Social Ties and Mental Health in Adolescence and Young Adulthood. Insights from Ecological Momentary Assessment and Social Network Analysis

Inauguraldissertation
zur
Erlangung des Doktorgrades
der
Wirtschafts- und Sozialwissenschaftlichen Fakultät
der
Universität zu Köln

2023

vorgelegt
von

Heike Krüger, M.Sc.

aus

Bad Saarow

Social Ties and Mental Health in Adolescence and Young Adulthood. Insights from Ecological Momentary Assessment and Social Network Analysis

Referent: Prof. Dr. Clemens Kroneberg, Universität zu Köln
Korreferentin: Prof. Dr. Lea Ellwardt, Universität zu Köln
Tag der Promotion: 12.03.2024

Acknowledgements

In crafting this dissertation, I've had the privilege of the guidance of many who played pivotal roles in my academic journey. Their contributions and support deserve recognition, and I am grateful for the imprint they've left on my research.

Clemens Kroneberg, my supervisor, deserves my foremost gratitude. Your mentorship has been instrumental in shaping this dissertation. You have consistently offered support for novel ideas and aided in addressing open questions. Through my work as a student assistant at your chair, I was introduced to the fascinating world of social network analysis, and you instilled in me the essence of theory-based sociological research. Hanno Kruse, your constant support and your expertise in navigating R packages and syntax issues have been invaluable. Writing a paper alongside you and Clemens was an enriching experience.

Mark Wittek, Sven Lenkewitz, Andrea Wingen, Kathrin Lämmermann, and Agnes Tarnowski, known as the SOCIALBOND-clique, have been my steadfast companions throughout several project years. Your camaraderie, insightful discussions, and the productive working environment we fostered were essential in bringing this dissertation to fruition.

To Thomas Grund, I owe my gratitude for the opportunity to delve deeper into the world of social network research and for providing a creative workspace that nurtured my intellectual curiosity. From the Aachen team, I would also like to thank Robert Hellpapp for our methodological discussions and reflections on the perfect research project.

I extend my thanks to all members of the Institute of Sociology and Social Psychology, with a special thanks to André Ernst, Harald Beier, Sebastian Sattler, and Fabian Hasselhorn. Your continuous feedback and challenging professional exchanges have enriched my academic journey. In the ten years I've spent studying and working at the Institute, I've learned a great deal from each of you.

To my co-author Robert Krause, I'm grateful for our collaborative work and the wealth of knowledge I've gained in longitudinal social network analysis. Your feedback and guidance have been invaluable. Zoran Kovacevic, Ibrahim Demirer, and Lea Ellwardt, your feedback on various parts of this dissertation has been incredibly helpful, and I appreciate your contributions.

I must also express my gratitude to my parents, who kindled my interest in mathematics and thus quantitative methods, and particularly to my mother for her unwavering belief in my abilities.

Ibrahim, your tolerance for my enthusiasm when discussing various methods and theories has been remarkable. Most of all, I am thankful for your loyalty and love and for having you by my side - yesterday, today and tomorrow.

Heidi and Charly, a wise man once told me you have always shown us what matters in life – and he was right.

For Charly.

Table of contents

Chapter 1

Introduction

1. Introduction

1.1 Background and aim of the dissertation

Social relationships are deeply rooted in the evolutionary history of mammals. Mammals belong to the subclass of vertebrates and are defined by the requirement to nourish their young through suckling milk during postnatal development. Therefore, a vital component of a mammal's growth is having a physically close relationship with its mother (Gans & Bell, 2001). During rearing, mammals acquire knowledge and skills through social interactions. Social learning is primarily facilitated by the observation and imitation of other group members (Griffin, 2004; Thornton & Clutton-Brock, 2011). Reproduction entails the joining of male and female members of the same species, which often involves complex mating rituals (Clutton-Brock, 2021). Additionally, integration into social groups provides protection. Group cooperation in defending against predators and common threats enhances survival. Social embedding is also crucial for well-being at a biological level. Neurotransmitters and hormones that affect mood and mental health are impacted by social interactions (Rogeness & McClure, 1996; Uvnäs-Moberg, 1998).

In summary, social interactions within the same species are crucial for the preservation of the species as a whole, hence, it is not unexpected to find that the amount und quality of social integration might impact the well-being of mammals. Empirical research conducted on primates and rodents exhibits that isolation, particularly separation from the mother, leads to behavioural abnormalities, symptoms of anxiety disorder, and depression (Fone & Porkess, 2008; Harlow et al., 1965; Mitchell et al., 1966).

Whilst humans are shielded from similar experiments in the name of science, research so far indicates that social embeddedness is similarly pertinent to the enhancement and preservation of our mental health compared to other social mammals. Especially thanks to a substantial amount of previous empirical research (for systematic reviews and meta-analyses see e.g. Gariépy et al., 2016a; Harandi et al., 2017; Leavy, 1983; Rueger et al., 2016; Wang et al., 2018), it appears evident that social support and relationships in some way impact mental health in humans. However, the evidence is less definite regarding the crucial elements of social relationships and the mechanisms through which they operate. Is it the quality of one's relationships, the quantity of social ties, or how high the levels of life satisfaction of

individuals in our immediate environment are, that have the greatest impact on our mental health?

In the era of globalization, the fear of social alienation and the increased social distance it might bring is a much-discussed topic. Nonetheless, the media's notion of a loneliness epidemic does not align with pre-COVID-19 empirical evidence. Analyses that differentiate between cohort and age effects reveal that the prevalence of loneliness in Western societies has remained relatively stable in past decades (Trzesniewski & Donnellan, 2010). Differences can be observed across age groups, with an increase in loneliness among adolescents and the elderly (Girault et al., 2023). There are, however, differences in the prevalence rates of depressive symptoms and anxiety between cohorts, with both showing an increase in the last decades (Brault et al., 2012; Calling et al., 2017; Kessler et al., 1994; Keyes et al., 2014).

Adolescence and young adulthood constitute a distinct stage for the development of mental health. The emergence of mental disorders is frequently observed before the age of 24 (Blakemore, 2019). Additionally, mental health difficulties during adolescence and early adulthood increase the likelihood of encountering further mental problems in later life (Johnson et al., 2018). Adolescence and young adulthood present challenges in various ways. During puberty, adolescents experience several hormonal changes that are thought to contribute to the development of mental health disorders especially in females (Angold & Costello, 2006; Angold et al., 1998). In addition to hormonal changes, adolescence and young adulthood are also characterised by structural and functional brain changes, which can further affect mental health (Trotman et al., 2013). Additionally, adolescence is a phase where peers become more influential in the perception of social standing, while the influence of parents diminishes as the search for autonomy increases (Laursen & Hartl, 2013). Positive peer relationships are essential for self-esteem development during this phase, while negative relationships and a lack of peer attachment pose a risk of low self-esteem (Gorrese & Ruggieri, 2013; Grunebaum & Solomon, 1987). The increased autonomy may also exert social pressure on those who feel not yet capable of certain tasks (Blakemore, 2019). Life transitions that are more common during adolescence and young adulthood, such as academic transitions and the shift from the parental home to independent living, entail elevated chances of failure and social conflicts with the involved parties. Therefore, there is considerable interest in understanding the impact of social relationships during adolescence and early adulthood.

My dissertation addresses the relationship between social ties and mental health in adolescence and young adulthood. I will investigate how the mode of contact and attributes of the interaction partners moderate the impact of social support and companionship on mood (chapter 2 and 3). For this purpose this thesis will leverage on data of two different ecological momentary assessment studies (Shiffman et al., 2008; Stone et al., 2007) and apply rigorous longitudinal analysis methods like fixed effects regression models (Allison, 2009) and hybrid mixed-effects regression models (Hedeker & Gibbons, 2006). Mood ratings are important indicators of mental disorders. Low levels of positive mood and high levels of negative mood (Myin-Germeys et al., 2003; Peeters et al., 2003), alongside greater instability in mood ratings (Bowen et al., 2013; Patel et al., 2015), have commonly been linked with depressive disorders.

I will further try to disentangle the complex co-dependency between social networks and mental health in the school context by separating peer influence effects pertaining to mental health from selection effects due to mental health differences (chapter 4). For this purpose, I will use RSiena co-evolution models (Ripley et al., 2023; Snijders et al., 2010; Steglich et al., 2010) to examine the association between social cognitive maps (Cairns et al., 1985; Kindermann, 1998) and mental health as well as loneliness. These stochastic actor-oriented models (SAOM) enable the differentiation between selection and social influence utilizing longitudinal network data.

The following subchapters present an overview of different theoretical frameworks that concretise the underlying mechanisms between social connectedness, social support and mental health. Specifically, I will address the importance of dyadic and structural processes and evaluate the extent to which „People are interconnected, and so their health is interconnected“ (Smith & Christakis, 2008, p. 406). Furthermore, I discuss the implications of different modes of contact. Towards the conclusion of the initial chapter, I will outline my research strategy and the data on which the analyses are based. Thereafter, Chapters 2, 3 and 4 will present independent empirical studies, whilst chapter 5 will synthesise the findings of the three studies and discuss limitations and future research avenues.

1.2 Theoretical framework

1.2.1 Social networks and social support

Social support is defined in the broadest sense as all functions that individuals of the social environment can provide (Thoits, 2011). Empirically, distinctions are made between

emotional, informational, and instrumental support (House & Kahn, 1985). Emotional support, also called esteem support, comprises all support efforts that provide affection, understanding, and acceptance for ego. Instrumental support, on the other hand, includes all those forms of practical assistance, for example in the form of services or financial support. In contrast, informational support is typified by the provision of information or advice to master problems or decisions (Cohen & Wills, 1985; Thoits, 2011).

In addition to the categorization of different functions of social support, a distinction must be made between different perspectives on social support, especially in the context of health research (Diewald & Sattler, 2010). Probably the most intuitive form is the actually provided or received support. However, the actual mobilization of support resources usually increases when there is an acute need and a stressor has to be overcome (Melrose et al., 2015). In situations where problems or stressors arise, we can also distinguish between the perceived amount of need for social support – how much support would an individual prefer to receive? - and the assessment of the adequacy of the actually received support – if support was provided, was it sufficient and appropriate in its execution?. To avoid dependence on the acute existence of a need for support, the concept of perceived availability of social support is particularly valuable. This concept does not measure the actual reception of social support, but rather the extent to which individuals hold the belief that they could access support in their social environment if they needed it (Diewald & Sattler, 2010). Empirically received and perceived support only seems to be moderately associated (Haber et al., 2007).

Given the interdependence between social relationships and mental health, it is crucial not only to look at the different forms of social support but also to open the black box of how and why social support can strengthen mental health. The main distinctions are between the main effect model, the buffering hypothesis and the preventive effect of social support. However, these three models should not be viewed as competing with each other. Instead, they delineate distinct mechanisms by which social support operates that are capable of coexisting.

The buffering hypothesis (Cohen & Wills, 1985) proposes that social support is particularly important when stressors arise. The occurrence of problems and the associated stress can have negative consequences for an individual's health, both in the short and long term. For example, at the neuroendocrine level, stress is associated with increases in cortisol and blood pressure (Miller & O'Callaghan, 2002; Vrijkotte et al., 2000); the immune system can also be weakened (Padgett & Glaser, 2003). Thus, stress can cause lasting damage to

physical and mental health if it occurs frequently (Arnold et al., 2012; Chida et al., 2008; Parker et al., 2022). Indirect effects, such as a reduction in the ability to have a healthy diet or exercise, may also be relevant (Hill et al., 2018; Stults-Kolehmainen & Sinha, 2014), as these factors in turn are predictors of mental disorders (Mikkelsen et al., 2017; O'Neil et al., 2014).

However, social support resources can mitigate the negative effects of stress by intervening „between the experience of stress and the onset of the pathological outcome by reducing or eliminating the stress reaction or by directly influencing physiological processes" (Cohen & Wills, 1985, p. 312). This is where emotional as well as practical support are particularly relevant. The former to reduce the perceived threat of the stressor and the latter to solve the problem itself. Even in the transactional model of stress and coping (Lazarus & Folkman, 1984) which focuses on the cognitive stress appraisal process, the role of social support in the coping process is emphasised. They describe social support as an important resource for the selection of appropriate behaviour patterns and the successful management of stressors. Furthermore, the mobilisation of social support can itself be categorised as a coping strategy and is considered to be a problem and emotion-focused coping strategy (Folkman & Lazarus, 1985). Cohen and Wills (1985) suggest an additional mechanism. Perceived social support may interfere with the stress appraisal process. Individuals with high levels of perceived support are more confident that they will be able to cope successfully with upcoming stressors of various kinds. They are therefore less likely to perceive stressors as threatening, or at least perceive them as less threatening.

Even in the absence of stressors, a robust support network can be expected to have a positive impact on an individual's health. This assumption is often referred to as the main effect model (Cohen & Wills, 1985). The mechanism of relevance is embeddedness in cohesive social networks. Social integration in groups is associated with more positive and varied daily experiences. The presence of significant others is also associated with the upholding of social roles. These provide meaning and routine in life. Furthermore, knowing that you are part of a close-knit social network reinforces the belief that you are important to others. This belief is important for self-esteem, which in turn is important for mental health (Cohen & Wills, 1985; Thoits, 2011). In addition, social support strengthens confidence in one's ability to carry out actions successfully and autonomously, known as self-efficacy. Self-efficacy, in turn, has a positive impact on mental health (Berkman et al., 2000).

The preventive effect, on the other hand, refers to the direct effect of social support on the occurrence of stressors. Practical support, such as financial resources, can prevent

individuals from experiencing certain everyday problems in the first place. Also, the amount of stress a stressor can induce may differ fundamentally depending on the available support resources (Diewald & Sattler, 2010). For example, legal disputes are likely to be associated with at least some stress. However, if an established lawyer in the immediate environment can take on the case and the family's financial resources are not a problem, the level of stress can be considered significantly lower than if no practical support can be provided in the environment and financial resources are limited.

In summary, the hypothesised causal sequence of effects between social support, stressors and mental health determines the fundamental difference between the three models of social support. In the absence of stressors, the main effect model assumes a direct effect of social support on mental health. The buffering hypothesis, conversely, explains how social support can impede the impact of stressors on health. The preventative model posits that social support influences the emergence and perception of stressors.

When considering the impact of social relationships on health, social support is only one of the most important factors. Berkman et al. (2000) outline a total of four pathways through which social networks can affect health. In addition to (1) provision of social support through social networks, they also identify „(2) social influence; (3) [[…]] social engagement and attachment; and (4) access to resources and material goods“ (Berkman et al., 2000, p. 846) as relevant. The members of one's own social network thus constitute an important comparison group against which one's own norms and behaviour are evaluated, and through which conscious or unconscious assimilation and social influence can take place. Close social relationships in particular can provide intimacy and offer attachment functions following the parental figures. These individual relationships can then produce attachment to superordinate social structures. The concept of social engagement, in turn, emphasises the importance of social networks in assigning social roles that generate meaning and stability. The meaning of attachment and social engagement are reminiscent of the argumentation of the significance of embeddedness from the main effects model (Cohen & Wills, 1985). Access to resources and material goods describes the extent to which an individual's social relationships shape his or her decision-making options. This includes access to financial resources, for example, but also to informal knowledge, which can influence health behaviour directly and indirectly by making certain life courses more or less likely (Berkman et al., 2000).

The mechanism of "access to resources and material goods" establishes a theoretical relationship with theories of social capital. According to Bourdieu (1986) and Lin (2001),

social capital is located at the individual level and is defined by the resources that individuals may not count among their personal resources but can generate through their social contacts. Individuals can therefore be differentiated by how their access to various resources differs according to their social position or social contacts. In health research, the distinction between cognitive and structural social capital is established (Baum & Ziersch, 2003; Moore & Kawachi, 2017). Cognitive social capital encompasses subjective resources of social ties, including trust in the benevolence of the social environment or the accessibility of social support. In contrast, network social capital describes the relevance of the structural dimension of social capital. Thereby, it is investigated to what extent differences in the structure and composition of individuals' networks are explanatory factors for health outcomes. For mental health systematic reviews indicate that cognitive social capital is more influential compared to network social capital (De Silva et al., 2005; Ehsan & De Silva, 2015).

