, T., Muntner, P., Holt, E., Joyce, C., Morisky, D. E., Webber, L. S., & Frohlich, E. D. (2010). Association of Depression with Antihypertensive Medication Adherence in Older Adults: Cross-Sectional and Longitudinal Findings from CoSMO. *Annals of Behavioral Medicine*, *40*(3), 248–257. https://doi.org/10.1007/s12160-010-9217-1

Lau, K. M., Hou, W. K., Hall, B. J., Canetti, D., Ng, S. M., Lam, A. I. F., & Hobfoll, S. E. (2016). Social media and mental health in democracy movement in Hong Kong: A population-based study. *Computers in Human Behavior*, *64*, 656–662. https://doi.org/10.1016/j.chb.2016.07.028

Lee, H. E., & Cho, J. (2019). Social Media Use and Well-Being in People with Physical Disabilities: Influence of SNS and Online Community Uses on Social Support, Depression, and Psychological Disposition. *Health Communication*, *34*(9), 1043–1052. https://doi.org/10.1080/10410236.2018.1455138

Leist, A. K. (2013). Social media use of older adults: A mini-review. *Gerontology*, *59*(4), 378–384. https://doi.org/10.1159/000346818

Lin, C., Namdar, P., Griffiths, M. D., & Pakpour, A. H. (2021). Mediated roles of generalized trust and perceived social support in the effects of problematic social media use on mental health: A cross-sectional study. *Health Expectations*, *24*(1), 165–173. https://doi.org/10.1111/hex.13169

Llorente-Barroso, C., Viñarás-Abad, M., & Sánchez-Valle, M. (2015). Internet and the elderly: Enhancing active ageing. *Comunicar*, *23*(45). https://doi.org/10.3916/C45-2015-03

Ma, Y., Liang, C., Yang, X., Zhang, H., Zhao, S., & Lu, L. (2021). The Effect of Social Media Use on Depressive Symptoms in Older Adults with Self-Reported Hearing Impairment: An Empirical Study. *Healthcare*, *9*(11), 1403. https://doi.org/10.3390/healthcare9111403

Maree, T. (2017). The Social Media Use Integration Scale: Toward Reliability and Validity. *International Journal of Human-Computer Interaction*, *33*(12), 963–972. https://doi.org/10.1080/10447318.2017.1301041

Marino, C., Gini, G., Vieno, A., & Spada, M. M. (2018). The associations between problematic Facebook use, psychological distress and well-being among adolescents and young adults: A systematic review and meta-analysis. *Journal of Affective Disorders*, *226*, 274–281. https://doi.org/10.1016/j.jad.2017.10.007

McCrae, N., Gettings, S., & Purssell, E. (2017). Social Media and Depressive Symptoms in Childhood and Adolescence: A Systematic Review. *Adolescent Research Review*, *2*(4), 315–330. https://doi.org/10.1007/s40894-017-0053-4

McDougall, M. A., Walsh, M., Wattier, K., Knigge, R., Miller, L., Stevermer, M., & Fogas, B. S. (2016). The effect of social networking sites on the relationship between perceived social support and depression. *Psychiatry Research*, *246*, 223–229. https://doi.org/10.1016/j.psychres.2016.09.018

Meshi, D., Cotten, S. R., & Bender, A. R. (2020). Problematic Social Media Use and Perceived Social Isolation in Older Adults: A Cross-Sectional Study. *Gerontology*, *66*(2), 160–168. https://doi.org/10.1159/000502577

Mete, B., Fırıncı, B., Doğan, E., & Pehlivan, E. (2018). Depression and affecting factors in patients over 50 years of age: A cross-sectional study. *Journal of Surgery and Medicine*, *3*(2), 149–154. https://doi.org/10.28982/josam.455047

Mongkhon, P., Ruengorn, C., Awiphan, R., Thavorn, K., Hutton, B., Wongpakaran, N., Wongpakaran, T., & Nochaiwong, S. (2021). Exposure to COVID-19-Related Information and its Association With Mental Health Problems in Thailand: Nationwide, Cross-sectional Survey Study. *Journal of Medical Internet Research*, *23*(2). https://doi.org/10.2196/25363

Mukhtar, S. (2020). Mental health and emotional impact of COVID-19: Applying Health Belief Model for medical staff to general public of Pakistan. In *Brain, Behavior, and Immunity* (Vol. 87, pp. 28–29). Academic Press Inc. https://doi.org/10.1016/j.bbi.2020.04.012

Nakagomi, A., Shiba, K., Kondo, K., & Kawachi, I. (2020). Can Online Communication Prevent Depression Among Older People? A Longitudinal Analysis. *Journal of Applied Gerontology*. https://doi.org/10.1177/0733464820982147

Nam, S.-J. (2021). Mediating effect of social support on the relationship between older adults' use of social media and their quality-of-life. *Current Psychology*, *40*(9), 4590–4598. https://doi.org/10.1007/s12144-019-00399-3

Nef, T., Ganea, R. L., Müri, R. M., & Mosimann, U. P. (2013). Social networking sites and older users – a systematic review. *International Psychogeriatrics*, *25*(07). https://doi.org/10.1017/S1041610213000355

Oxman T.E, Berkman L.F, Kasl S, D.H, F., Oxman, T., Berkman, L., Kasl, S., Freeman, D., & Barett, J. (1992). Social support and depressive symptoms in the elderly. *American Journal of Epidemiology*, *135*(4), 356–368.