Thoits (2011) proposed a similar categorisation of the pathways between social relationships and health compared to Berkman et al. (2000). The categorisation distinguishes seven main mechanisms, which are assumed to be strongly interrelated. Here (1) social support is also identified as one of the relevant mechanisms. However, in contrast to Berkman et al. (2000), a clear distinction is made between (2) social influence through normative behavioural guidance without explicit efforts by the social environment to provoke change, and (3) social control. Social control refers to proactive methods of social influence in which the environment seeks to bring about behavioural modifications. For mental health, social control becomes relevant when changes in sleeping patterns, substance usage, or seeking professional help are monitored or pressurised. Included in this is guidance on suitable coping techniques. Social influence is also a factor in the development of mental health. For instance, individuals may unconsciously align with negative or positive thought patterns present in their social surroundings, which could be conveyed in shared conversations (Lakey & Tanner, 2013). There are once again similarities in the aspect of social engagement, which is expressed by the mechanism (4) Belonging and companionship. Three additional pathways are identified, outlining how social ties could potentially influence health indirectly through social roles. These pathways include a sense of control and mastery (5), self-esteem (6), and mattering (7). Adopting social roles has been connected to performing daily tasks repeatedly. Should these tasks be mastered, a sense of control is established. Individuals experience a sense of control over their lives and confident handling of forthcoming challenges, aligned with a positive self-image. This correlates with self-esteem, as individuals expect a favourable

evaluation from others due to fulfilling their role obligations. Mattering pertains to the meaning derived from the assignment of social roles, which grants significance within our environment and enhances our perceived importance as individuals (Thoits, 2011). Self-efficacy beliefs and levels of self-esteem are in turn predictive of mental health outcomes (Maddux & Meier, 1995; Sowislo & Orth, 2013).

When examining the relevance of social relationships for mental health, it is necessary to acknowledge and incorporate that there may exist considerable disparities between the desired social embeddedness, the perceived integration in social relationships and the actual social situation. Therefore, a conceptual distinction must be drawn between social integration or social isolation and loneliness. Social isolation refers to the objective lack of embeddedness in social networks, whereas loneliness refers to perceived social isolation. More specifically, loneliness is defined as the dissatisfaction that individuals experience with the quality or quantity of their available relationships (de Jong Gierveld, 1987; de Jong Gierveld et al., 2018). We can distinguish between emotional and social loneliness. Emotional loneliness describes the impression that important emotional attachment figures are missing. Social loneliness, conversely, pertains to the perception of insufficient companionship and integration within social activities and wider social structures (Weiss, 1973). Loneliness arises when perceived social connectivity falls below the desired intensity of social integration (Perlman & Peplau, 1981). From an evolutionary perspective, loneliness is also recognised as social pain, which should encourage individuals to engage more in social activities (Cacioppo & Cacioppo, 2018).

Loneliness is a substantial predictor of the onset of mental disorders (Mann et al., 2022) and has the potential to be a self-fulfilling prophecy, ultimately leading to social isolation (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010). The absence of social interaction and appropriate attachment figures can than results in deterioration of mental health. Furthermore, loneliness is related to a plethora of negative emotions, particularly feelings of sadness (Buchholz & Catton, 1999). Prolonged negative emotions can lead to the development of depressive symptoms.

However, restrictions in social interaction due to mental illness may contribute to the development of loneliness (de Jong Gierveld et al., 2018). At the psychophysiological level, both loneliness and depressive symptoms are associated with similar changes in neural processing (Quadt et al., 2020). Empirical evidence supports that loneliness and mental

disorders are mutually dependent (Hsueh et al., 2019; McDowell et al., 2021; Nuyen et al., 2020).

1.2.2 Mode of contact

The hitherto theoretical framework suggests that to whom we are connected and the amount of (perceived) social support provided through relationships are primarily relevant for the effect social networks have on mental health. With the rapid technological advancements of recent decades, there has been a constant increase in the medium's individuals can use to communicate. In many areas of the Western world, in-person meetings are just one among several communication methods that people regularly use to interact. Especially among younger generations, text messaging, video calls and phone conversations are all increasingly prevalent options.

Representative survey data from 2022 in Germany shows that around 73% of adolescents meet their friends in-person every day or several times a week during their leisure time. Meanwhile, over 90% of them use WhatsApp to communicate every day or several times a week (Feierabend et al., 2023a). In early adolescence, approximately 51% of them utilise video chat services, and 72% of them converse with their friends on the phone at least once a week (Feierabend et al., 2023b). The mean length of time spent on social media sites is around 165 minutes per day, with an upward trend in later adolescence (Forsa, 2022).

In this context, it is pertinent to examine the relationship between in-person and digital communication and consider how their impact on mental health might differ.

One concern regarding digitalisation is the possibility of a displacement effect. Increased usage of social media and communication through such technologies may have the effect of reducing the number of in-person interactions according to the social displacement hypothesis. This, in turn, might lead to new cultural norms about appropriate patterns of social interaction (Twenge, 2020). However, mental health is negatively affected only under two conditions. Firstly, if online contact cannot contribute to the maintenance of social relationships to the same extent as in-person contact. Than the decline in in-person interaction would pose a risk to the erosion of social connections. Secondly, if the pathways described in the previous chapter may not apply, or may not apply to the same extent, to online communication. A key aspect is whether e.g. text messaging can foster a sense of belonging and companionship similar to in-person meetings.

Previous research has indicated that a crucial aspect of digital communication is the type of communication involved. Passive social media usage or heavy digital media use

(Jensen et al., 2019; Rens et al., 2021; Thorisdottir et al., 2019; Verduyn et al., 2015) has been found to have negative associations with both mood and mental health. An underlying mechanism for these findings could be the heightened anonymity when passively consuming social media content. The lack of personal involvement undermines successful performance and adoption of social roles, ultimately resulting in a diminished sentiment of fulfilment from role-related tasks. In contrast, dyadic online communication, such as text messaging, appear to have a positive impact on positive affect (Burke & Kraut, 2016; Liu et al., 2019).

The social augmentation hypothesis (Ahn & Shin, 2013; Walther, 1996) presents an additional perspective, suggesting that there need not be a rivalry between in-person and digital communication. Online interaction may even reinforce existing social connections, paving the way for more offline gatherings or it can enable the formation of new connections in the first place. Previous research based on an experience sampling study suggests that, between adolescents, those with more social media use consider their friendships to be closer. On the within person level, however, it was found that adolescents rated friendship closeness to be lower in moments when they engaged in more text messaging with their friends (Pouwels et al., 2021). Findings from cohort analysis indicate that displacement happens at the cohort level, with a decrease in in-person social interaction as digital media usage increases. However, on the individual level, there is a positive association between in-person social interaction and social media use (Twenge et al., 2019).

A potential concurrence between the social displacement hypothesis and the social augmentation hypothesis could be attained if the social context is taken into account. For instance, as per the compensatory internet use model (Kardefelt-Winther, 2014), whether the impact on mental health is negative or positive depends on the context and purpose of online media use. Digital communication channels are predominantly utilised in adverse situations or to compensate for the absence of alternate avenues for social engagement. Especially when social media usage or text messaging is required to meet otherwise unfulfilled social needs, they are accompanied by an increase in positive emotions. The COVID-19 pandemic serves as an exemplification of this phenomenon. Owing to the extensive limitations imposed on in-person meetings, digital communication has emerged as the primary or sole means of interaction. Consequently, it has acquired critical importance in preserving social connections. However, research findings on the development of loneliness during the COVID-19 pandemic, especially in relation to pre-pandemic levels, suggest an increase in loneliness throughout the pandemic (Ernst et al., 2022; Farrell et al., 2023). This may imply that

enhanced online communication can only partially compensate for decreased in-person interaction. Online games provide another example for the compensatory internet use model. Numerous multiplayer games have both text-based and verbal communication features. Research has previously indicated that fellow players can act as a substitute source of support in lieu of in-person support structures (Prochnow et al., 2020).

Overall, it can be assumed that the opportunity structure and individual purpose of utilising online forms of contact have an impact on how they affect the mental health of individuals. Since it is unclear whether the theoretical pathways linking social relationships with mental health function similarly for online and in-person interactions, additional theoretical and empirical research is necessary to discern any variations in the main and buffering impacts of these different modes of interaction.

1.2.3 Dynamics in dyadic relationships

Thus far, this dissertation has addressed pathways through which social support and integration into social networks can improve mental health. Nevertheless, adverse mental health effects are also possible, depending on the social context in which an individual finds himself or with whom the exchange of support takes place. The nature of the relationship between ego and alter may determine whether offered support is viewed as supportive or demeaning. Previous findings suggest that support from those with whom ego shares a negative relationship is more likely to adversely affect health (Sandler & Barrera, 1984). Equity theory provides a theoretical framework that explains the significance of equality within interpersonal relationships (Foa, 1971; Tilden & Galyen, 1987). The theory focusses on the exchange of material and psychological goods between individuals and the underlying principles that govern this exchange. Accordingly, to understand the effectiveness of social support, we need to assess three dimensions: the cost of social support, including both the services provided and the perceived debt for services received; conflict, which refers to the quality of the relationship with others; and reciprocity, which concerns the perceived balance of support resources exchanged between the individual and others (Tilden & Galyen, 1987). In particular, if individuals receive significantly more help than they provide, this can lead to feelings of dependency and guilt, creating stress and consequently adversely affecting mental health (Tilden & Galyen, 1987). This is especially pertinent for individuals with limited socio-economic resources and chronic illnesses, as there is often a longer-term need for social support (Lubbers et al., 2020). This can lead to feelings of overwhelm and fatigue if the need for support exceeds the capacity of the social context to provide it (Baptista et al., 2012;

Maier et al., 2015). The increase in the need for social support over a longer period of time, in combination with a reduced capacity to maintain social relationships, can lead to the deterioration of social support relationships in particular and social relationships in general (Kaniasty & Norris, 1995; Norris et al., 2005). In contrast to larger forms of assistance that activate norms of reproduction, it is the smaller support services in everyday life, which may be difficult to identify as such, that exert a positive effect on health (Thoits, 2011).

Besides receiving an excessive amount of social support, providing an excess of social support can have a negative impact on health as well. Negative emotions can arise from the perception that you are providing more to others than you are receiving: “the underbenefited feel angry because of their smaller return” (Tilden & Galyen, 1987, p. 12). In contrast, by increasing self-esteem and signalling being needed, moderate support provision for others is more likely to evoke positive emotions (Biehle & Mickelson, 2012; Morelli et al., 2015).

Differences in social hierarchy between the individual and their social support provider could also be significant in relation to the perception and impact of social support. The social competition hypothesis (Price et al., 1994) posits that depressive symptoms are an evolutionary consequence of social competition. Depression serves as an adaptive strategy that compels individuals to relinquish pursuits in a futile social contest. The purpose of depression is to decrease the drive to compete socially, communicate harmlessness, and establish resignation as a mental state.

Previous research indicates a correlation between lower social status and poorer mental health (Fournier, 2009; Langner et al., 2012). It appears that the suppression of negative emotions is an important mediator, as it is more common among individuals of lower social status and increases the risk of depressive symptoms (Fournier, 2009). The provision of social support from those with a higher social status can make status differences more salient and evoke negative feelings, for example in the form of dependency. In contrast, individuals of lower social status often do not reciprocate social support provided by individuals in leadership positions, as it is perceived as a duty of the latter's elevated position, leading to disappointed expectations (Toegel et al., 2013).

1.2.4 Attribute alignment or misalignment between interaction partners

Mario Small's work "someone to talk to" (2017) highlights the need for support research to extend beyond the immediate social group. In daily life, significant others do not always constitute the primary or exclusive source of social support. Specifically, when discussing conflicts with confidantes, social contacts who are emotionally close are often not

the best individuals to talk to compared to uninvolved others. When an individual experiences a stressor in its daily life, there arises an acute requirement to discuss it. Here, Small stresses the importance of the opportunity structure. In order for an individual to be pertinent to the provisions or perceptions of social support, they must be at the right place at the appropriate time and be available in that moment. In view of the importance of the mode of contact discussed above, it is worth noting that the opportunity structure is of greater importance in choosing support providers in person, whereas it is less significant in online support exchanges in times of constant accessibility via smartphones.

But beyond the opportunity structure, what are the characteristics that determine with whom a close relationship is formed and to whom one turns in case of difficulties? An important principle that structures the formation and maintenance of social relationships is homophily. It describes the tendency for contact to be more likely between individuals who are similar than between individuals who are less similar: “Similarity breeds connection“ (McPherson et al., 2001, p. 415). A distinction can be made between two types of homophily. Status homophily describes similarity based on status characteristics, e.g. demographic categories such as gender, age or migration background. In contrast, value homophily describes the tendency to have more contact with individuals who share one's own values, attitudes and belief systems (Lazarsfeld & Merton, 1954). Especially in adolescence, same-sex and similarity in age are important predictors of friendship formation (Laniado et al., 2016; McPherson et al., 2001; Stehlé et al., 2013). Likewise, for the exchange of emotional support, analyses of full networks in adolescence show that females are more likely to exchange social support with females, and males are more likely to exchange social support with other males (Baerveldt et al., 2004; Lakon et al., 2017; van Rijsewijk et al., 2016). Adolescent females are also more often nominated as providers of support than males (van Rijsewijk et al., 2016). There also appear to be gender-specific patterns in the provision and receipt of social support in social relationships in the later stages of the life course. Paradoxically, while females report more perceived social support, the prevalence of mental illnesses such as depression and anxiety are higher among females (Asher et al., 2017; Piccinelli & Wilkinson, 2000). To some extent, gender differences may be ascribed to biological factors, such as hormone fluctuations, differences in brain structure and function and genetic vulnerability (Hyde et al., 2008; Parker & Brotchie, 2010). It's important to note that these biological differences do not fully account for the gender gap in mental health. Previous research indicates that one possible explanation is that females form closer

emotional bonds, which in turn are associated with more conflict in everyday life (Turner, 1994). In addition, the impact of relationship quality on female's health also appears to be greater (Kiecolt-Glaser & Newton, 2001; Williams, 1988), thereby making them more vulnerable to negative interactions. There are also indications that the preferred dimensions of support and its scope differ between males and females (Olson & Shultz, 1994; Xu & Burleson, 2001). Femininity, for example, is more likely to be associated with needing and receiving more emotional support (Reevy & Maslach, 2001).

In the context of global migration, and particularly in view of the fact that Germany is the world's second most popular country for immigration (Thränhardt, 1995; United Nations, 2020), the significance of migration background for the health impact of social relations is of particular societal relevance. In accordance with the homophily principle, there is substantial evidence in migration research for ethnic homophily in positive relationships, even when controlling for opportunity structures (Grund & Densley, 2015; McPherson et al., 2001; Wittek et al., 2020). Due to language barriers and the acculturation process in general, first-generation migrants in particular are more likely to have close social relationships with individuals of their own ethnic group (Titzmann & Silbereisen, 2009; van Tubergen, 2015). Given the frequent experience of ethnic discrimination by the host society, it can be assumed that social interactions with members of one's own ethnic group are not necessarily processed in the same way as those with members of the host society. Positive intra-ethnic contact may, for example, reduce lack of belonging by strengthening in-group identification and thus making embeddedness in a particular social group more salient (Berjot & Gillet, 2011). In contrast, positive inter-ethnic interactions are relevant to mood and emotions, especially with members of the majority, as they can reduce feelings of rejection and exclusion (Marinucci et al., 2022). Inter-ethnic support exchange can be hindered by cultural discrepancies in emotional reactions and expressions in the face of challenges (Cole et al., 2002; Mesquita & Frijda, 1992) and in preferred forms of social support (Kim et al., 2008). This may result in an elevated divergence between anticipated and actual provisions of social support. Emotional responses are known to align with those of the host society in the course of the acculturation process (Jasini et al., 2023), and second- or third-generation individuals may thus receive greater advantages from the support of members of the host society than first-generation migrants.

Similar mechanisms underlie value homophily. Shared values, attitudes or behaviours are conducive to relationship formation because they are rewarding by confirming one's

perception of reality. Clearly divergent attitudes increase the potential for conflict with the alteri. Withholding one's own opinion when attitudes differ from those of the interaction partner is also associated with negative emotions such as frustration (Lazarsfeld & Merton, 1954). According to the theory of cognitive dissonance (Festinger, 1962), perceiving conflicting information or attitudes can be stressful and cause emotional distress. People who experience discomfort try to reduce the cognitive dissonance. One method of decreasing dissonance is to avoid sources that create these contradictions - for social interactions, this could mean avoiding people whose dispositions or actions do not align with one's own. Previous research indicates that homophily is also evident for health-related outcomes (e.g. de la Haye et al., 2011; Schaefer et al., 2011).