Pew Research Center. (2021). *Social Media Fact Sheet*. https://www.pewresearch.org/internet/fact-sheet/social-media/

Phelan, E., Williams, B., Meeker, K., Bonn, K., Frederick, J., Logerfo, J., & Snowden, M. (2010). A study of the diagnostic accuracy of the PHQ-9 in primary care elderly. *BMC Family Practice*, *11*, 63. https://doi.org/10.1186/1471-2296-11-63

Pietrabissa, G., & Simpson, S. G. (2020). Psychological Consequences of Social Isolation During COVID-19 Outbreak. *Frontiers in Psychology*, *11*, 2201. https://doi.org/10.3389/FPSYG.2020.02201/BIBTEX

Potts, M. K. (1997). Social support and depression among older adults living alone: the importance of friends within and outside of a retirement community. *Social Work*, *42*(4), 348–362. https://doi.org/10.1093/sw/42.4.348

Preacher, K., & Hayes, A. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, *36*(4), 717–731. https://doi.org/10.3758/BF03206553

Reinecke, L., Aufenanger, S., Beutel, M. E., Dreier, M., Quiring, O., Stark, B., Wölfling, K., & Müller, K. W. (2017). Digital Stress over the Life Span: The Effects of Communication Load and Internet Multitasking on Perceived Stress and Psychological Health Impairments in a German Probability Sample. *Media Psychology*, *20*(1), 90–115. https://doi.org/10.1080/15213269.2015.1121832

Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior*, *29*(3), 1243–1254. https://doi.org/10.1016/j.chb.2012.11.012

Ruggiero, K. J., Armstadter, A. B., Acierno, R., Kilpatrick, D. G., Resnick, H. S., Tracy, M., & Galea, S. (2009). Social and Psychological Resources Associated with Health Status in a Representative Sample of Adults Affected by the 2004 Florida Hurricanes. *Psychiatry: Interpersonal and Biological Processes*, *72*(2), 195–210. https://doi.org/10.1521/psyc.2009.72.2.195

Schnutzel. (2014). *ELI5:Web 1.0 and 2.0*. https://www.reddit.com/r/explainlikeimfive/comments/21nxqc/eli5web_10_and_20/

Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. v., & Rodríguez-Mañas, L. (2020). Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. *The Journal of Nutrition, Health & Aging*, *24*(9), 938. https://doi.org/10.1007/S12603-020-1500-7

Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social Science & Medicine*, *32*(6), 705–714. https://doi.org/10.1016/0277-9536(91)90150-B

Sherman, A. M. (2003). Social relations and depressive symptoms in older adults with knee osteoarthritis. *Social Science & Medicine*, *56*(2), 247–257. https://doi.org/10.1016/S0277-9536(02)00023-0

Sum, S., Mathews, R. M., Hughes, I., & Campbell, A. (2008). Internet use and loneliness in older adults. *CyberPsychology & Behavior*, *11*(2), 208–211. https://doi.org/10.1089/cpb.2007.0010

Sutin, A. R., Terracciano, A., Milaneschi, Y., An, Y., Ferrucci, L., & Zonderman, A. B. (2013). The trajectory of depressive symptoms across the adult life span. *JAMA Psychiatry*, *70*(8), 803–811. https://doi.org/10.1001/jamapsychiatry.2013.193

Teo, A. R., Choi, H. J., & Valenstein, M. (2013). Social Relationships and Depression: Ten-Year Follow-Up from a Nationally Representative Study. *PLoS ONE*, *8*(4), 1–8. https://doi.org/10.1371/journal.pone.0062396

Teo, A. R., Markwardt, S., & Hinton, L. (2019). Using Skype to Beat the Blues: Longitudinal Data from a National Representative Sample. *American Journal of Geriatric Psychiatry*, *27*(3), 254–262. https://doi.org/10.1016/j.jagp.2018.10.014

Tsai, H.-H., Tsai, Y.-F., Wang, H.-H., Chang, Y.-C., & Chu, H. H. (2010). Videoconference program enhances social support, loneliness, and depressive status of elderly nursing home residents. *Aging & Mental Health*, *14*(8), 947–954. https://doi.org/10.1080/13607863.2010.501057

Tsai, H.-H., Tsai, Y.-F., Wang, H.-H., Chang, Y.-C., Chu, H. H., & Tsai, Hsiu-Hsin; Tsai, Yun-Fang; Wang, Hsiu-Hung; Chang, Yue-Cune; Chu, H. Hua. (2010). Videoconference program enhances social support, loneliness, and depressive status of elderly nursing home residents. *Aging & Mental Health*, *14*(8), 947–954. https://doi.org/10.1080/13607863.2010.501057

Vošner, H. B., Bobek, S., Kokol, P., & Krečič, M. J. (2016). Attitudes of active older Internet users towards online social networking. *Computers in Human Behavior*, *55*, 230–241. https://doi.org/10.1016/j.chb.2015.09.014

Ward, B. W., Schiller, J. S., & Goodman, R. A. (2014). Multiple Chronic Conditions Among US Adults: A 2012 Update. *Preventing Chronic Disease*, *11*(3), 130389. https://doi.org/10.5888/pcd11.130389

Weisen, S. R. (2016). *Relational-Interdependence and Life Transitions in College: Study Abroad, First-Year, and International Students*.

Wong, F. H. C., Liu, T., Leung, D. K. Y., Zhang, A. Y., Au, W. S. H., Kwok, W. W., Shum, A. K. Y., Wong, G. H. Y., & Lum, T. Y.-S. (2021). Consuming Information Related to COVID-19 on Social Media Among Older Adults and Its Association With Anxiety, Social Trust in Information, and

COVID-Safe Behaviors: Cross-sectional Telephone Survey. *Journal of Medical Internet Research*, *23*(2). https://doi.org/10.2196/26570

Wood, A. M., Maltby, J., Gillett, R., Linley, P. A., & Joseph, S. (2008). The role of gratitude in the development of social support, stress, and depression: Two longitudinal studies. *Journal of Research in Personality*, *42*(4), 854–871.