The research so far shows that classical theoretical frameworks such as social support theories (Berkman et al., 2000; Cohen & Wills, 1985; Thoits, 1995) depend on who the alteri available to ego are. The main effect as well as the buffering effect of social support can be expected to depend on the characteristics of the alteri. For instance, if primarily female alteri are available, a higher level of emotional social support could be anticipated (MacGeorge et al., 2003; van Rijsewijk et al., 2016). Meanwhile, similarities in attributes such as gender or ethnicity may increase the visibility and effectiveness of the provided support.

1.2.5 Reciprocal relationship between social relationships and mental health

In view of the complex relationship between social relationships and mental health, it should not be overlooked that health can very well have an impact on people's relationships. Because of their symptomatology, mental illnesses are often associated with a reduced ability to maintain social relationships and a reduced ability to participate in social activities to the same extent and with the same frequency (de Jong Gierveld et al., 2018). In addition to active social withdrawal, depressive symptoms also affect communication during social interactions. A high level of symptoms is linked to a reduction in facial expressions which can increase emotional distance (Girard et al., 2014). The quality and quantity of social interactions are negatively associated with depressive symptoms. There is also evidence that for people with depression, it is mainly social interaction with significant others that has a positive effect (Nezlek et al., 1994). Similarly, individuals with depressive symptoms appear to be more likely to be rejected in the context of interactions with strangers or weak ties (Hammen & Peters, 1978; Joiner, 1996).

Alternatively, if mental or physical illnesses become known, it may increase the alteri's willingness to provide support and activate certain support resources within the network (Barrera, 1986). However, it should be noted that in the context of mental health disorders, these might not be disclosed to the social context for fear of stigmatisation (Barney et al., 2009), and therefore it can be assumed that only a high burden of symptoms will lead to visibility and ultimately to the mobilisation of support. Over time, particularly in the case of chronic illnesses, individuals within support networks may become overwhelmed if they feel unable to meet support needs. This can subsequently result in deterioration of social relationships (de Jong Gierveld et al., 2018).

Alongside the impaired ability to maintain social relationships or responses from the social environment as a result of symptoms of mental health conditions, another prominent factor warrants attention. Typically, changes in cognition co-occur with mental illnesses.

According to the cognitive theory of depression (Beck, 1967, 1976) depressive symptoms are produced as well as maintained by distorted thought processes. According to the theoretical framework, these distortions manifest themselves in the form of a cognitive triad: the self, the social environment and the future are seen as negative. Experiences and interactions that contradict the negative view tend to be ignored. As a result, positive social interactions or support are less likely to be noticed. This can lead to dissatisfaction with the social environment or social relationships without the latter being able to identify the causes. This increases the potential for conflict and the likelihood of relationship dissolution.

Coyne outlines in the interactional theory of depression (1976) how the negative impact of depressive symptoms on the social environment can contribute to their perpetuation. The ever-increasing need for reassurance and empathy from the social environment can, in the long run, become a burden on social contacts and decrease their commitment. If depressed people perceive these changes in behaviour towards them, this may lead them to actively seek more support. This can put undue strain on social relationships and lead to feelings of isolation - processes that promote the persistence of depressive symptoms. In the context of loneliness research, behavioural and attitudinal changes that occur as a result of altered perceptions of social relationships are referred to as the self-reinforcing loop of loneliness: the generated insecurity and associated negative behavioural adjustments towards the social environment can become a self-fulfilling prophecy and then lead to the actual loss of relationships (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010).

The presumed changes in the cognition of depressed persons have been an area of immense empirical investigation. Experimental research showed that depressed individuals recall standardised evaluations more negatively than the control group and were more likely to not recall or underestimate positive feedback (DeMonbreun & Craighead, 1977; Gotlib, 1983; Nelson & Craighead, 1977). The underlying mechanism is deemed to be decreased cognitive control in processing negative stimuli. Furthermore, the processing of negative information is intensified and it is increasingly difficult to let go of negative thoughts or information (Gotlib & Joormann, 2010). However, especially with regard to the processing of neutral or positive feedback, here has also been research that found no differences between depressed individuals and control groups (e.g. Hoehn-Hyde et al., 1982).

Research on social network accuracy suggests that indicators of mental health, such as lower positive affect or depressive symptoms, are associated with greater misperception of one's own social relationships. This tendency is also evident with regard to perceived acceptance; students with depressive symptoms systematically underestimate the extent to which they are accepted by their peers (Kistner et al., 2006). The deterioration of the self-perception of social acceptance by peers and relationships with peers seems to postdate the onset of depressive symptoms (Zimmer-Gembeck et al., 2009).

Previous research indicates that mental disorders are not necessarily linked to reduced or distorted perception in all aspects of cognition. There is also evidence to suggest greater tracking accuracy among individuals experiencing depressive symptoms. These individuals exhibit heightened attention towards their social environment's behaviour towards them. As a result, they appear to be better at detecting behavioural changes in significant others, particularly within intimate relationships (Overall & Hammond, 2013). In an experimental context, the hypothesis of depressive realism has emerged based on evidence indicating that individuals with depressive symptoms are more realistic in evaluating contingency. In contrast, non-depressed individuals tend to overestimate their influence on various outcomes to a greater extent – thus leading to Alloy and Abramsons evaluations as “sadder but wiser” (Alloy & Abramson, 1979).

1.2.6 Beyond the individual and dyad level: the social network perspective

So far, I treated the concepts of social support, social ties and social networks as nearly interchangeable. When examining the impact of social relationships on mental health, it is insufficient to only consider dyadic information. The attitudes and behaviours we adopt

from our friends and acquaintances are also influenced by their social connections. The extent of our influence on the broader social context depends not solely on our direct contacts, but also on their contacts and the contacts of their contacts: friends of friends matter.

Social network theory offers a compelling approach to analysing social phenomena (Borgatti et al., 2009; Liu et al., 2017). Social network theory structures social phenomena into nodes and edges, where nodes can represent single individuals or institutions and edges represent their relationships or connections. The joint consideration of nodes and edges constitutes social networks, bringing social structures into the centre of our analysis (Berkman et al., 2000). Social support is to be distinguished from social networks in the sense that: "Social networks are thus to be regarded as a kind of infrastructure for the production and distribution of social support and not as social support itself" (own translation; Diewald & Sattler, 2010, p. l83).

The network approach provides a new lens through which to view the relationship between social ties and health. We might consider not only our dyadic contacts and our satisfaction or dissatisfaction with them, but also the relevance of structural positions in social networks. Does it matter if we occupy a central position in the network, meaning that we are better connected to others than most, or if we are on the periphery?

The meaning of structural equivalence can be explored in network theory. Structural equivalence pertains to individuals who share a similar structural position within the network (Borgatti et al., 2009). Mental health could be predicted by similarity, e.g. in the number of incoming relationship nominations or centrality, as these measures provide information about access to social resources and position in the social hierarchy.

By examining network panel data, we can reveal two opposing theoretical mechanisms that can lead to the value or status homophily discussed above. The resemblance between befriended actors may be the product of peer influence effects discussed in various socialisation theories (for more information see e.g. Bandura, 1986; Hurrelmann, 1993). In the subchapter "Social networks and social support" an explicit differentiation was also made between social influence and social control (Thoits, 2011). Peer influence effects describe the tendency of individuals to assimilate their behaviour and attitudes to that of their peers over time. In instances where relationships are at least to some extend freely chosen by individuals (e.g. in friendship versus family ties), selection effects are additionally recognised as a possible mechanism. In such settings, individuals are more likely to initiate contact with others who bear similar traits consciously or unconsciously. Regarding social relationships,

similarity may further decrease the likelihood of conflicts and result in a lower chance of losing connections. To distinguish between social influence and social selection mechanisms, both longitudinal data and information regarding complete social networks are required. The former indicates the temporal sequence while the latter determines which relationships were possible but not pursued; this perspective cannot be obtained through an egocentric perspective.

1.3 Approach

The reviewed literature indicates that an individual's mental health is substantially influenced by the social context and structures in which they are a part of. Mental health cannot only be seen as a product of individual decisions and individual attributes. Instead, it is dependent on the social structures of the environment and can itself help to shape them. The co-dependency and feedback process between theoretical concepts place high demands on empirical testing regarding data sets and analysis methods. This sub-chapter demonstrates how ecological momentary assessment studies and longitudinal complete social network data can make significant contributions. Subsequently, the SOCIALBOND study is presented and the extent to which it enables the implementation of the research strategy presented.

1.3.1 Research strategy

Ecological momentary assessment (EMA), also known as experience sampling methodology or smartphone-based experience sampling methodology, involves participants responding to repeated assessments at short intervals while in their natural environment. The individual short surveys typically ask for the same content and last only a few minutes. EMA studies generally exhibit higher ecological validity compared to conventional surveys or experiments (Stone et al., 2007). Since the short surveys take place in the real everyday world of the participants and are less likely to take them out of their routines due to the short duration - it can be inferred that the findings have greater potential for being transferred to social reality. By avoiding retrospective questions, there is less of a demand on participants' long-term memory. Recalling information from long-term memory carries the risk of recall bias (Shiffman et al., 2008), where the result of cognitive processing steps is more likely to be remembered than the actual memory. In the context of the outlined cognitive distortions frequently connected to mental illness, this appears especially relevant to the present subject.

In the context of this study, the methodology involves collecting almost real-time perceptions of everyday interactions. Participants are not required to reconstruct existing social relationships or relationship quality retrospectively for long periods. Instead, they can continuously provide descriptions of their current interaction partners, including their impressions of the very same. Throughout the entire survey duration, data on the various social environments in which ego is active will be collected.

The ecological momentary assessment (EMA) data implies numerous extended possibilities on the analytical side. With multiple observation points available for each individual, within-subject processes can be specifically analysed using fixed effects models. Within-subject effects are derived by mean-centering, essentially by subtracting each respondent's mean from every data point of the respective individual, thereby quantifying deviations from the individual's average. This procedure removes all time-constant sources of bias between individuals (Allison, 2009).

Hybrid mixed-effects regression models provide a suitable alternative, particularly when there are multiple time points available for each individual and a sufficient number of different individuals have been interviewed. These models effectively differentiate between within and between person estimators. In addition to the within estimators known from fixed effects regression, the averaged association between the independent and dependent variables across all observations is estimated under control of the within-effects (Begg & Parides, 2003; Hedeker & Gibbons, 2006). Therefore, this method also takes into account whether there are differences in, for example, access to support resources and how these impact mental health.

Although ecological momentary assessment studies demonstrate strengths in ecological validity and contextual variation, they possess limitations in studying the social environment. While it is possible to at least gather significant information on dyadic contacts, such as their age, gender, ethnic background and mode of contact, we are restricted in terms of other features of the interaction partners. Previous research suggests that individuals tend to overestimate how similar their interaction partners are to themselves in terms of their behaviour and attitudes (Goel et al., 2010; Young & Weerman, 2014). Therefore, to identify peer influence or selection effects, it is essential to consider not only ego's perception but also the reports provided by the alteri themselves. Moreover, conventional ecological momentary assessment studies solely offer details on the interactions that occurred, leaving uncertain the potential interaction partners that were available but not sought out.

Complete social network data collection and analysis methods offer an alternative and a solution to the limitations stated above. Surveying complete social networks involves interviewing every individual within a predetermined social boundary. Aside from individual level attributes, each participant provides nominations of his perceived relationships to other individuals within the network boundary.

Nomination data in panel studies offers an advantage in examining the co-dependency between social relationship structures and mental health longitudinally. This is a crucial methodological prerequisite for distinguishing peer influence from selection effects. Since depressed or lonely individuals may perceive their social networks through distorted cognitive lenses, classic nomination methods are suspected of carrying inherent biases in mental health research. Social cognitive mapping (Cairns et al., 1985; Kindermann, 1998) provides a promising alternative. Every individual reports his perception of the relationships between other individuals within the network boundary. The aggregated social network is based on all members' perceptions of each other's relationships. This approach can be integrated into panel studies to conduct analyses of longer-term developments.

Due to the inherent need of complete social network studies to define a network boundary, I will focus on ties between adolescents in the school context. This might seem like a far-reaching restriction and produces a blind spot for ties outside the school. However, in adolescence, it is important to consider that peers are becoming more and more important in the socialisation process. During adolescence, a key goal is to achieve autonomy and independence from parents as primary caregivers. Peers are increasingly important as a source of support (Laursen & Hartl, 2013). Within societies where schooling is obligatory, the school class and cohort depict one of the most significant contexts for socialisation, positive and negative, because of frequent meetings and the absence of escape possibilities.

To accurately estimate the mechanisms of peer influence and selection effects described above on the basis of complete longitudinal network data we need to account for the respective other mechanism. To the best of my knowledge, this can only be achieved using RSiena. RSiena co-evolution models provide a framework for the simultaneous examination of dynamics in networks and behaviour variables. As social structures and mental health are assumed to be interrelated, the identification of causality is of particular concern. The issue of causality is addressed in RSiena through the explicit modelling of feedback processes between networks and individual level attributes (Lomi et al., 2011; Steglich et al., 2010). Thus, it can be examined whether individuals become more similar to

their social ties over time concerning a specific attribute (e.g. their mental health becomes more alike to that of their friends), or whether selection effects are more important and they choose their ties according to the attribute under investigation (e.g. adolescents with mental disorders are less likely to find new friends).

As part of the Stochastic Actor-Oriented Models (SAOM), alterations occurring within the networks and individual level attributes are conceptualized from an actor-oriented perspective. The time intervals between recorded observations are discretized into micro-steps, assuming a continuous evolution of the network and attributes between these temporal points. During each micro-step, actors can choose to change ties and make individual-level attribute adjustments. The actor choices are modelled conditionally on the current state of the network and the individual-level attributes of the alteri (Ripley et al., 2023; Snijders et al., 2010; Steglich et al., 2010).

While certain network attributes, such as the number of friends in the class and their feedback processes with mental health, can also be estimated longitudinally using methods such as cross-lagged panel analysis (e.g. Kenny, 2014; Newsom, 2015), RSiena offers a crucial advantage by enabling the modelling of a multitude of structural network parameters. When examining social relationships, various social mechanisms structure the formation of relationships. Reciprocity, for instance, increases the likelihood of assisting another person if they aided us previously. Triadic effects may lead to higher chances of two individuals, who happen to be my friends, developing a friendship compared to two randomly selected individuals, because the former possess more opportunities to interact with each other through me. The various cases of endogenous network effects are important for relationship formation. To achieve an unbiased estimation of social influence and selection processes, it is imperative to account for these endogenous network effects so as not to overestimate the effect of the other processes of interest (Ripley et al., 2023; Snijders et al., 2010).

1.3.2 Data description: The SOCIALBOND study

The data of the project "Social Integration and Boundary Making in Adolescence" (SOCIALBOND)[1] is particularly well suited for the research aim of this dissertation. It comprises a three-wave panel study of students within the school context. Data collection initiated at the start of the school year in autumn 2018 (wave 1) and was repeated one year

[1] This research was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 716461).

later in autumn 2019 (wave 2) and two years later in winter 2020 (wave 3). The data was collected from an entire cohort of seventh-grade students in wave 1, eighth-grade students in wave 2 and respectively ninth-grade students in wave 3. The data collection involved audio-supported tablet-assisted self-interviews conducted within classrooms in the first two waves and due to pandemic related restrictions, an online survey in wave 3. This dataset encompasses 37 schools that participated in the first two waves, resulting in approximately 3500 students being interviewed. Importantly, complete social networks were constructed at the grade level through the use of name lists, yielding participation rates of 75.99% in wave 1 and 80.48% in wave 2. These high participation rates provide a reliable presentations of the network structure and thus unbiased results in that regard (Kossinets, 2006). Due to the shift to an online survey, merely 575 adolescents participated in Wave 3.

Following the third wave of the panel study, adolescents in the ninth year of participating schools could engage in an ecological momentary assessment (EMA) study in February 2021. Participants received eight short questionnaires over four weeks, capturing their daily mood and social interactions during a time defined by home schooling and contact restrictions. In November 2021, the same adolescents participated in another ecological momentary assessment study. During the second survey period, the adolescents were again in regular school classes and the contact restrictions only applied to larger gatherings of people, providing valuable insights into the impact of changing social contexts. The questionnaires invitations were distributed in the evening. The specific time of the short questionnaires were randomly selected for each participant and each short questionnaire, to discourage adjustment of behaviour in anticipation of a fixed survey time. 290 adolescents participated in the initial EMA study conducted in February and responded to at least one short survey, while 160 adolescents participated in the EMA follow-up study which was conducted in November.