Wu, H. Y., & Chiou, A. F. (2020). Social media usage, social support, intergenerational relationships, and depressive symptoms among older adults. *Geriatric Nursing*, *41*(5), 615–621. https://doi.org/10.1016/j.gerinurse.2020.03.016

Wu, H.-Y., & Chiou, A.-F. (2020). Social media usage, social support, intergenerational relationships, and depressive symptoms among older adults. *Geriatric Nursing*, *41*(5), 615–621. https://doi.org/10.1016/j.gerinurse.2020.03.016

Yoon, S., Kleinman, M., Mertz, J., & Brannick, M. (2019). Is social network site usage related to depression? A meta-analysis of Facebook–depression relations. *Journal of Affective Disorders*, *248*, 65–72. https://doi.org/10.1016/j.jad.2019.01.026

Zhang, K., Kim, K., Silverstein, N. M., Song, Q., & Burr, J. A. (2021). Social Media Communication and Loneliness Among Older Adults: The Mediating Roles of Social Support and Social Contact. *The Gerontologist*, *61*(6), 888–896. https://doi.org/10.1093/geront/gnaa197

Tables

Table 1 Description of the Sample

Variables	M or %	SD	Range
Predictor			
Social Media Use (SMUIS)	33.1	5.9	25-62
Mediator			
Social Support (MOSS-SSS)	62.5	19.5	18-90
Outcome			
Depression (PHQ-9)	3.96	3.9	0-23
Covariates			
Age	70.2	8.1	55-96
Female, %*	85.2	-	-
Graduated College, %	79.5	-	-
Ethnicity, White %	84.9	-	-
Income, %*			
Less than $10,000 to $49,000	32.3	-	-
$50,000 to $99,000	21.0	-	-
$100,000 to $149,000	24.8	-	-
$150,000 or more	19.4	-	-
Marital Status, %			
Not married	49.1	-	-
Married	50.9	-	-
Physical Health, %			
Poor	1.9	-	-
Fair	14.0	-	-
Good	43.4	-	-
Very Good	33.2	-	-
Excellent	7.5	-	-
Total Chronic Conditions, %			
0	25.3	-	-
1	30.7	-	-
2	24.0	-	-
3	12.4	-	-
4	3.5	-	-
5	2.7	-	-
6	1.1	-	-
7	0.3	-	-
8	0.0	-	-
9	0.0	-	-
10	0.0	-	-

(*N* = 371)

**9 missing from income, 2 missing from gender*

Table 2 Social Media Characteristics

Characteristics	Frequency	(%)
Negative Social Media Exposure		
Never	19	5.1
Sometimes	213	57.4
About half the time	92	24.8
Most of the time	41	11.1
Always	5	1.3
Social Media Device Used		
smart phone	164	44.2
tablet	77	20.8
laptop	75	20.2
desktop	55	14.8
Number of Social Media Platforms Used		
1	80	21.6
2	116	31.3
3	104	28.0
4	44	11.9
5	18	4.9
6	8	2.2
7	1	0.3
Primary Social Media Platform		
Facebook	244	65.8
Instagram	6	1.6
Twitter	1	0.3
Direct Messenger[1]	58	15.6
Others	62	16.7
Types of Social Media Platforms		
Facebook	366	98.7
Instagram	135	36.4
Twitter	65	17.5
Snapchat	9	2.4
Reddit	14	3.8
YouTube	90	24.3
Linked-In	49	13.2
Direct Messengers	171	46.1
Others	55	14.8

[1] (What'sApp, Viber, Skype, and similar services)

1 missing negative social media exposure

Table 3 Pearson correlations

		1	2	3	4	5	6	7	8
1	Age	--							
2	Depression (PHQ9)	-.219**	--						
3	Social Media Use (Social Media Use Integration Scale)	-0.035	.135**	--					
4	Social Support (Medical Outcome Social Support Survey)	-0.053	-.164**	-0.039	--				
5	Tangible Social Support	-0.086	-.134**	-0.084	.860**	--			
6	Affectionate Social Support	-0.06	-.179**	-0.04	.843**	.737**	--		
7	Positive Interaction Social Support	-0.079	-.195**	-0.075	.829**	.695**	.754**	--	
8	Emotional Informational Social Support	-0.002	-.109*	0.015	.888**	.605**	.597**	.603**	--

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 4 Mediation Models 1 to 5

	β	se	p	LLCI	ULCI
Direct Effects					
social media use → depression	0.070	0.033	**0.037	0.004	0.136
Model 1: MOSS-SSS					
social media use → total social support	-0.090	0.163	0.583	-0.411	0.231
total social support → depression	-0.038	0.011	***0.001	-0.059	-0.017
social media use + social support → depression	0.066	0.033	**0.044	0.002	0.131
Model 2: Tangible Social Support					
social media use → tangible social support	-0.073	0.047	0.120	-0.166	0.019
tangible social support → depression	-0.103	0.038	***0.007	-0.177	-0.029
social media use + tangible social support → depression	0.062	0.033	*0.062	-0.003	0.128
Model 3: Affectionate Social Support					
social media use → affectionate social support	-0.016	0.032	0.604	-0.078	0.046
affectionate social support → depression	-0.211	0.056	***0.000	-0.320	-0.102
social media use + affectionate social support → depression	0.066	0.033	**0.044	0.002	0.131
Model 4: Positive Social Interactions					
social media use → positive social interactions	-0.041	0.031	0.183	-0.101	0.019
positive social interactions → depression	-0.244	0.057	***0.000	-0.356	-0.131
social media use + positive social interactions → depression	0.060	0.033	*0.068	-0.004	0.124
Model 5: Emotional Informational Social Support					
social media use → emotional informational	0.040	0.082	0.623	-0.121	0.202
emotional informational → depression	-0.051	0.022	**0.018	-0.094	-0.009
social media use + emotional informational → depression	0.072	0.033	**0.031	0.007	0.137
Indirect Effects		**Effect**	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Model 1: social media use → social support → depression		0.003	0.007	-0.009	0.020
Model 2: social media use → tangible social support → depression		0.008	0.006	-0.002	0.022
Model 3: social media use → affectionate social support → depression		0.004	0.008	-0.011	0.021
Model 4: social media use → positive social interactions → depression		0.010	0.009	-0.006	0.029
Model 5: social media use → emotional informational → depression		-0.002	0.005	-0.012	0.007

** p<.1, ** p<.05, *** p<.01*

Mediation Models 1 to 5: Mediation models adjusted for demographic controls of age, gender, education, ethnicity, marital status, employment, income. N=360, missing 9 from income, missing 9 from income, 2 from gender N=360

LLCI—lower limit confidence interval; ULCI—upper limit confidence interval

Table 5 Mediation Models 6 to 10

	β	se	p	LLCI	ULCI
Direct Effects					
social media use → depression	0.046	0.032	0.146	-0.016	0.108
Model 6: MOSS-SSS					
social media use → total social support	-0.025	0.161	0.875	-0.343	0.292
total social support → depression	-0.024	0.010	**0.023	-0.044	-0.003
social media use + social support → depression	0.045	0.031	0.149	-0.016	0.107
Model 7: Tangible Social Support					
social media use → tangible social support	-0.063	0.047	0.180	-0.156	0.030
tangible social support → depression	-0.076	0.036	**0.033	-0.146	-0.006
social media use + tangible social support → depression	0.041	0.031	0.192	-0.021	0.103
Model 8: Affectionate Social Support					
social media use → affectionate social support	-0.004	0.031	0.904	-0.065	0.058
affectionate social support → depression	-0.144	0.054	***0.007	-0.250	-0.039
social media use + affectionate social support → depression	0.045	0.031	0.148	-0.016	0.107
Model 9: Positive Social Interactions					
social media use → positive social interactions	-0.026	0.030	0.390	-0.084	0.033
positive social interactions → depression	-0.157	0.056	***0.005	-0.267	-0.047
social media use + positive social interactions → depression	0.042	0.031	0.181	-0.020	0.103
Model 10: Emotional Informational Social Support					
social media use → emotional informational	0.067	0.081	0.408	-0.093	0.227
emotional informational → depression	-0.025	0.021	0.224	-0.066	0.016
social media use + emotional informational → depression	0.048	0.032	0.132	-0.014	0.110
Indirect Effects		**Effect**	**Boot SE**	**Boot LLCI**	**Boot ULCI**
Model 6: social media use → social support → depression		0.001	0.005	-0.008	0.011
Model 7: social media use → tangible social support → depression		0.005	0.005	-0.002	0.017
Model 8: social media use → affectionate social support → depression		0.001	0.005	-0.010	0.012
Model 9: social media use → positive social interactions → depression		0.004	0.006	-0.007	0.018
Model 10: social media use → emotional informational → depression		-0.002	0.003	-0.008	0.004

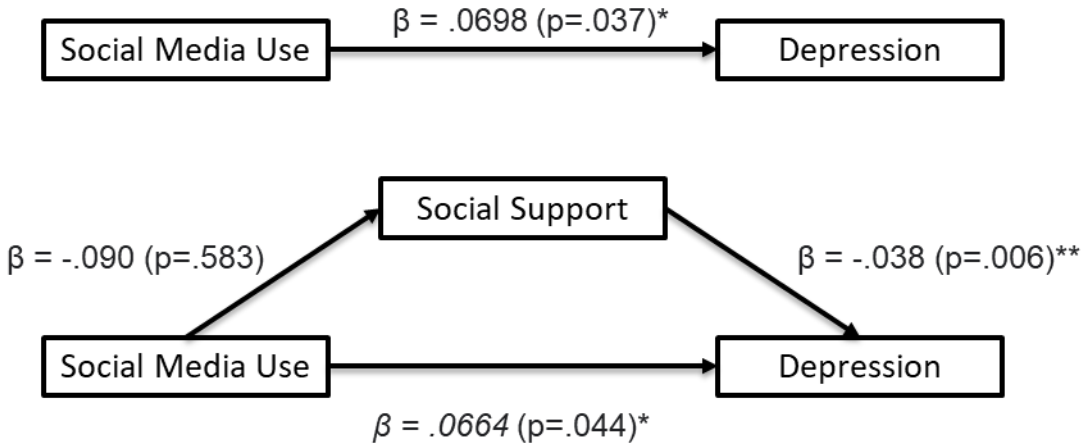
** p<.10, ** p<.05, *** p<.01*

Mediation Models 6 to 10: Mediation models adjusted for demographic controls of age, gender, education, ethnicity, marital status, employment, income, physical health and total chronic conditions. N=360, missing 9 from income, missing 9 from income, 2 from gender. N=360

LLCI—lower limit confidence interval; ULCI—upper limit confidence interval

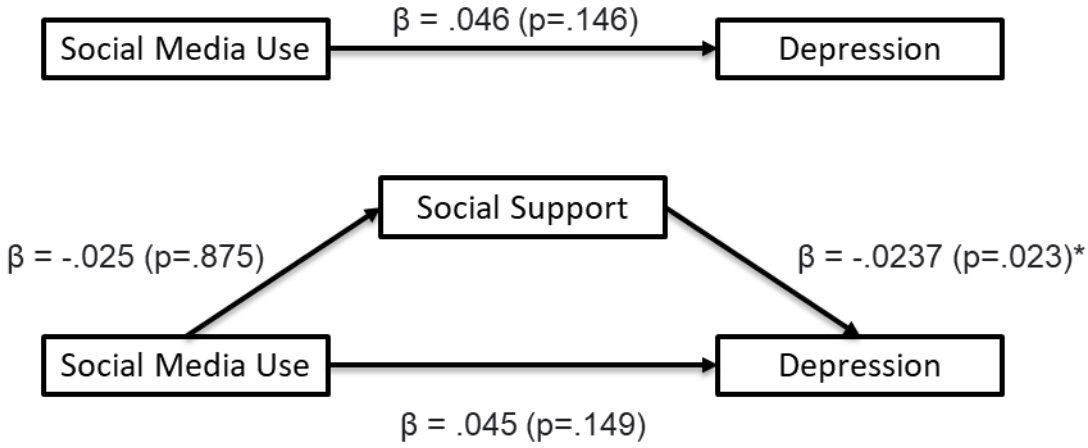
Figures

Figure 1 Mediating effect of social support on the relationship between social media and depression adjusting for age, gender, education, ethnicity, marital status, employment, income



* p<.1, ** p<.05, *** p<.01

Figure 2 Mediating effect of social support on the relationship between social media and depression adjusting for age, gender, education, ethnicity, marital status, employment, income, physical health, and total chronic conditions