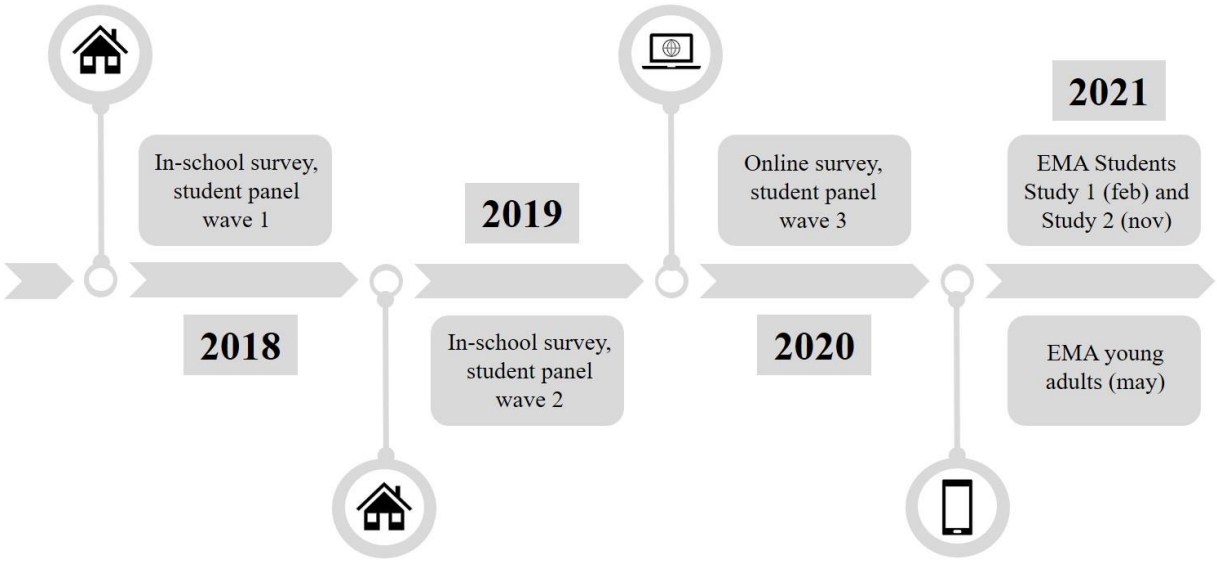
Furthermore, the dataset extends its reach to young adult first-generation migrants in Germany through another ecological momentary assessment study[2]. The study was conducted with a subsample of the large-scale two-wave panel study ENTRA (Kristen & Seuring, 2021). In the second wave, all participants of Turkish, Syrian, or Polish origin had the opportunity to indicate whether they were interested in the smartphone-based study. 1,078 individuals agreed

[2] This research was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 716461). Funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy—EXC 2126/1–390838866.

to participate and 977 responded to at least one short questionnaire. Over seven days, participants received invitations to short questionnaires three times a day on their smartphone, collecting data on positive and negative interactions, information about the interaction partners and the current mood. Again, a signal-contingent sampling approach was chosen and the timing of the short questionnaires was chosen at random.

One notable aspect of the SOCIALBOND dataset is its versatility in examining the relationship between social ties and mental health across different social contexts, including the pre-COVID-19 school context and everyday data from adolescents and young adults in different phases of the pandemic. This combination of ecological momentary assessment data and complete social networks at the grade level enables a comprehensive analysis of (1) the interplay between individuals and social structures within the school context and (2) the dynamics of positive and negative interactions across various social contexts at the everyday level. Figure 1 provides an overview of the timeline and the different data collection modules.

Figure 1: Timeline of the different modules of the SOCIALBOND project



1.4 Short outline of empirical studies

This thesis aims to identify and quantify mechanisms and intervening processes in the relationship between social ties and mental health. To this end, I have proposed a general theoretical framework. The individual theoretical components are interconnected and consolidated in Figure 2. Four direct effects (straight lines) are considered: the assumption of a preventive effect or dark side of social ties which could function as stressors (path a), the negative impact of stressors on mental health (path b), and the reciprocally causal relationship between mental health and social ties (paths c and d), whereby the main effect model of social

support along with other concepts such as mattering and companionship, are summarised in path c. Along with the direct effects, potential moderating factors (dashed lines) of the central relationships are also incorporated. I presume that social ties serve as a stress-buffering mechanism (path e). The characteristics of interaction partners can impact the bidirectional connection between social ties and psychological health (path f and g) as well as the extent to which social ties offer stress-buffering (path h). The mode of contact may modulate the effect of social relationships on mental health (path j) and the extent to which they provide stress relief (path i). Within this framework, three research questions are interlinked:

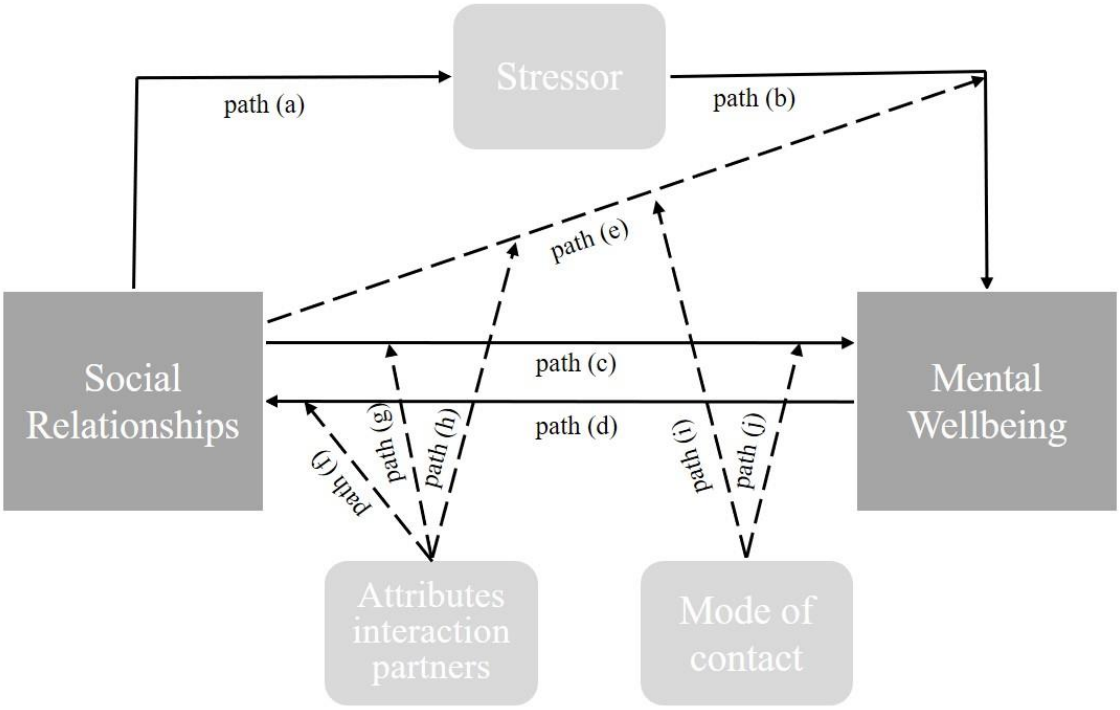
(1) How are different modes of social contact with friends and daily mood changes related?

(2) Is there a distinction made between the importance of inter- and intra-ethnic interaction partners in concern to stress buffering? and

(3) Do we find peer influence as well as selection effects for social cognitive maps and mental health as well as loneliness?

I will now present an overview of three empirical studies and outline which part and which paths of the theoretical foundation are being tested. Each of the following chapters contains one of the independent studies.

Figure 2: Theoretical model of hypothesized causal relationships (straight lines indicate direct effects and dashed lines indicate moderating effects)



Chapter 2: Adolescents' mode of contact with friends and mood changes during the COVID-19 pandemic: An ecological momentary assessment study

The study delves into the emotional consequences of online text-messaging in adolescents. It discusses how social interaction with friends is positively related to positive mood (path c). More precisely, the study examines whether online contacts provide similar benefits to mental health as in-person contacts (path j). The COVID-19 pandemic created a unique context for this study, as it led to a significant reduction in in-person peer contacts among adolescents. This situation made online contact increasingly important for maintaining social relationships and companionship. The study aims to explore how these shifts in modes of contact, influenced adolescents' mood. This study also considers potential gender-specific associations and explores whether these associations are stronger in adolescent females than in males (path g).

In this study, the two student ecological momentary assessment studies of the SOCIALBOND project are used. The two studies were conducted among German adolescents during periods of strict school closures and when schools were open. Using the intensive longitudinal design, adolescents' mental health and different modes of online and in-person contact were measured over four weeks. The fixed effects regression employs within-person estimators to control for time-constant unobserved heterogeneity.

Contribution Chapter 2: As the lead author, I developed the research question, prepared the data for analysis and conducted the analyses. I developed the theoretical framework and analysis strategy as well as prepared the manuscript together with my co-authors Clemens Kroneberg (University of Cologne, Germany) and Hanno Kruse (University of Bonn, Germany).

Chapter 3: Everyday discrimination, co-ethnic social support and mood changes in young adult immigrants in Germany – Evidence from an ecological momentary assessment study

The concept of perceived discrimination as a stressor and its impact on mood is central to this study (path b). The role of social support in processing stressors is explored. Following Lazarus and Folkman's transactional model of stress and coping social support is considered a valuable resource in coping with stress. The buffering hypothesis further suggests that social support can buffer the effects of acute stress either by resolving underlying problems or providing emotional support (path e), thus reducing vulnerability to mental illness. The study

differentiates between inter-ethnic and intra-ethnic relationships among first-generation migrants. In-group ties are expected to mitigate feelings of lack of belonging and strengthen in-group identification. On the other hand, perceived support from members of the host society is anticipated to reduce feelings of rejection and social exclusion. Accordingly, I will examine how the buffering effect of social support differs between inter- and intra-ethnic support providers (path c and h).

The study is based on the ecological momentary assessment data with young adult first-generation migrants in Germany. The study's contribution lies in its use of EMA data to investigate the immediate impact of discrimination experiences on mood changes. It aims to ascertain whether perceived social support at the situational level can mitigate the negative effects of discrimination and whether interactions with inter- or intra-ethnic support providers affect mood outcomes differently. The research design allows for within-person and between-person analyses using hybrid mixed-effects regression models.

Contribution Chapter 3: I am the sole author of this paper.

Chapter 4: Exploring the complex relationship between social integration, loneliness, and mental health in adolescence: A longitudinal study using social cognitive mapping

The research question central to this study revolves around the complex interplay between social integration into peer groups, loneliness, and mental health during adolescence, leveraging the first two waves of the SOCIALBOND panel study. The theoretical foundation of the study emphasizes that both individuals and their mental health are interconnected within the social structure. During adolescence, the peer group becomes increasingly influential. The objective is to examine the co-development of social integration and loneliness, as well as social integration and mental health (path c and d) while accounting for the network structure of the data using Stochastic Actor-Oriented Models. RSiena co-evolution models facilitate the investigation of feedback processes. Attributes of the interaction partner are considered in concern to peer influence and selection effects (path f and g). We analyse whether the average mental health of clique members influences the mental health of each individual, and whether egos and alters mental health are relevant to the selection patterns of clique members. Incorporating the concern that perceived networks may differ from actual behaviour networks, this study overcomes the limitations of standard self-report measures by utilizing the social cognitive mapping approach. The aim of this proxy

measurement for social interactions is to better capture the objective reality, thus reducing the potential for biased estimates.

Contribution Chapter 4: As the lead author, I developed the research question and the theoretical framework, I prepared the data for the analysis and prepared the manuscript. My co-author Robert Krause (University of Kentucky, USA) assisted with the development of the analytical strategy and the analysis.

An overview of the three empirical studies is provided in Table 1.

Table 1: Overview of the empirical studies included in this dissertation

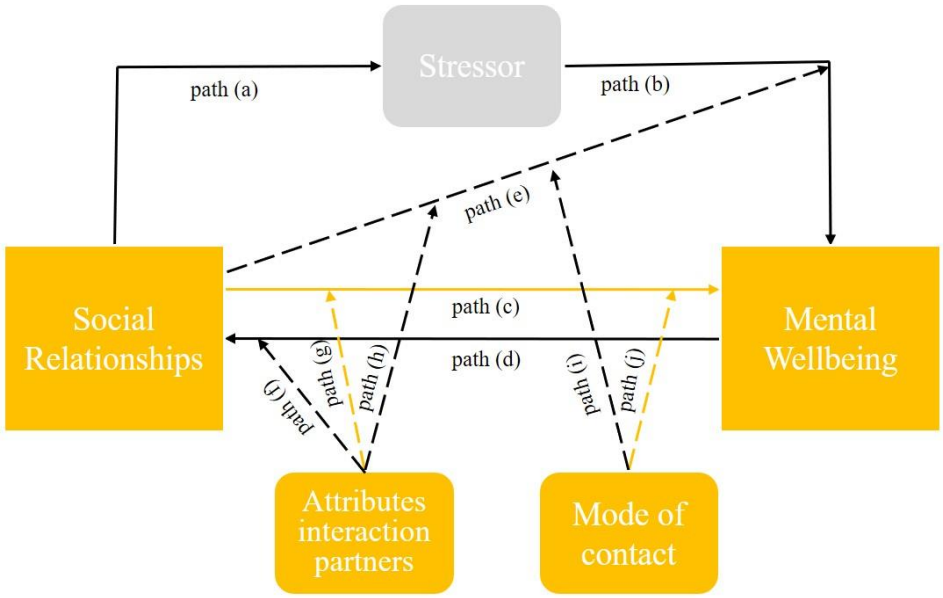
	Study 1 (Chapter 2)	Study 2 (Chapter 3)	Study 3 (Chapter 4)
Title	Adolescents' mode of contact with friends and mood changes during the COVID-19 pandemic: An ecological momentary assessment study	Everyday discrimination, co-ethnic social support and mood changes in young adult immigrants in Germany – Evidence from an ecological momentary assessment study	Exploring the complex relationship between social integration, loneliness, and mental health in adolescence: A longitudinal study using social cognitive mapping
Author(s)	Heike Krüger, Clemens Kroneberg and Hanno Kruse	Heike Krüger	Heike Krüger and Robert Krause
Research Question(s)	• How are different modes of social contact and daily mood changes related? • Does the relationship differ between different phases of the COVID-19 pandemic?	• Which social resources can buffer negative effects of discrimination? • Is there a distinction made between the importance of inter- and intra-ethnic interaction partners in processing stressors?	• Does the number of clique members positively impact mental health? • Are there peer influence effects on mental health within cliques? • Are adolescents more likely to connect with others whose mental health is similar to their own?
Theoretical Framework	• Main effect model of social support • Social displacement hypothesis • Model of compensatory internet use	• Stress-buffering hypothesis • Transactional model of stress and coping	• Social network theory • Cognitive theory of depression/ self-reinforcing loop of loneliness • Stress-buffering hypothesis • Social influence
Dependent Variable	Mood	Mood	Mental health, loneliness, clique networks

Core independent variables	In-person and text-messaging with friends	Discrimination, perceived social support, inter- and inter-ethnic interaction partner	Mental Health, loneliness, clique networks
Data	SOCIALBOND smartphone survey student study 1 and 2	SOCIALBOND smartphone survey young adults	SOCIALBOND school survey wave 1 and 2
Statistical method	Fixed effects regression	Hybrid mixed-effects regression	RSiena co-evolution models
Results	• In-person contact with friends is associated with increased positive mood • Text messaging with friends is only positively associated with mood during school closures among females	• A positive main effect on mood is observed for situational variations in perceived social support as well as for support from interaction partners • Only minor differences between inter- and intra-ethnic support	• Higher levels of loneliness are associated with an increase of clique members • No evidence for peer influence effects for either mental health or loneliness • No evidence that similarity in mental health or loneliness is relevant for clique formation
Status	Revise and resubmit at Journal of Social and Personal Relationships	Published: Krüger, H. (2024). Everyday discrimination, co-ethnic social support and mood changes in young adult immigrants in Germany–Evidence from an ecological momentary assessment study. Journal of Migration and Health, 9, 100212.	Psyarxiv

Chapter 2

Adolescents' mode of contact with friends and mood changes during the COVID-19 pandemic: An ecological momentary assessment study[3]

Figure 3: Theoretical framework pertaining paper 1



[3]This research was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 716461). I would like to thank my co-authors Clemens Kroneberg and Hanno Kruse.

2. Adolescents' mode of contact with friends and mood changes during the COVID-19 pandemic: An ecological momentary assessment study

Abstract

Using smartphone-based experience sampling, the current work investigated the relationship between different forms of social contact and daily mood changes in adolescents during the COVID-19 pandemic. Study 1 was conducted during strict school closures in February 2021 ($N_{individuals}$ = 290; $N_{observations}$ = 1796; M_{age} = 14.47; 59% female) and Study 2 in November 2021 after schools had reopened ($N_{individuals}$ = 160; $N_{observations}$ = 1061; M_{age} = 15.21; 66% female). Fixed-effects regression models showed that in-person contact with friends was associated with more positive mood in both periods. Text messaging with friends was only positively associated with mood during school closures among girls.

Keywords: mode of contact, mood, adolescents, home-schooling, ecological momentary assessment study

2.1 Introduction

Over the past years, the pandemic related to the coronavirus disease of 2019 (COVID-19) brought about drastic disruptions in the daily lives of most people (Bates et al., 2020; Caroppo et al., 2021). Children and adolescents were particularly affected by school closures and related measures aimed at reducing the frequency of in-person interactions and the associated risk of transmission. Previous research suggests that these measures may have had strong adverse effects on children's and adolescents' emotional well-being (for reviews, see Chaabane et al., 2021; Viner et al., 2022).

As adolescents' in-person peer contacts were substantively reduced during the pandemic, different forms of online interaction and general screen time use gained in importance (Marciano et al., 2022; Pandya & Lodha, 2021). Compared to the usage behavior of young adolescents before the pandemic, there has also been an increase in problematic media use (Eales et al., 2021). Given the central role of peer contact in the development of children and adolescents (Hartup, 2005; Laursen & Hartl, 2013), these marked shifts in adolescents' frequency and mode of contact with friends may have contributed to the widely observable decline in their emotional well-being.

At the same time, online interaction can also serve as a source of social support, comfort, and exchange and hence have positive effects on well-being (Burke & Kraut, 2016; Liu et al., 2019). And this positive function may have been especially relevant in times of distress during the COVID-19 pandemic, when other means of (offline) interaction were less readily available. In this study, we therefore address the question of how different modes of contact affected adolescents' mood depending on the availability of alternatives – during times of school closures and when they were re-opened.

2.1.1 Online contact and mental health in adolescence

The emotional consequences of online social contacts in children and adolescents are a controversial topic. In general, social interaction and membership in social groups serve as an essential protection against feelings of loneliness (Gierveld et al., 2018) and the amount of social interaction is negatively related to depressed mood and loneliness (Kuczynski et al., 2022). Social relationships are central for mental health partly because they provide social support. There is evidence for both a main effect and a buffering effect of social support (Cohen & Wills, 1985; Thoits, 2011), so that social support not only promotes mental health (Bernasco et al., 2021; Chin et al., 2023; Gariépy et al., 2016a) but also mitigates the negative

consequences of stressors for mental health (Demirer et al., 2021; Rueger et al., 2016). However, the extent to which online contacts provide the kind of social support that is similarly beneficial to mental health as in-person contacts remains an open question.

Previous research suggests that direct (i.e., dyadic) forms of online communication can mitigate feelings of loneliness and stress (Magis-Weinberg et al., 2021; Marciano et al., 2022). Using social media for the purpose of direct communication with close ties or entertainment can have positive effects (Burke & Kraut, 2016; Liu et al., 2019) – although negative interaction, insufficient positive feedback and social comparison on social networking sites are associated with a greater risk of depression and anxiety (Lee et al., 2020; Seabrook et al., 2016). In addition, online support also shows a mitigating effect when stressors occur. However, face-to-face support seems to show a stronger association with mental health (Cole et al., 2017), online support could be especially relevant for individuals with limited resources of face-to-face support (Juvonen et al., 2021; Prochnow et al., 2020). For older adults, face-to-face interactions also appear to be more consistently associated with well-being than digital or telephone interactions (Macdonald et al., 2021).

At the same time, previous research suggests that social media use in adolescence tends to reduce mental health if it is particularly intensive and passive (Jensen et al., 2019; Rens et al., 2021; Thorisdottir et al., 2019; Verduyn et al., 2015), involves perpetual texting behavior (Coyne et al., 2018; George et al., 2018) or night-time mobile phone use (Vernon et al., 2018). Scholars have also pointed to a potential displacement effect, by which online interaction may reduce in-person interaction (Twenge et al., 2019; Verduyn et al., 2021). Furthermore, intensive social media use carried out during in-person interactions can negatively influence the quality of these interactions (Twenge, 2020). The closeness and quality of conversations can be negatively affected by the mere presence of a smartphone (Przybylski & Weinstein, 2013).

Previous work investigating the impact of different modes of social contact on adolescents' mood often found gender-specific associations. These studies suggest that girls are more negatively affected by social media use, while it may benefit boys to some extent (Thorisdottir et al., 2019; Twenge & Martin, 2020). For example, among boys, the time spent playing video games has been found to be associated with lower anxiety (Ohannessian, 2009). Previous research indicates that gaming can even have a beneficial effect on the perception of online and offline resources of social support (Trepte et al., 2012). Compared to boys, girls tend to use social media more frequently for social comparison and interpersonal feedback-

seeking, which are risk factors for depressive symptoms and body dissatisfaction (Nesi & Prinstein, 2015; Scully et al., 2020).

2.1.2 Contacts and well-being during the COVID-19 pandemic

The drastic changes brought about by the COVID-19 pandemic allow for a new look at these questions. In particular, the pandemic-induced contact restrictions led to a withdrawal into the nuclear family and limited adolescents' access to in-person contact with peers. Given the central role of peers as providers of support for adolescents (Richard et al., 2022; Vaughan et al., 2010), it can be assumed that online contact was increasingly used to maintain social relationships and to exchange social support during the lockdown. Indeed, there is evidence that adolescents adapted their electronic contact behavior in response to contact restrictions, and that being satisfied with online communication was particularly relevant for their mental health (Juvonen et al., 2022; Juvonen et al., 2021). More generally, the model of compensatory internet use (Kardefelt-Winther, 2014) holds that online contacts are especially pursued in negative life situations and at times of insufficient social stimulation (Kardefelt-Winther, 2014, p. 352). To the extent that internet use fulfills social needs, it can be associated with positive emotions.

A few studies already speak to these arguments in the context of the COVID-19 pandemic. A study of university students reported a positive association between the amount of direct virtual communication and mental health during the pandemic, mediated by decreasing loneliness and an increased perceived social support (Sahi et al., 2021). Likewise, there is evidence that the number of virtual social contacts was positively related to mood and negatively to loneliness during the pandemic (Sabato et al., 2021). In contrast, a survey of Dutch adolescents during different phases of the pandemic only found stabilizing mood effects for in-person but not for online contacts (Asscheman et al., 2021).

Our study adds to this emerging body of research. By comparing adolescents' activities and experiences in times of open schools and in times of (pandemic-induced) school closures, we examine how, and with what effects, adolescents make use of different forms of online contact depending on the availability of in-person contacts.

2.1.3 The current study

In this article, we report findings from two smartphone-based experience sampling studies among German adolescents (Study 1 M_{age} = 14.47; Study 2 M_{age} = 15.21) that we conducted over four weeks in February 2021 ($N_{individuals}$ = 290; $N_{observations}$ = 1796) and

November 2021 ($N_{individuals}$ = 160; $N_{observations}$ = 1061). These two periods were characterized by strict school closures and re-opened schools, respectively.

Our study builds on recent research that has made important progress by analyzing large-scale data on digital media use in hours and relating it to (one-time) measures of mental health and well-being. Relying on a more intense longitudinal design, our study adds greater analytic rigor to the study of these questions: As we measured both adolescents' well-being and their different forms of online and offline contact eight times over four weeks, we can examine the associations between different forms of contact and adolescents' well-being using within-person estimators that control for time-constant unobserved heterogeneity. We estimated a series of fixed-effects regression models for our full samples as well as separately for boys and girls.

Given the previous research discussed above, we hypothesize that the frequency of in-person contact with friends was associated with a more positive mood. We also expect that online communication was positively associated with adolescents' positive mood – especially in times of school closures, where online contact served as the only alternative to and a means to cope with the lack of in-person forms of contact with friends. In times of open schools, online contact with friends was arguably less crucial to the proper functioning of adolescents' peer interactions, leading us to expect a weaker association between their frequency of online contact and positive mood. Finally, and in line with previous findings on the role of social contact for emotional well-being, we expect that all associations between adolescents' frequency of (the different modes of) contact with friends and their positive mood were stronger in girls than in boys.

2.2 Study 1

Study 1 investigated the relationship between different forms of contact with friends and mood during the COVID-19 pandemic when schools were closed and classes were held exclusively in the form of homeschooling. In addition, in-person meetings were restricted to just one other individual not living in the same household and nonessential shops were not allowed to open. The German authorities also recommended that all in-person contacts be reduced to the absolute minimum.

2.2.1 Method

2.2.1.1 Participants

The data came from a smartphone-based experience sampling study that was administered to a subsample of adolescents who had participated in a previous school-based panel study. The initial target population of this study comprised seventh graders in secondary schools in the German state of North Rhine-Westphalia. The school sample was chosen to include schools of all major school types and both urban and rural schools. Within selected schools, all adolescents of the selected cohort were eligible to participate in the study and were surveyed in 2018, 2019, and 2020.

The smartphone study was collected in February 2021. In the weeks before the start of the study, some participating schools were still able to provide printed information materials and parent consent forms to parents through the teachers responsible for the school classes. These consent forms were then signed by parents and handed back to the teachers and forwarded to the project team. All other participating schools sent a brief informational text to parents via mailing lists, which allowed parents to access informational materials about the study and an online consent form via a web link.

All parents who provided consent for their child to participate in the smartphone study were asked to provide their child's email address. The project team used the e-mail addresses to send information on the study and to ask the students for their consent and cell phone number.

A total of 1482 parental consent forms were received, including 1239 permissions for their children to participate in the smartphone study. Out of these, 455 adolescents indicated their willingness to participate and 290 adolescents responded to at least one sampling moment.

The participating adolescents were in the ninth grade and between 13 and 17 years old (mean 14.51 years), among them 172 (59.31 %) were girls and 118 were boys.

2.2.1.2 Procedure

The data collection of the smartphone-based experience sampling phase started in the first week of February. One week before the start of the main survey, the adolescents received an invitation to a short pre-survey, in which we collected information on basic characteristics and informed the participants about the start of the main survey. The first day of the survey was randomly selected for the adolescents within the first week of February. Thereupon, they

received a short questionnaire every three days, which we will also refer to as sampling moments. A total of 8 short questionnaires were administered. The survey invitations were sent in the late afternoon and early evening by randomly selecting a time between 4 and 6:30 p.m. for each sampling moment, given that scheduling surveys during school time or in the late evening could have jeopardized the willingness of schools and parents to participate.

The invitations to the pre-survey and short questionnaires were sent via SMS. Each SMS contained a link to the survey, which could only be answered with an existing internet connection. If the adolescents did not answer the short survey after 30 minutes, they were reminded of the invitation via SMS. Two hours after sending the initial invitation, the survey invitation expired. On average, responses to the sampling moments lasted 5min 9sec.

As an incentive, the participating adolescents received an Amazon gift voucher. The amount of the voucher depended on the frequency of participation. The amount was €0.50 per answered sampling moment and an additional €10 for at least six completed sampling moments. On average, each participant answered 6.19 (0.14 SD) sampling moments, yielding a total of 1796 registered sampling moments overall.

2.2.1.3 Measures

Mood. Mood was captured by a series of mood adjectives as is common for ecological momentary assessment Studies (de Vries et al., 2021). For each adjective, the adolescents were asked to rate the extent to which it described their feelings at the moment of the survey. Answer options ranged from "0 not at all" to "4 very much". The positive mood dimension was measured with the adjectives happy, enthusiastic, and optimistic. The adjectives sad, downhearted and angry captured negative mood. After reversing the negative mood items, the overall mood scale was obtained by calculating a mean index over all six adjectives (Cronbach's alpha 0.74), with higher values indicating better mood.

Interaction module. As part of each short questionnaire, the adolescents were asked whether they had already had contact on the day of the survey with people with whom they did not live together. Because of the lockdown conditions, little variation was expected in contact with persons with whom the adolescents cohabitated. It was specified that the mode of contact could be a conversation but also text messages. If the adolescents had contact with at least one person, they were prompted to specify the contact groups. A distinction was made between relatives (living outside of their home), friends, and other social contacts. For each group selected, they were then asked to specify the mode of contact. A distinction was made

between in-person, (video) telephone and text messaging (e.g. WhatsApp). Respondents could choose more than one answer here.

Observed confounding variables. We considered the following variables as time-varying confounders. Mood typically fluctuates across weekdays with a peak on weekends (Stone et al., 2012). In addition, however, the frequency and type of contact with friends also differ between the days of the week. Therefore, the day of the week on which each short survey was collected was included as a control variable, with Monday serving as the reference category. Moreover, mood and contact behavior change during the progression of the day (Díaz-Morales et al., 2015; Egloff et al., 1995). Therefore, the hour of submitting the short survey is included as a metric control variable. Finally, school days are usually associated with lower mood scores (Díaz-Morales et al., 2015) and also influence frequency and forms of contact. Hence, we included a dummy variable, which takes the value 1 on school days as an additional control. In addition, the control variable "any other contact" was added. The variable indicated whether any other form of social contact beyond in-person contact or text messaging with friends had been reported for the day of the survey (e.g., in-person contact with relatives, video phone call with friends).

2.2.1.4 Analytic Strategy

The data structure is nested with up to eight sampling moments (level 1) for each respondent (level 2). We used fixed effects regression models to estimate the influence of time-varying variables, thus focusing on changes within individuals. Studying the links between modes of contact and mood is complicated by the well-known problem of unobserved heterogeneity, meaning that other, unobserved differences could be responsible for the observed associations. Our intensive longitudinal design allows us to use fixed-effects models that remove time-constant differences between individuals that may bias our estimates of the relationships between modes of contact and mood. For example, some unobserved characteristics may lead particular adolescents to engage in text messaging or in in-person contact more or less often and to report a more or less positive mood. Such common causes produce a spurious correlation between modes of contact and mood. The crucial advantage of within-persons fixed-effects models is that they take care of all the time-constant sources - whether they lie within or beyond our current state of theoretical knowledge - resulting in estimates that a much more robust to biases than other models. We obtained the within-subject effect by mean-centering, i.e., by subtracting each respondent’s mean from each sampling moment, thus measuring the deviation from the subject-level mean. By de-meaning,

the influence of all time-constant variables was eliminated, hence they could no longer cause bias (Allison, 2009).

We estimated one fixed effects model for ‘in-person contact’ and ‘text messaging with friends.’ and included the respective control variables.

2.2.2 Results

2.2.2.1 Descriptive statistics

Table 2 presents descriptive statistics of all variables for the full sample and separately for boys and girls. Figure 4 depicts the relative frequencies of different forms of social contacts and having left home across weekdays during school closure in February 2021. Overall, we observed relatively little variation across weekdays, possibly due to the levelling impact of social distancing measures. In terms of having left home, there was hardly any variation across days and, with at least 40 percent not having left home during the day. The proportion of observations in which the adolescents had contact with at least one person outside their own home dropped slightly on Saturdays. The proportion of adolescents reporting in-person contact with friends on the day of the survey was similar across weekdays. From Monday to Friday, a higher proportion of adolescents reported longer text messaging with friends. On weekends, the reported frequency is similar to that of in-person contact with friends.