* p<.1, ** p<.05, *** p<.01

CHAPTER 6

Dissertation Summary

Chapter 6. Dissertation Summary

The current population trend now shows more people over the age of 65 than children under five years old (Administration on Aging Administration for Community Living, 2012). Depression in older adults is associated with severe consequences, including an increased risk of heart disease, dementia, and suicide (Garand et al., 2006; Mirza et al., 2016; Péquignot et al., 2016). Social support has long been recognized as a beneficial and protective factor in preventing depression in older adults (Cohen et al., 1985; Dumont & Provost, 1999; George et al., 1989; Wood et al., 2008). Social media has enabled older adults to maintain relationships with their social networks and support systems (Chou et al., 2009; Ngenye & Wright, 2018). In an era of social distancing under the COVID-19 pandemic, social media have debatably facilitated safe social interaction, communication, and exchange of information for older adults. While social media behaviors and their impact on mental health are a growing area of research, the digital behaviors of an aging population are understudied, particularly the relationship between their social media behavior, social network structures, social support, and depression in the context of COVID-19. It is critical to understand how the digital behaviors of an aging population, specifically social media use, can influence their mental health. This dissertation's overall purpose explored the relationship between social media use, social support, and depression in older adults.

The **first manuscript**, "Social Media Use and Depression in Older Adults: A Systematic Review,*"* is a review of the literature aimed at identifying and synthesizing quantitative studies addressing the relationship between social media use and depression in older adults. This systematic review revealed mixed findings between social media use and depression in older adults. There is a notable difference in the agreed conceptualization of social media use. There is a paucity of studies that use validated measures and instruments to measure social media use in the older adult population. Our findings also suggest that age-related health and social variables could influence the relationship between social media use and depression. There is

also a potential age variation in examining the relationship between social media use and depression, as certain measures of social media use might vary in different age cohorts. Furthermore, this literature review finds that studies of current social media use measurements in older adults omit descriptions of social network characteristics to include social network structure and function. Age cohort difference, social factors and health variables could partially influence the relationship between social media use and depression in older adults. Future research could benefit from including aging-related covariates to ascertain the effect of social media use on depression in older adults.

The **second manuscript**, “The Mediating Effect of Social Support on the relation of Social Network Structures and Depression in Older Adults, " analyzes an older adult’s structural social network, both online and offline networks, in its relationship to social support and depression. This manuscript examines the mediating effect of social support in the relation of social network structures (online and offline) and depression in older adults. This study found that social support does not significantly mediate the relationship between online social network structure and depression. However, social support mediated the relationship between offline social network structure and depression to some extent. The tangible and emotional/informational social support domains did not mediate the known relationship between network structure and depression in older adults. The precautions established by the COVID-19 pandemic may have challenged the availability of tangible support and informational support in older adults. Both structural sizes of online and offline social network size did not show any significant relationship to depression. The size of the offline social network, not the online social network size, predicted higher levels of social support. Higher total social support scores predicted lower depression scores in both online and offline network size models. Online and offline social network size models showed that increased social support predicts lower depression scores on all social support scales except the emotional/informational subscale. Certain domains of social support did not mediate the known relationship between offline social

network structure and depression in older adults in the context of the COVID-19 pandemic. Further, the pandemic and social media use might have complicated and redefined the meaning of friendship, social networks, and social support in older adults, and further studies are needed.

The **third manuscript**, "Digital Behaviors of Older Adults: The Mediating Role of Social Support to Social Media Use and Depression during the COVID-19 Pandemic," examines the functional social network in terms of using social media, a tool to connect to one's social network in its relationship to social support and depression. We examine the mediating effect of social support in the relationship between social media use and depression in older adults. Using the Social Media Use Integration Scale (SMUIS), we measured how social media is integrated into an older adult's daily routines along with their emotional attachment to its use. In this study, the SMUIS provided reliability for the total scale of 10 items at α = .83, social integration/emotional connection subscale of 6 items at α = .81, and integration into social routines subscale at α = .76. This study showed that social support did not have a significant mediation effect on the relationship between social media use and depression in older adults in models that controlled for demographic and health covariates. We found that greater social media use significantly predicted higher depression scores in older adults, including only basic demographic covariates (β=.070, se=.333, *p*=.037). However, when health covariates are included, this significant association between social media use and depression is removed (β=.046, se=.032, *p*=.146). Social media use did not show a significant relationship with total social support scores and within each of its subscales in all our models. Increased social support predicts lower depression on all social support scales, except the emotional/informational subscale. The inclusion of health variables in studies of social media use and depression could influence the identified relationship between social media use and depression outcomes for older adults. The COVID-19 pandemic, along with an infodemic, may have influenced the results of this study, as older adults' social life changed—from their social media use, social support, and uncertainties brought about by the pandemic. More studies are

needed to examine the complexity of social media use and the social media behaviors of older adults and how it relates to social support and depression during and without a pandemic.

Implications to Clinical Practice and Public Health Policy

Although the role of technology or social media communication has been shown to have some benefits in older adults, understanding its disadvantages is also essential, as it could influence their mental health and depression. In hospital settings or nursing homes, staff and family can play an essential role in helping patients and residents socially connect through technology, such as video chats and social media. Although clinicians need to encourage the use of social communication technologies to maintain the social connections of older adults, further research is needed to ascertain which aspects or behaviors in their social media use and which specific platforms by design have positive benefits to an older adult's mental health.

Consequently, the COVID-19 pandemic, along with the infodemic that coincided with it, has implications for policy and practice in terms of recognizing that social media is a double-edged sword when it comes to the health and mental well-being of older adults. We also should recognize and develop technological solutions to minimize the risk of predatory social media campaigns and the spread of misinformation or disinformation in social media. Public health campaigns should encourage digital media literacy in older adults, consisting of practices that educate critical evaluation of social media content. Health providers should collaborate with various social media platforms to educate older adults about fake news and how they can detect and critique misleading reports to reduce the spread of misinformation. The nursing profession is currently the most trusted profession, and we must transform this trust and influence into the digital space. As such, the nursing profession should reach out to the public and become themselves influencers in social media. Nurses must include digital media literacy in health education.