Figure 4: Mean leaving home and social contacts by weekdays, Study 1

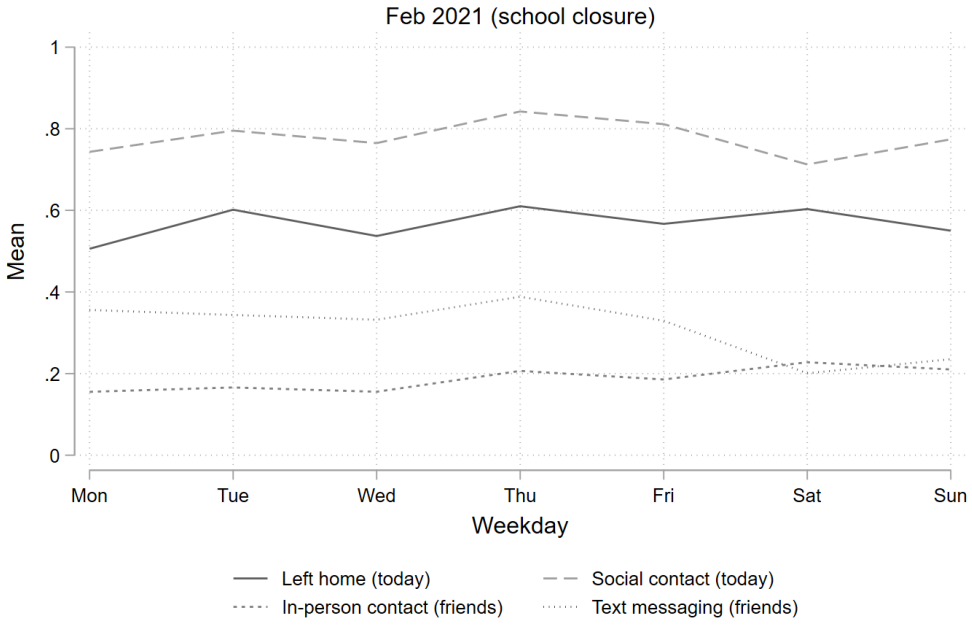
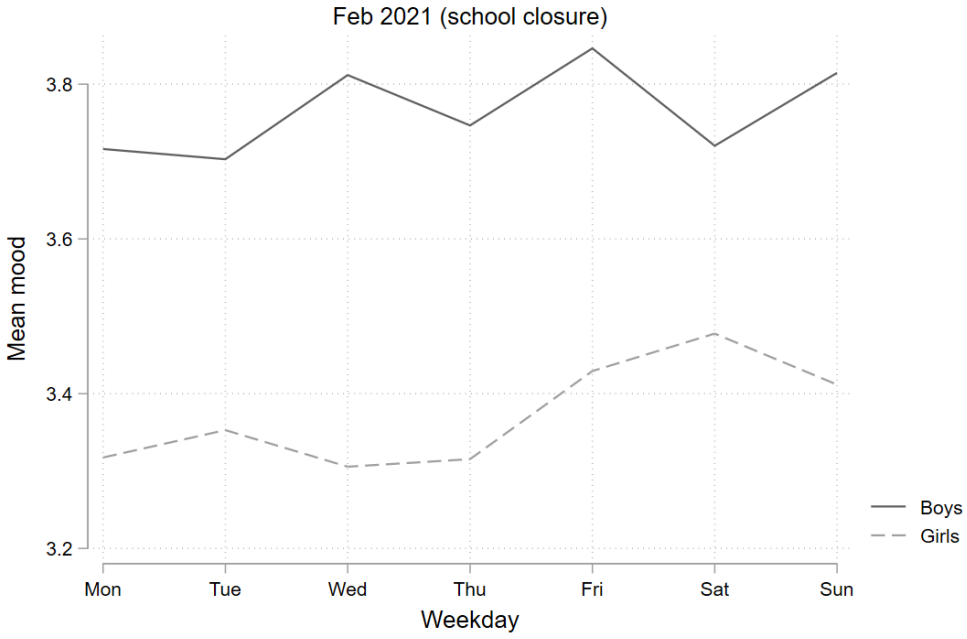


Table 2: Descriptive statistics, Study 1

	Full sample		Boys		Girls			
Variable	Mean	SD	Mean	SD	Mean	SD	Min	Max
Left home (today)	.568	.496	.563	.496	.571	.495	0	1
Social contact (today)	.777	.416	.763	.425	.786	.41	0	1
In-person with friends	.187	.39	.184	.388	.19	.392	0	1
Text messaging with friends	.31	.463	.367	.482	.273	.446	0	1
Any other contact (today)	.642	.48	.557	.497	.697	.46	0	1
Mood	3.538	.796	3.771	.709	3.387	.814	1	5
Time of day (pm)	.	.	.	.	.	.	.	.
04:00	.2	.4	.202	.402	.198	.399	0	1
05:00	.289	.453	.29	.454	.288	.453	0	1
06:00	.39	.488	.38	.486	.397	.489	0	1
07:00	.109	.312	.113	.317	.106	.308	0	1
08:00	.012	.111	.015	.122	.011	.103	0	1
Weekday	.	.	.	.	.	.	.	.
Mon	.146	.354	.157	.364	.139	.347	0	1
Tue	.145	.352	.142	.349	.147	.355	0	1
Wed	.135	.342	.125	.331	.141	.349	0	1
Thu	.14	.347	.14	.348	.139	.347	0	1
Fri	.149	.357	.143	.351	.153	.36	0	1
Sat	.148	.355	.149	.357	.147	.355	0	1
Sun	.136	.343	.143	.351	.132	.338	0	1
School day	.642	.48	.615	.487	.659	.474	0	1
Sex	.606	.489	0	0	1	0	0	1
Age	14.471	.672	14.513	.727	14.444	.633	13	17
N (sampling moments)	1681		663		1018			
N (individuals)	279		116		163			

Figure 5 illustrates the changes in mood (aggregated across all observations) across weekdays. Despite the school lockdown, there tended to be a difference between weekdays and weekends, with girls' mood tending to be higher from Friday to Sunday. In contrast, the boys reported no marked mood differences between weekdays and the weekend. On average, girls reported significantly lower mood scores on all days of the week. For more descriptive patterns see Appendix Figure A1 and A2.

Figure 5: Mean mood by weekdays, Study 1



2.2.2.2 Fixed effects regression models

We now turn to the results of the fixed effects regression model that we estimated to examine the differential impact of in-person contact and text messaging with friends on mood. Figure 6 and Table 3 depict the results, providing within-person estimates for the different contact forms. The regression model was estimated for the full sample and separately for the subsamples of boys and girls. We also estimated a model for the full sample adding interaction terms between modes of contact and gender yielding substantially similar results (see online appendix Table A4).

During this lockdown period the estimates indicated that girls reported a higher mood on days where they had in-person contact with friends. This association was weaker and statistically not significant among boys. On days with longer text messaging with friends, girls reported slightly better mood than on days without text messaging, even though the

estimated difference was small. Among boys, we found no indication for an effect of text messaging on mood.

Based on the full sample, statistical tests confirmed that in-person contact is more positively associated with adolescents' mood than text messaging (Wald test, p= 0.0464). In the subsamples of girls and boys, the differences between the two forms were not significant, which might be due to limited statistical power (Wald test boys, p = 0.2788; Wald test girls, p = 0.0906). Wald tests of the differences between boys and girls for the two activities also did not reach conventional levels of statistical significance.

As a robustness check, we estimated one additional model that took into account that in-person contact and text messaging were not mutually exclusive, since adolescents could have engaged in both forms of contact during a day (for regression tables, see the online appendix Table A3). Results indicated that having only in-person contact (but no text messaging) with friends at the day of the survey was positively associated with mood among girls. When girls only reported text messaging and no in-person contact with friends the association was also positive but not significant. For girls and boys, having had both in-person contact and text messaging with friends on the day of the survey was associated with a more positive mood.

Figure 6: Fixed effects regression models for mood, within-person coefficients Study 1

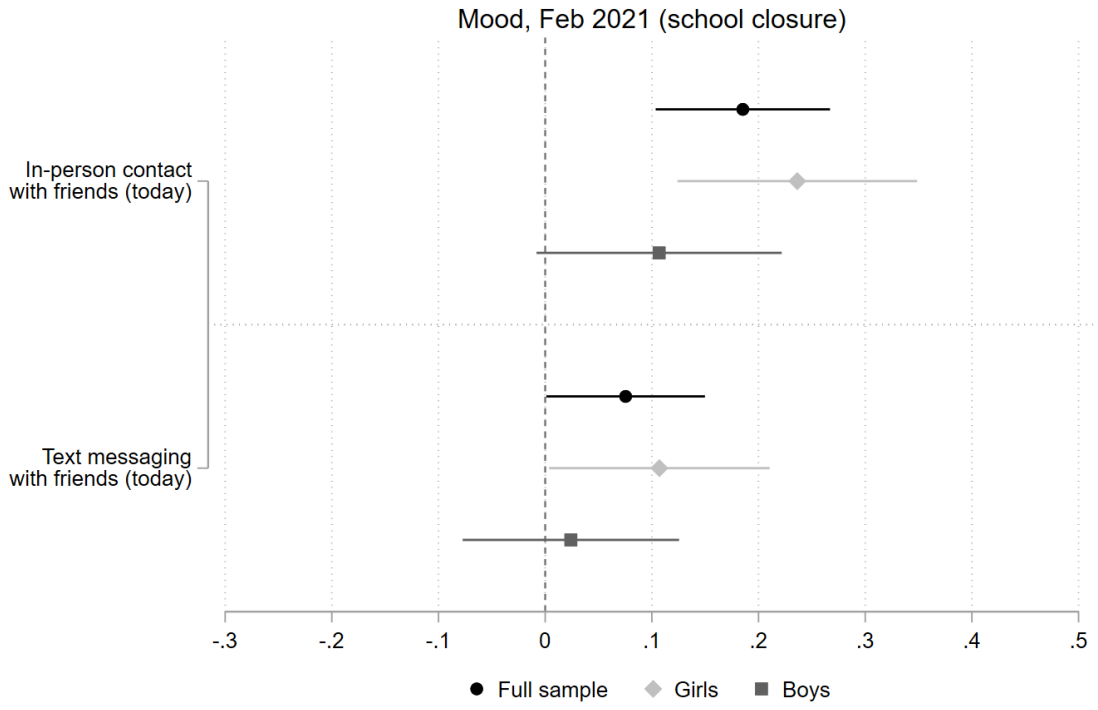


Table 3: Fixed effects regression of mood for the full sample and separate models for boys and girls, Study 1

	Full sample	Boys	Girls
In-person contact friends (today)	.185***	.107*	.236***
	(.042)	(.059)	(.057)
Text messaging with friends (today)	.075**	.024	.107**
	(.038)	(.052)	(.053)
Any other contacts (today)	-.006	-.029	.02
	(.036)	(.046)	(.053)
Response time	-.011	.039**	-.041**
	(.014)	(.02)	(.02)
Weekday (ref. Mon)			
Tue	.051	.008	.076
	(.048)	(.065)	(.066)
Wed	.048	.104	.022
	(.049)	(.067)	(.068)
Thu	.021	.022	.023
	(.048)	(.065)	(.067)
Fri	.125***	.143**	.128*
	(.047)	(.064)	(.066)
Sat	.085	-.025	.163**
	(.055)	(.072)	(.078)
Sun	.095*	.018	.143*
	(.056)	(.075)	(.079)
School day	-.04	-.122**	.006
	(.041)	(.054)	(.058)
Constant	3.475***	3.702***	3.314***
	(.062)	(.081)	(.089)
Observations	1681	663	1018
Within R^2	0.027	.037	.039

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

2.3 Study 2

In Study 2, we aimed to replicate Study 1 during a different phase of the pandemic that was characterized by open schools. The COVID-19-related contact restriction policies were significantly relaxed at the time of the survey allowing for much more in-person contacts. Measures to protect against infection mainly affected public areas. For example, proof of immunity was required to attend clubs, restaurants, or public events.

2.3.1 Method

2.3.1.1 Participants

Data for Study 2 were collected from adolescents from the same target population in the German state of North Rhine-Westphalia as Study 1. A total of N=160 adolescents

participated in Study 2, of which N=155 already participated in Study 1. Parental consent for Study 1 and Study 2 was obtained jointly. The students who indicated their willingness to participate could decide individually before each of the two studies whether they wanted to participate. The smartphone-based experience sampling phase was conducted in November 2021. Respondents were between 13 and 18 years old (mean 15.18 years) and attended the 10th grade. Once again, more girls (N = 105, 66.04 %) participated than boys[4].

2.3.1.2 Procedure

As in Study 1, adolescents received an invitation to a short pre-survey one week before the start of the experience-sampling phase. Adolescents who gave their consent to participate received the invitation to the first sampling moment on a randomly selected day in the first week of November. Thereafter, they received a new invitation every three days. The time window for sending the invitations and the maximum response time was identical to Study 1. Following the experience-sampling phase, the adolescents received an invitation to participate in a short post-survey. On average, responses to the sampling moments lasted 4min 19 sec.

As an incentive for regular participation, participants once again received an Amazon gift voucher. The amount of the voucher depended on the frequency of participation. The possible voucher amount was adjusted to keep the panel attrition as low as possible (i.e., 1€ per answered sampling moment and a bonus of 15€ if at least 6 sampling moments were answered). A total of 1061 sampling moments were answered. On average, each participant answered 6.63 (0.14 SD) out of 8 sampling moments.

2.3.1.3. Measures

Mood. Mood was measured and operationalized identically to Study 1 with a series of mood adjectives, which were combined into a mean score (Cronbach's alpha 0.75), higher values represent a more positive mood.

Interaction module. Since contact restrictions in Germany were significantly reduced at the time of Study 2, it was not sensible to record the contacts for the entire day (as done in Study 1). Instead, it was asked whether the adolescents had contact with people outside their own home and outside of school classes *in the last hour* "for example, a short conversation or a Whatsapp chat". The last hour time period also allows for further reduction of recall bias

[4] In this article, we use 'gender' and 'sex' inter-changeably as no explicit differentiation was made between biological and social sex during data collection. In the following, we use adolescents' asserted category.

and a better estimation of short-term effects on mood. If the adolescents had contact with more than one person, they were asked to choose one person for the following questions. For the person of choice, they were then asked which group of people (e.g., friends) they could be assigned to and how the contact took place. A distinction was made between in-person, telephone, text messaging, video, and other contact. Due to the much shorter reference period of 1 hour (compared to Study 1), multiple answers were not allowed for the mode of contact.

Observed confounding variables. As in Study 1, the day of the week, the time of day, and the information on whether it was a school day were considered confounding variables. For the estimation of the effect of in-person and text messaging with friends, the respective other form of contact was treated as a possible confounder and hence both effects were calculated simultaneously in one model. In addition, for these two forms of contact, the information on whether any other form of contact (e.g., in-person contact with cousins, video phone call with friends) took place in the last hour was added, as well.

2.3.1.4 Analytic Strategy

We used fixed effects regressions (Allison, 2009) to determine the relationship between within-person variations in forms of contact with friends and adolescents' mood. We estimated the effect of in-person contact and text messaging simultaneously. Since in Study 2 only one form of contact could be specified for the reported interaction in the last hour, no overlap effects were analyzed.

2.3.2. Results

2.3.2.1 Descriptive statistics

Table 4 presents descriptive statistics for the main variables. Figure 7 shows the relative frequencies of the different forms of contact across days of the week. In this period, when most distancing measures had been lifted, almost all adolescents left their home during weekdays, while this proportion dropped to about two thirds on weekends. Around 20 percent of observations had in-person contact with at least one person outside their own home or were text messaging, with only a slight drop on Sundays. Text messaging and in-person contact with friends were reported with similar frequency for the last hour. The relative frequency of in-person contact with friends was lowest on Sundays.