Directions for Future Research

Our studies reveal the complexity of social media's relationship to social support and depression in older adults in the context of the COVID-19 pandemic. There is a lack of research on social media's influence on depression in the aging population, and further research is needed. Even less is known about social media behaviors of older males as our literature review and our study included women predominately. Social media and internet use behavior variables are slowly being added to established longitudinal surveys. This would be advantageous in ascertaining the relationship between social media use and depression, as correlational studies cannot determine causation. As there are noted differences in the agreed conceptualization of social media use, further studies should include a variety of social media use related variables from structural and functional characteristics of their social network, duration of use, frequency of use, type of social media platforms, and instruments that measure engagement and integration to social media use when examining its relationship to depression. The quality of content and interaction in an older adult's social media deserves attention in research.

Social media behavior research in older adults must control for the combined influence of psychological and health-related variables, as it also influences their mental health and depression. Furthermore, 'social' on social media is inevitably tied to terms of community, connectivity, and relationships. Social media use is inevitably tied to the surrounding social environment and, as such, social variables such as social support should be included in studies on social media use and depression in older adults.

Conclusions

The findings of our current study reveal the complexity of an older adult's social media use and its relationship to social support and depression during the COVID-19 pandemic. Studies on social media use and its association to social support and depression in the older population are limited but growing. The COVID-19 pandemic had shown the importance of

social media to keep older adults connected and feel less isolated, as social isolation and loneliness are major risk factors that have been linked with poor mental health and depression. The results from this dissertation have implications for policy and practice in terms of recognizing that social media is a double edge sword when it comes to the health and mental well-being of older adults. The COVID-19 pandemic will undoubtedly have a long-term and profound effect on older adults' mental health and social interactions, and more research is needed.

References

Administration on Aging Administration for Community Living. (2012). *A Profile of Older Americans: 2012*. https://www.pearsonhighered.com/assets/samplechapter/0/2/0/5/0205727646.pdf

Chou, W. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P., & Hesse, B. W. (2009). Social Media Use in the United States: Implications for Health Communication. *Journal of Medical Internet Research*, *11*(4), e48. https://doi.org/10.2196/jmir.1249

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support. In *Social support: Theory, research and applications* (pp. 73–94). Springer.

Dumont, M., & Provost, M. A. (1999). Resilience in adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, *28*(3), 343–363.

Garand, L., Mitchell, A. M., Dietrick, A., Hijjawi, S. P., & Pan, D. (2006). Suicide in Older Adults: Nursing Assessment of Suicide Risk. *Issues in Mental Health Nursing*, *27*(4), 355–370. https://doi.org/10.1080/01612840600569633

George, L., Blazer, D., Hughes, D., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry*, *154*(4), 478–485.

Mirza, S. S., Wolters, F. J., Swanson, S. A., Koudstaal, P. J., Hofman, A., Tiemeier, H., & Ikram, M. A. (2016). 10-year trajectories of depressive symptoms and risk of dementia: a population-based study. *The Lancet Psychiatry*, *3*(7), 628–635. https://doi.org/10.1016/S2215-0366(16)00097-3

Ngenye, L., & Wright, K. (2018). Online Social Support Groups/Communities. In *Global Perspectives on Health Communication in the Age of Social Media* (pp. 1–27). IGI Global. https://doi.org/10.4018/978-1-5225-3716-8.ch001

Péquignot, R., Dufouil, C., Prugger, C., Pérès, K., Artero, S., Tzourio, C., & Empana, J.-P. (2016). High Level of Depressive Symptoms at Repeated Study Visits and Risk of Coronary Heart Disease and Stroke over 10 Years in Older Adults: The Three-City Study. *Journal of the American Geriatrics Society*, *64*(1), 118–125. https://doi.org/10.1111/jgs.13872

Wood, A. M., Maltby, J., Gillett, R., Linley, P. A., & Joseph, S. (2008). The role of gratitude in the development of social support, stress, and depression: Two longitudinal studies. *Journal of Research in Personality*, *42*(4), 854–871.

Appendix A: Recruitment Poster

Appendix B: Qualtrics Survey Export

Digital behaviors in aging: The relationship of social media use to social support and depression

Start of Block: Demographics

CONSENT You are invited to participate in a research study by Ariz Guzman, MSN, RN, a doctoral candidate under Dr. Janet C. Mentes, Ph.D., APRN, FGSA, FAAN from the Department of the School of Nursing at the University of California, Los Angeles. Your participation in this internet-based questionnaire about digital behaviors, social support, and depression in aging is voluntary and you may stop doing the survey at any point in time.

Purpose of the Research: The goal of this research is to learn about the relationship between social media use, social support, and depression in adults 55 and older with an active social media account.

Procedures: If you would like to participate in this study, please select "YES: I CONSENT to participate in this study" and click next. If you would not like to participate, you can close the window to leave the survey. If you consent to participate, the survey will appear on your computer screen. If you ever decide that you no longer want to complete the survey, you are free to stop taking the survey at any point in time. There are no right or wrong answers. Your responses will be anonymous and will not be associated with you personally in any way. It will take about approximately 10-15 minutes to complete the questionnaire. The survey will include a depression questionnaire, a social support questionnaire, questions about your social media behavior and demographic data.

Participation and Inclusion Criteria: To participate, you must be 55 and older and currently reside in and around the Los Angeles area. You must have access to the internet and own or have used some form of social media account in the last two weeks.

Potential risks and discomforts: There is a potential risk of boredom, fatigue, frustration while filling out the survey. These risks are minimal, and the study survey is kept short in order to help mitigate these effects. As this study includes a depression questionnaire, you may feel uncomfortable emotions. If the survey questions make you feel uncomfortable, you are free to stop taking the survey at any point in time. The questions are designed to be as clear as possible so it is likely that you will not experience emotional discomfort as a result of the survey.

Payment for Participation: You will not be paid for participating in this research study. However, as a token of our appreciation for your participation, you will have the opportunity of entering a drawing for a $200 VISA gift card. Participation in the study is not required in order to participate in the raffle. If you meet the inclusion criteria but decide that you no longer want to complete the survey, please navigate to the end of the survey to enter the raffle. You will have 1 in 300 chance of winning.

Confidentiality: There will be no information obtained in connection with this study that can be identified with you. Your name, address or other information that may identify you will not be collected during this research study. Your participation is anonymous and there will be no way to link these data files back to you. The data will be stored in the Qualtrics database,

accessed only using the investigator's office in a password protected computer. These files will be kept indefinitely. Information collected in this research could be used for future research studies without additional informed consent from the subject. If you do not want your data used in future studies, you should not participate in this study.

Participation and Withdrawal: Your participation is VOLUNTARY. You may withdraw your consent at any time and discontinue participation without penalty by not proceeding nor answering the survey questions.

If you have questions about the research, you may contact Ariz Guzman, MSN, RN at 562-301-6828 or through email at ariz.guzman@ucla.edu or the faculty sponsor, Dr. Janet C. Mentes, Ph.D., APRN, FGSA, FAAN at Jmentes@sonnet.ucla.edu . If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA OHRPP by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail: Box 951406, Los Angeles, CA 90095-1406. You must be 55 and older and currently, reside in and around the Los Angeles area, have access to the internet and own or have used some form of social media account in the last two weeks to participate. If you agree to participate in the survey, please highlight YES: I CONSENT to participate in this study" and click NEXT

- YES: I CONSENT to participate in this study (1)

Skip To: date of birth If You are invited to participate in a research study by Ariz Guzman, MSN, RN, a doctoral candid... = YES: I CONSENT to participate in this study

---

date of birth What is your year of birth?

_____

gender What is your gender?

- Male (1)
- Female (2)
- Prefer not to answer (3)

maritalstatus Are you now married, widowed, divorced, separated or never married?

- Married (1)
- Never Married (2)
- Separated (3)
- Widowed (4)
- Divorced (5)

ethnicity Choose one or more ethnicity/races that you consider yourself to be:

- White (1)
- Black or African American (2)
- Asian/Pacific Islander (3)
- Hispanic or Latino (4)
- Native American or American Indian (5)
- Other (6)

education What is the highest level of school you have completed or the highest degree you have received?

- Less than high school degree (1)
- High school graduate (high school diploma or equivalent including GED) (2)
- Some college but no degree (3)
- Graduated college (Including professional education) (4)

---

employment What is your current employment status?

- Employed full time (40 or more hours per week) (1)
- Employed part time (up to 39 hours per week) (2)
- Unemployed and currently looking for work (3)
- Unemployed and not currently looking for work (4)
- Retired (5)
- Homemaker (6)
- Self-employed (7)
- Unable to work (8)

income Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes.

- Less than $10,000 (1)
- $10,000 to $19,999 (2)
- $20,000 to $29,999 (3)
- $30,000 to $39,999 (4)
- $40,000 to $49,999 (5)
- $50,000 to $59,999 (6)
- $60,000 to $69,999 (7)
- $70,000 to $79,999 (8)
- $80,000 to $89,999 (9)
- $90,000 to $99,999 (10)
- $100,000 to $149,999 (11)
- $150,000 or more (12)

---

zipcode What is your zipcode?

_____

End of Block: Demographics

Start of Block: Social Media Use Integration Scale (SMUIS)

smactivity1 Social Media Activity Questionnaire - The Social Media Use Integration Scale

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	Agree (5)	Strongly agree (6)
I feel disconnected from friends when I have not logged into social media (1)	•	•	•	•	•	•
I would like it if everyone used social media to communicate (2)	•	•	•	•	•	•
I would be disappointed if I could not use social media at all (3)	•	•	•	•	•	•
I get upset when I can't log on to social media (4)	•	•	•	•	•	•
I prefer to communicate with others mainly through social media (5)	•	•	•	•	•	•
Social media plays an important role in my social relationships (6)	•	•	•	•	•	•

smactivity2 Integration into Social Routines sub-scale

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (7)	Somewhat agree (8)	Agree (9)	Strongly agree (10)
⊗ I enjoy checking my social media account (1)	•	•	•	•	•	•
⊗ I don't like to use social media (r) (2)	•	•	•	•	•	•
⊗ Using social media is part of my everyday routine (3)	•	•	•	•	•	•
⊗ I respond to content that others share using social media (4)	•	•	•	•	•	•

End of Block: Social Media Use Integration Scale (SMUIS)

Start of Block: Content outside of social contact during social media use

sm_negativeint **How often do you encounter something negative while using social media?**
This includes being bothered by, offended, or having negative arguments online.

	Never (1)	Sometimes (2)	About half the time (3)	Most of the time (4)	Always (5)
Frequency of negative social media interaction (1)	•	•	•	•	•

End of Block: Content outside of social contact during social media use

Start of Block: Health Data

sumchronicconditions Chronic Conditions Question Have you ever been told by a doctor or health care provider that you have the following?
Please check each box below which applies or leave blank when it does not apply.

- Hypertension (1)
- Coronary Heart Disease (2)
- Stroke (3)
- Diabetes (4)
- Cancer (5)
- Arthritis (6)
- Hepatitis (7)
- Kidney Problems (8)
- Asthma (9)
- COPD (10)

depdiag Have you ever been treated or been diagnosed with Major Depression Disorder?

- No (0)
- Yes (1)

anxdiag Have you ever been treated or been diagnosed with Generalized Anxiety Disorder?

- No (0)
- Yes (1)

alcoholproblem Have you been treated or currently being treated for an alcohol problem?