Table 4: Descriptive statistics, Study 2

	Full sample		Boys		Girls			
Variable	Mean	SD	Mean	SD.	Mean	SD.	Min	Max
Left home (today)	.843	.364	.825	.381	.852	.355	0	1
Social contact (today)	.808	.394	.772	.42	.824	.381	0	1
In-person contact with friends	.19	.393	.166	.372	.202	.402	0	1
Text messaging with friends	.18	.385	.172	.378	.184	.388	0	1
Any other contact (today)	.31	.463	.256	.437	.335	.472	0	1
Mood	3.384	.77	3.553	.683	3.305	.795	1	5
Time of day (pm)	.	.	.	.	.	.	.	.
04:00	.171	.377	.156	.364	.179	.383	0	1
05:00	.33	.47	.341	.475	.325	.469	0	1
06:00	.361	.481	.359	.481	.362	.481	0	1
07:00	.125	.33	.122	.328	.126	.332	0	1
08:00	.013	.113	.022	.147	.009	.093	0	1
Weekday	.	.	.	.	.	.	.	.
Mon	.151	.358	.147	.355	.152	.36	0	1
Tue	.16	.366	.147	.355	.165	.372	0	1
Wed	.141	.348	.138	.345	.142	.349	0	1
Thu	.142	.349	.131	.338	.146	.354	0	1
Fri	.147	.354	.153	.361	.143	.351	0	1
Sat	.129	.335	.131	.338	.127	.334	0	1
Sun	.133	.339	.153	.361	.123	.329	0	1
School day	.677	.468	.659	.475	.685	.465	0	1
Sex	.681	.466	0	0	1	0	0	1
Age	15.206	.59	15.366	.691	15.132	.52	14	18
N (sampling moments)	1003		320		683			
N (individuals)	156		52		104			

Figure 7: Mean leaving home and social contacts by weekdays, Study 2

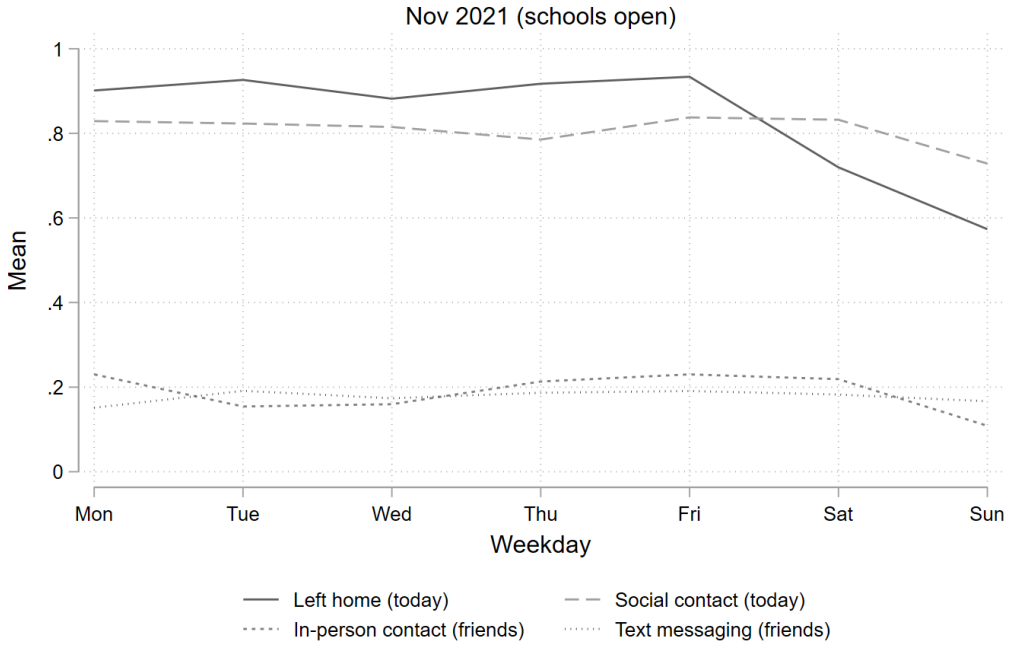


Figure 8: Mean mood by weekdays, Study 2

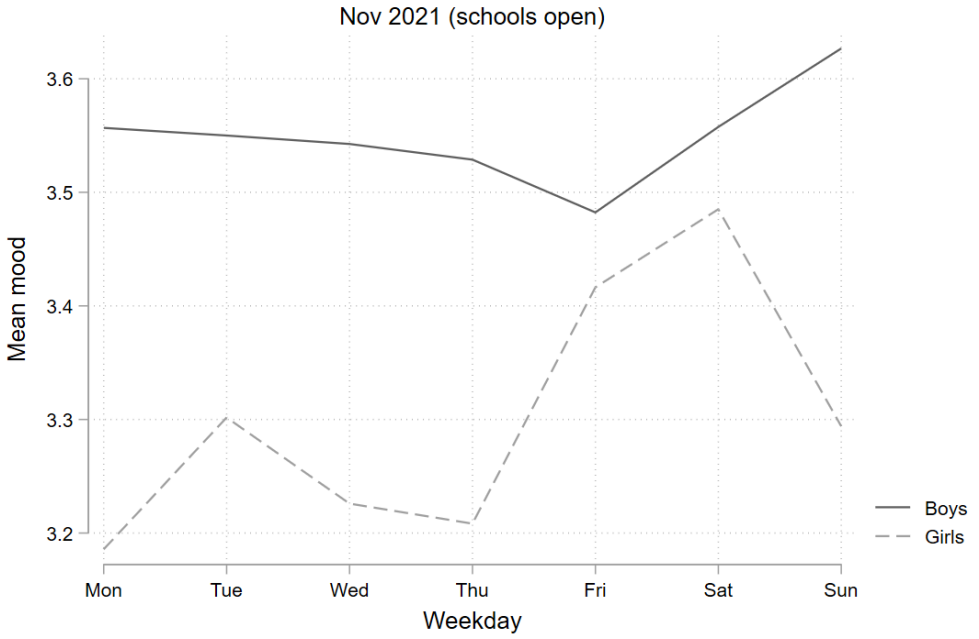


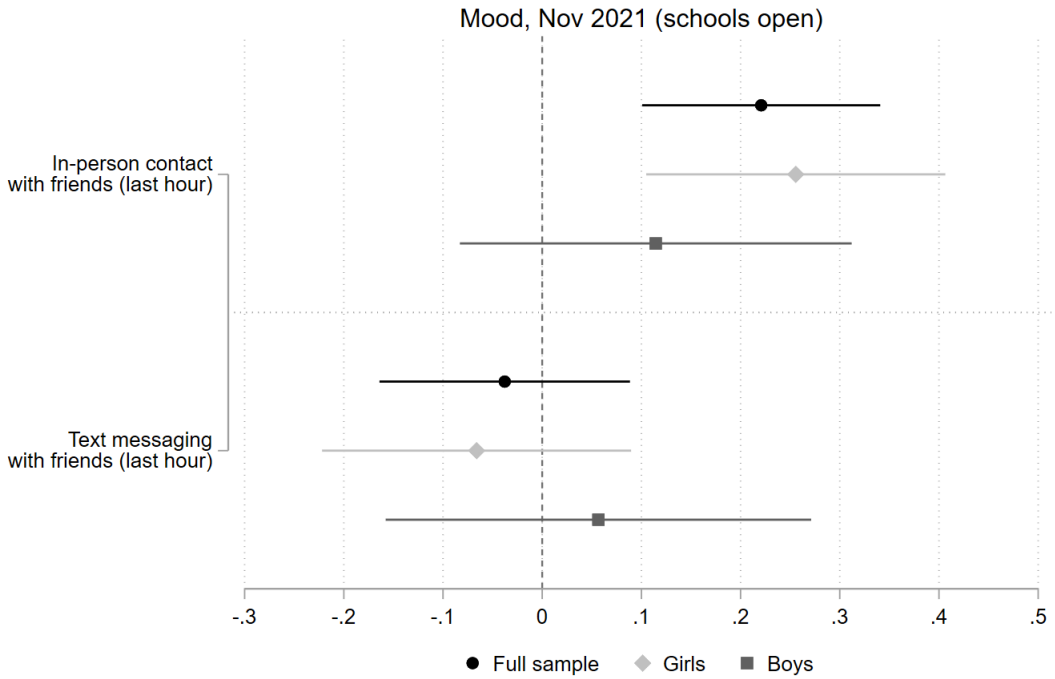
Figure 8 depicts the changes in mood (aggregated across all observations) across weekdays separately for boys and girls. For both groups, there was a clear difference between weekdays and weekends. For boys, on average, the lowest mood values were observed on Friday, which increased over the weekend and peaked on Sunday. Girls reported the lowest average mood values on Wednesdays and Thursdays and peaked on Saturdays, followed by a

decline in mood on Sundays. There were clear gender differences across all days of the week, with girls reporting lower mood scores on average than boys.

2.3.2.2 Fixed effects regression models

Figure 9 and Table 5 present the results of the fixed-effects regression models. All models were separately estimated for girls and boys and the full sample. Displayed are the within-person coefficients for in-person contact and text messaging with friends in the last hour.

Figure 9: Fixed effects regression models for mood, within-person coefficients Study 2



Sampling moments where the adolescents reported in-person contact with friends in the last hour were associated with better mood scores. This association was statistically significant for girls, but not among boys. For text messaging in the last hour, we observed a negative association. When contract restrictions were lifted, text messaging with friends in the last hour was associated with a more negative mood among girls, although the coefficient was small and not significant.

In the full sample and in the subsample of girls, the coefficients of in-person contact and text messaging differed significantly from each other, indicating that in-person contact was more positively associated with adolescents' mood than text messaging (Wald test full sample, $p = 0.0001$; Wald test girls, $p = 0.0001$; Wald test boys, $p = 0.6236$). Although the effect is significant in the full sample, it was most likely driven by the girls. According to

Wald tests, the coefficients of the two contact forms did not differ significantly between the models for boys and girls on the 5%-level.

Table 5: Fixed effects regression of mood for the full sample and separate models for boys and girls, Study 2

	Full sample	Boys	Girls
In-person contact friends (last hour)	.221***	.114	.256***
	(.061)	(.1)	(.077)
Text messaging with friends (last hour)	-.038	.057	-.066
	(.064)	(.109)	(.079)
Any other contacts (last hour)	.043	.093	.036
	(.055)	(.089)	(.069)
Response time	-.009	-.017	-.006
	(.02)	(.032)	(.025)
Weekday (ref. Mon)			
Tue	.07	.006	.095
	(.064)	(.105)	(.08)
Wed	-.006	.044	-.028
	(.066)	(.106)	(.083)
Thu	-.01	-.037	.007
	(.066)	(.107)	(.082)
Fri	.13**	-.045	.205**
	(.065)	(.104)	(.083)
Sat	.133*	-.019	.194**
	(.08)	(.142)	(.097)
Sun	.074	.089	.044
	(.079)	(.134)	(.099)
School day	-.078	-.02	-.115
	(.061)	(.107)	(.074)
Constant	3.356***	3.55***	3.274***
	(.088)	(.157)	(.108)
Observations	1003	320	683
Within R^2	.042	.017	.07

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

2.4 Discussion

The COVID-19 pandemic was a challenging time for adolescents, particular as they were restricted in their peer contacts and had to deal with school closures in many countries. To better understand the widely reported emotional distress among adolescents during this period (Barendse et al., 2023), we conducted smartphone-based experience sampling over the course of several months in Germany – including times of strict school closures as well as of open schools. By focusing on changes in adolescents' everyday peer interaction, we provide new insights into the role of (lacking) in-person peer contact in the school context for changes in adolescents' emotional well-being. We specifically asked to what extent text messaging

with friends could emotionally compensate for the absence of in-person contact during periods of pandemic-related school closures.

Our study found that *in-person contact with friends* was positively associated with adolescents' mood, both under the strict contact restriction policies (Study 1) and under the more lenient social distancing measures (Study 2). During the strict lockdown and school closures, *text messaging with friends* was also associated with an increase in mood. However, when schools were open and contact restrictions minimal (Study 2), text messaging was no longer positively associated with mood. Instead, we observed a weak, statistically not significant negative association between text messaging with friends and mood. Both studies suggested that these relationships may differ by gender, although these differences could not be estimated with sufficient certainty. On average, the associations were most pronounced for girls, whereas we found weaker and often insignificant associations between the different modes of social contact and mood for boys.

Our results suggest that the effects of different types of contact on mood may be context-specific. Studies 1 and 2 covered different phases of the COVID-19 pandemic in Germany, characterized by severe (Study 1) or marginal (Study 2) restrictions of social contacts. While formal statistical tests that compare estimates between the two studies are impeded by differences in measurements (e.g., time reference of contact: last hour vs. whole day), a qualitative comparison is essentially consistent with our expectations: in-person contact was positively associated with mood in both studies, irrespective of contact restrictions. In contrast, contact via text messaging was slightly associated with positive mood only when in-person contact was severely restricted.

Second, our studies contribute to the discussion of the role of adolescents' gender in how they are affected by different patterns and forms of peer interaction. Overall, social media use seems to have more negative effects among girls (Thorisdottir et al., 2019; Twenge & Martin, 2020). More generally, we may think of girls being more susceptible to the effects of social media use. In line with this notion, our results indicate a stronger association between mode of contact and mood among girls. While in-person contact was associated with an increase in girls' mood in both studies, Study 1 suggests that their mood may actually have benefited from online communication in the context of extensive contact restrictions.

An important strength of our research design lies in its ecological validity. Adolescents' mood and their social interaction were assessed during their normal daily routines, providing real-time and real-world insights into the relationship between mode of

contact and mood. In addition, by asking about current mood and interactions in a narrow time frame, recall bias was minimized compared to retrospective questions about past weeks and months (Shiffman et al., 2008). Finally, our study goes beyond previous research by realizing an intensive longitudinal design that collected up to eight sampling moments per respondent. This allowed for an analysis of intraindividual changes (Ram et al., 2017) which yields more reliable estimates of the associations between different forms of contact and adolescents' well-being by statistically removing any source of time-constant unobserved heterogeneity.

2.4.1 Limitations and directions for future research

These strengths notwithstanding, our studies also have several limitations. First, while our longitudinal design enabled us to examine within-person changes, it comes at the cost of a relatively small sample size. Future experience sampling studies could attempt to target larger and more representative samples (see already Twenge & Martin, 2020). Second, even though our within-persons fixed-effects models strengthen the basis for causal inference, it needs to be stressed that our evidence is still correlational. In particular, there may be unobserved time-varying factors that affect both adolescents' mood and their modes of contact. Additionally, we cannot rule out reverse causation (Engeln et al., 2020; Hunt et al., 2018): To some extent, adolescents' mood may have led them to choose text messaging over in-person contact, or vice versa. Third, our studies did not capture the intensity of text messaging or the extent of social media use. Therefore, we cannot differentiate between heavy and light use, which would be necessary to further qualify the (potentially negative) impact of heavy social media use and passive forms of use (Thorisdottir et al., 2019; Twenge & Martin, 2020). A fourth limitation is the absence of information about the quality of interactions. In both in-person meetings and text messaging, it is unknown whether the exchange was positive or negative, i.e., whether or not the conversations were experienced as friendly and supportive. Negative social conversations or those that tend to imply social exclusion are associated with a worsening of mood and an increase in loneliness (Offer, 2021). However, the presence of unidentified negative interactions would most likely mean that we underestimated the positive association between contact and mood, so that it should produce a conservative bias in our analysis. Finally, examining gender differences in the context of mental health research faces the methodological problem that male respondents may be more prone to social desirability bias when answering questions about mental health. The response bias hypothesis suggests that men tend to exaggerate their mental wellbeing (Kessler, 2000; Nolen-Hoeksema & Hilt,

2009). While this methodological challenge has been well studied concerning global measures of mental illness such as depression and anxiety disorders, future research is needed to determine its significance for mood assessment.

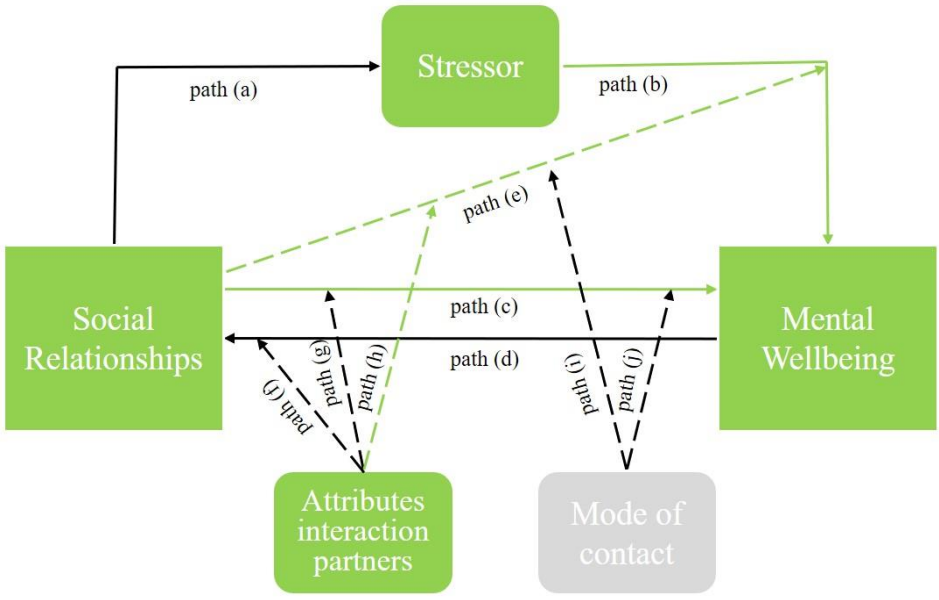
2.4.2 Conclusion

Synthesizing work on the impact of the COVID-19 pandemic on adolescents' mental health, research on social media use, gender differences, and momentary mood assessment, the current research examined the (gender-specific) relationship between mode of contact and mood among adolescents at different stages of the pandemic. Our findings suggest that online communication may have been beneficial for mood when the opportunities for in-person contact were limited due to societal constraints. In such circumstances, social media use may be essential for maintaining social relationships and may partially compensate for the lack of in-person contact (Kardefelt-Winther, 2014; Orben et al., 2020). In times of unrestricted in-person contact opportunities, this beneficial role is less evident. Thus, parental monitoring and restriction of social media use should be attentive to the respective context and role of this form of peer interaction. Finally, even in times of physical distancing measures, online contact did not fully compensate for the lack of in-person contacts, as the mood-enhancing effects appear to be smaller. This underlines the significance of in-person contacts for adolescents' emotional well-being.