- No (0)
- Yes (1)

physhealth Describe your overall physical health

- Poor (1)
- Fair (2)
- Good (3)
- Very Good (4)
- Excellent (5)

menthealth Describe your overall mental health

- Poor (1)
- Fair (2)
- Good (3)
- Very Good (4)
- Excellent (5)

End of Block: Health Data

Start of Block: Patient Health Questionnaire-9 (PHQ-9)

phq-9begin This depression screening is not intended to replace a consultation with a doctor. Please note that your results will not be individually reviewed by a mental health professional nor will we provide any treatment or help for symptoms of depression. If you believe that you might be thinking of hurting yourself or someone else, we urge you to talk a mental health professional or a medical doctor. If you do not think you can remain safe, please seek help immediately or call 911 or your doctor's office.

phq9 **Patient Health Questionaire-9 (PHQ-9)**
Over the **last 2 weeks**, how often have you been bothered by any of the following problems?

	Not at all (1)	Several days (2)	More than half the days (3)	Nearly every day (4)
Little interest or pleasure in doing things (Q12_1)	•	•	•	•
Feeling down, depressed, or hopeless (Q12_2)	•	•	•	•
Trouble falling or staying asleep, or sleeping too much (Q12_3)	•	•	•	•
Feeling tired or having little energy (Q12_4)	•	•	•	•
Poor appetite or overeating (Q12_5)	•	•	•	•
Feeling bad about yourself--or that you are a failure or have let yourself or your family down (Q12_6)	•	•	•	•
Trouble concentrating on things, such as reading the newspaper or watching television (Q12_7)	•	•	•	•

Moving or speaking so slowly that other people could have noticed? Or opposite-- being so fidgety or restless that you have been moving around a lot more than usual (Q12_8)	• • • •
Thoughts that you would be better off dead or of hurting yourself in some way (Q12_9)	• • • •

Q42
Please note that your results will not be individually reviewed by a mental health professional nor will we provide any treatment or help for symptoms of depression. If you believe that you might be thinking of hurting yourself or someone else, we urge you to talk a mental health professional or a medical doctor. If you do not think you can remain safe, please seek help immediately or call 911 or your doctor's office.

National Suicide Prevention Lifeline
Call 1-800-273-8255
Available 24 hours everyday

Page Break

End of Block: Patient Health Questionnaire-9 (PHQ-9)

Start of Block: Social Network Function

smplatforms On the list provided, **SELECT ALL** the social media platform/services you are actively using to communicate with your family and/or friends?

- Facebook (1)
- Instagram (2)
- Twitter (3)
- Snapchat (5)
- Reddit (6)
- Youtube (7)
- Linked-In (8)
- Direct Messenger (What's-App, Viber, Skype, and similar services) (9)
- Other (10) _____

smprimary On the similar list, **SELECT ONE** that you use PRIMARY to contacts family and/or friends

- Facebook (1)
- Instagram (2)
- Twitter (3)
- Snapchat (5)
- Reddit (6)
- Youtube (7)
- LinkedIn (8)
- Direct Messenger (What'sApp, Viber, Skype, and similar services) (9)
- Other (10) _____

smaccesspt What do you use to login or access your social media?

- smart phone (iphone, samsung, google phone, and similar devices) (1)
- tablet (ipad, android tablet, kindle, and similar devices) (2)
- laptop (3)
- desktop (4)

snf_contactweek How often you log on to your device to check your social media account **in the past two weeks?**

	Once a week (1)	Several times a week (2)	Once a day (3)	Several times per day (4)
Social media use in the past two weeks (1)	•	•	•	•

Display This Question:

If How often you log on to your device to check your social media account in the past two weeks? [Several times per day] (Count) = 4

snf_contactday How often do you check your social media account per day?

	1 time per day (35)	2-4 times a day (36)	5-9 times a day (37)	10 or more times a day (40)
Daily Social Media use to contact friends/family (1)	•	•	•	•

snf_contactlength How long have you been using social media to contact your family/friends?

- Less than one year (1)
- 1-5 years (2)
- more than 5 years (3)

End of Block: Social Network Function

Start of Block: Social network structure

sns_online Give an ESTIMATE of how many family/friends do you have in your most used social media account?
You are encouraged to check your social media account for accuracy

- 1-25 (1)
- 26-50 (2)
- 51-100 (3)
- 100-125 (4)
- 126-150 (5)
- 151-175 (6)
- 176-200 (7)
- More than 200 (8)

sns_offiline Give an ESTIMATE of how many family/friends do you stay in touch with outside of social media?

- 1-25 (1)
- 26-50 (2)
- 51-100 (3)
- 100-125 (4)
- 126-150 (5)
- 151-175 (6)
- 176-200 (7)
- More than 200 (8)

End of Block: Social network structure

Start of Block: Medical Outcomes Study Social Support Survey (MOS)

soc_emoinfo Emotional/informational support	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
⊗ Someone you can count on to listen to you when you need to talk (1)	•	•	•	•	•
⊗ Someone to give you information to help you understand a situation (2)	•	•	•	•	•
⊗ Someone to give you good advice about a crisis (3)	•	•	•	•	•
⊗ Someone to confide in or talk to about yourself or your problems (4)	•	•	•	•	•
⊗ Someone whose advice you really want (5)	•	•	•	•	•
⊗ Someone to share your most private worries and fears with (6)	•	•	•	•	•
⊗ Someone to turn to for suggestions about how to deal with a personal problem (7)	•	•	•	•	•
⊗ Someone who understands your problems (8)	•	•	•	•	•

soc_tan Tangible support	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Someone to help you if you were confined to bed (1)	•	•	•	•	•
Someone to take you to the doctor if you needed it (2)	•	•	•	•	•
Someone to prepare your meals if you were unable to do it yourself (3)	•	•	•	•	•
Someone to help with daily chores if you were sick (4)	•	•	•	•	•

soc_affect Affectionate support	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Someone who shows you love and affection (1)	•	•	•	•	•
Someone to love and make you feel wanted (2)	•	•	•	•	•
Someone who hugs you (3)	•	•	•	•	•

soc_posint Positive social interaction	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Someone to have a good time with (1)	•	•	•	•	•
Someone to get together with for relaxation (2)	•	•	•	•	•
Someone to do something enjoyable with (3)	•	•	•	•	•

End of Block: Medical Outcomes Study Social Support Survey (MOS)