Chapter 3

Everyday discrimination, co-ethnic social support and mood changes in young adult immigrants in Germany – Evidence from an ecological momentary assessment study[5]

Figure 10: Theoretical framework pertaining paper 2



[5] This research was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 716461). Funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy—EXC 2126/1–390838866.

3. Everyday discrimination, co-ethnic social support and mood changes in young adult immigrants in Germany – Evidence from an ecological momentary assessment study

Abstract

Objective: In the context of international migration flows, Germany is the second largest receiving country of migrants in the world. The aim of this study is to investigate the momentary mood effects of discrimination experiences for young adult immigrants and which social resources can buffer negative effects. A distinction is made between the importance of inter and intra-ethnic interaction partners in processing stressors.

Method: Using an ecological momentary assessment design, first-generation migrants in Germany who had recently migrated from Poland, Turkey or Syria were interviewed three times a day over seven days in June 2021 (N individuals=976; N observations=11,470). Hybrid mixed-effects regression models were estimated.

Results: The results indicate that perceived social support only moderately buffers the negative effect of everyday discrimination experiences on mood. A positive main effect on mood is observed for situational variations in perceived social support as well as for support from interaction partners.

Conclusion: The findings illustrate that being embedded in supportive relationships is important in everyday life, regardless of the occurrence of stressors. Furthermore, the study suggests that the level of perceived support is more important for first-generation migrants than the ethnic origin of the support provider.

Keywords: mood, immigrant health, discrimination, social support, intergroup contact, ecological momentary assessment

3.1 Introduction

A widely replicated finding in the context of migration research is the Healthy Immigrant Effect (HIE), whereby migrants have significantly better health outcomes compared to the host society (Kennedy et al., 2015). This difference is attributed to selection mechanisms and usually persists for years after migration, until there is an alignment with the host society in terms of health (Constant et al., 2018).

However, while this line of research tends to focus on physical health, research in the area of mental wellbeing points in the opposite direction. For example, first-generation migrants appear to have a higher prevalence of depression, post-traumatic stress disorder and anxiety disorders (Bas-Sarmiento et al., 2017; Close et al., 2016; Lee, 2019). Particularly for those with war-related refugee experiences, the effects of war trauma are of long-term relevance (Długosz, 2023; Knaevelsrud et al., 2017). First-generation migrants often face an increased number of stressors even after arrival in the host society: Distance from social contacts in the home country, social isolation in the host country, and legal problems. First-generation migrants are also particularly vulnerable to experiences of discrimination, which can further negatively affect mental health (Pearce et al., 2019), sleep quality (Alcántara et al., 2017), and cardiovascular health (Panza et al., 2019). In particular, these trends have also been confirmed for experiences of ethnic discrimination (e.g. Paradies et al., 2015; Stopforth et al., 2022).

3.1.1 Perceived discrimination as a stressor

Stress is not a phenomenon that occurs only in connection with specific life events or catastrophes, but is an element of everyday life: “it typically concerns thoroughly socialized people engaged in the ordinary pursuits of life and driven by widely shared values and commitments.” (Pearlin, 1999, p. 396). Although stress is a part of every individual's life, the frequency, severity, and nature of the stressors to which individuals are exposed vary between social categories (Turner et al., 1995). First generation migrants in particular, are at increased risk of experiencing discrimination in the host society.

Experiences of discrimination represent an identity threat because they reveal a conflict between the social context and the individual's social identity. The perception of this conflict can lead to a lack of belonging on the one hand, and to feelings of exclusion and rejection on the other (Brance et al., 2022; Slepian & Jacoby-Senghor, 2020). In particular, experiences of social exclusion tend to be associated with negative emotions (MacDonald &

Leary, 2005; Slepian & Jacoby-Senghor, 2020). Empirical evidence further suggests that experiences of discrimination promote the development of negative relational schemas. A survey of US adults identified concerns about rejection and invalidation as driving dimensions of social cognition that act as mediators between discrimination and depression (Mikrut et al., 2022).

For refugees, subjective social status in the host society is a key predictor of mental health (Correa-Velez et al., 2010). However, discrimination can also cause stress indirectly, for example when structural disadvantages lead to economic restrictions (Krieger, 2001), and poorer working conditions (Devkota et al., 2021). Experimental studies show that experiences of discrimination also operate through neuroendocrine pathways, as they are associated with increased cortisol levels (Korous et al., 2017). Ecological momentary assessment data provide evidence that discrimination experiences continue to influence cortisol levels the next day (Nam et al., 2022). Discrimination not only has an immediate impact on individuals, but also affects long-term health. Meta-analyses and systematic reviews show a negative association with self-reported health (Wanner & Pecoraro, 2023), and overall mental health (Cave et al., 2020). Against this background, it is important to explore which social resources can buffer the negative impact of discrimination on the mental health of first-generation migrants.

3.1.2 Perceived discrimination and the role of social support

According to Lazarus and Folkman's (1984) transactional model of stress and coping, coping refers to behavioral patterns aimed at managing stressors and their consequences, either cognitively or through action. Coping can thus mitigate short-term effects on mood and long-term effects on mental and physical health. Social support is an important resource within the coping process (Thoits, 1995). The Buffering Hypothesis (Cohen & Wills, 1985) also emphasizes the role of social support. In acute stress situations, such as experienced discrimination, social relationships can buffer the impact on health. For example, a functioning support system may help to resolve the underlying problem that triggers a stress response, or it may help with emotional coping by providing emotional support. These mechanisms lead to greater resilience in stressful situations, reducing vulnerability to mental illness. However, Cohen and Wills (1985) also assume that perceived social support can prevent a stressful event form causing a stress appraisal response in the first place. Thus, being embedded in a supportive network and being aware of the availability of instrumental and emotional support may reduce the likelihood of stressors being categorized as such, as their potential risk is perceived to be lower. An extensive number of studies have tested the

general assumptions about the direct and buffering effects of social support on mental health. Results of meta-analyses are largely in accordance (e.g. Harandi et al., 2017; Rueger et al., 2016). Buffering tendencies have also been shown in the context of discrimination, where social support was able to reduce the negative impact (Ajrouch et al., 2010; Chou, 2012).

The distinction between inter-ethnic and intra-ethnic relationships is highlighted in research on immigrant incorporation (e.g. Baerveldt et al., 2004; Portes & Sensenbrenner, 1993). In particular, first-generation migrants are often still closely connected to family members and friends from their home country. At the same time, the development of close relationships in the host society is complicated by language barriers and acculturation processes (Jasinskaja-Lahti et al., 2006). The first social contacts in the country of arrival are often members of the same ethnic group and are therefore more likely to be providers of social support in the first years after arrival (van Tubergen, 2015). In the case of racial discrimination, intra-ethnic interaction partners can strengthen in-group identification and thus mitigate the emerging sense of lack of belonging by making the ethnic group membership more salient and "in that they can bring information, help, share emotions and experiences about painful situations, or to enact specific strategies" (Berjot & Gillet, 2011, p. 6). In general, in-group ties seem to be negatively associated with the use of ruminative coping and may therefore be particularly effective in coping with stress (Ysseldyk et al., 2018). In contrast, it is to be expected that perceived support from members of the host society should attenuate feelings of rejection associated with experiences of discrimination, by counteracting the perceived exclusion through positive interactions, thereby buffering the negative effect on mood. This has been confirmed in relation to first-generation migrants in Italy, where feelings of social exclusion were mitigated mainly by social contacts with members of the host society (Marinucci et al., 2022).

Previous studies that have differentiated between the importance of inter- and intra-ethnic support in dealing with experiences of discrimination have yielded mixed results. For most of the studied migrant groups, intra-ethnic support had a positive effect and was able to mitigate the negative impact of discrimination experiences on mental health (Kim & Noh, 2016; Mossakowski & Zhang, 2014; Noh & Kaspar, 2003), with the exception of Vietnamese migrants in the Canadian context (Kim & Noh, 2016). However, both reinforcing and mitigating effects are found for interethnic support from members of the host society, depending on the migrant group (Jasinskaja-Lahti et al., 2006; Kim & Noh, 2016). A survey of refugees in Switzerland also indicates that intergroup friendships can mitigate the negative

impact of post-migration living difficulties in general on mental health. However, the association between trauma and psychological distress was stronger for refugees with Swiss friends (Pouraghajan et al., 2023).

In part, these differences may be due to differences in the host societies and immigrant groups under study. In addition, previous studies have only used cross-sectional data. Thus, they have only been able to examine between-subject differences in aggregate perceptions of support and discrimination.

3.1.3 Contribution

This study contributes to the discussion by using survey data from first-generation migrants in Germany who have recently migrated from Poland, Turkey or Syria. Using a smartphone-based experience sampling design, the study examines the momentary impact of discrimination experiences on mood changes. The study provides evidence on whether perceived social support at the situational level can mitigate the negative impact of discrimination. By collecting information on recent social interaction partners, it is possible to test whether individuals are less likely to report declining mood scores after a discrimination experience if they interact with an inter- or intra-ethnic support provider.

The current study makes three contributions to this line of research. First, it is based on a research design that allows for the distinction between within-person and between-person sources of variation. Thus, compared to previous studies, it adds the possibility of examining within-person variation in perceived discrimination, social support and mood. Second, the ecological momentary assessment method allows the measurement of the immediate consequences of discrimination experiences and their association with situational variation in support resources and partners. Measuring mechanisms at the situational level greatly reduces the influence of recall bias, in contrast to the retrospective self-reports of standard surveys (Schwarz, 2007). Collecting data in the context of regular day-to-day routines also increases ecological validity (Shiffman et al., 2008). Finally, the research questions is tested on a relatively large sample of first-generation migrants in Germany, which is a sub-sample of a larger random sample. So far, the importance of inter- and intra-ethnic support has not been investigated in Germany. However, in the context of international migration flows, Germany is the second largest receiving country of migrants in the world (Thränhardt, 1995; United Nations, 2020).

3.2 Methods

3.2.1 Study design and participants

I use data from a smartphone-based experience sampling study conducted with a subsample of a large-scale two-wave panel study of young adult first-generation migrants in Germany (ENTRA). Participants in this panel study were identified using a random sample of registry data from each of the five cities with the most migrants from the respective group in Germany (Kristen & Seuring, 2021). In the second wave, all participants of Turkish, Syrian, or Polish origin had the opportunity to indicate whether they were interested in the smartphone-based study. 1,078 individuals agreed to participate and 977 responded to at least one signal. The questionnaire was translated into Turkish, Arabic and Polish, following the TRAPD translation model (Harkness, 2003; Mohler et al., 2016).

The smartphone-based survey was an ecological momentary assessment study. After a pre-survey, participants were sent three short questionnaires every day (signals) for seven consecutive days in May 2021. In total, 21 signals were sent. The survey invitations were sent via SMS, and an existing internet connection was required to complete the short questionnaires. The first daily questionnaire was sent between 10 am and 1 pm, the second in the afternoon between 2 pm and 5 pm, and the third in the evening between 6 pm and 9 pm. The exact time of the survey invitation within these intervals was randomized. Participants had one hour to complete the short surveys, after which the survey link expired. 11,470 responses were received. The overall response rate was 55.96%. The response rate differs between individuals of Turkish (57.94%), Syrian (48.80%) and Polish (60.14%) origin. After listwise deletion, the analysis sample consists of 9282 signals, of which 2614 are from Syrians, 3753 from Poles and 2915 from Turks.

3.2.2 Measures

Discrimination: Discrimination was measured using an adapted version of the everyday discrimination scale (Williams et al., 1997). For seven different types of discrimination, respondents were asked whether they had experienced each type in the last hour (e.g. you were treated with less courtesy than other people). For the purposes of the analyses below, there is only a distinction between whether the respondent had experienced at least one of the seven types of discrimination in the last hour, and whether the respondent had not experienced any of the seven types of discrimination in the last hour.

Perceived social support: Perceived social support was measured with four items. Two items each measured the emotional (e.g. I am shown empathy for my situation) and practical (e.g. I feel supported in everyday life) dimensions of support. Respondents were asked to answer the four items using the temporal reference 'at the moment'. All four items were collapsed into a mean score index (Cronbach's alpha 0.886).

Social support within interactions: Each short questionnaire assessed whether respondents had interacted with other people in the past hour - examples of interactions were a (short) conversation, a purchase or an online communication. If an interaction had taken place, detailed follow-up questions were asked about one interaction partner selected by the respondent. For this interaction partner, the respondent was asked: "How strongly do you feel supported by the other person?". The response options ranged from "0 not at all" to "4 very much". In addition, the perceived ethnic background of the interaction partner was recorded. This information was dichotomized, with 0 indicating partners of a different ethnicity and 1 indicating persons of the same ethnicity.

Mood: Mood was captured by a series of mood adjectives, as is common in ecological momentary assessment studies (de Vries et al., 2021). For each adjective, respondents rated the extent to which it described their feelings at the moment. The response options ranged from "0 not at all" to "4 very much". The adjectives relaxed, happy, enthusiastic and optimistic represent the dimension of positive mood (Cronbach's alpha 0.782). Negative mood was captured by the adjectives nervous, sad, downhearted, and angry (Cronbach's alpha 0.841). The mood scale was obtained by calculating a mean index over all eight items (Cronbach's alpha 0.846), the negative mood adjectives were reversed beforehand.

Confounding variables: Seven variables were considered as time-constant confounders. The first seven originate from the first wave of ENTRA. Thus, the data were collected about 2 years prior to this study. Gender was included because women tend to report poorer mental health (Campbell et al., 2021) and because social support resources also differ between the sexes (Flaherty & Richman, 1989). A distinction was made between female, male and diverse. Age at the time of the survey was entered as a continuous variable. Previous research suggests an association with both social support and mental health (Bell et al., 2019; Wrzus et al., 2013). I distinguished the three migrant groups in terms of country of origin as Syrians, Turks and Poles. Length of stay in Germany was measured in years, and language proficiency was self-reported. Migration-related indicators were classified as confounders because migration history has an impact on integration into the host society and thus on social

resources (Oppedal et al., 2004). In addition, it is a factor related to health (Juárez et al., 2018; Koneru et al., 2007). Socio-economic indicators are the number of years spent in the education system and net household income. These were included because social support resources show a socio-economic gradient (Schafer & Vargas, 2016) and previous research also suggests a relationship with mood (Hao & Farah, 2020). In addition, global mental health was considered a confounder because of its importance as a predictor of situational mood (Armey et al., 2015) and because it shapes how we view social situations (Leskelä et al., 2008). The WHO-5 well-being index (WHO, 1998), which was collected during the pre-survey, was used.

Two time-varying confounders were included: Time of day and day of week. Due to the survey design, time of day was included as a categorical variable rather than a continuous variable. A distinction was made between surveys in the morning, afternoon, and evening. These are confounding factors in that mood varies with time of day and day of week (Egloff et al., 1995; Stone et al., 2012). Furthermore, interaction partners typically differ across these temporal dimensions.

3.2.3 Analytical strategy

To address the research question, a series of hybrid mixed-effects regression models (MRMs) (Hedeker & Gibbons, 2006) were estimated. Intercepts were allowed to vary between individuals (υ_{0i}). Effects were decomposed into within-subject and between-subject effects. The within-subject effect was obtained by mean-centering: the subject-level mean is subtracted from each time-varying observation, thus measuring the deviation from the subject-level mean $(X_{ij} - \bar{X}_i)$. The between-subject effect was identified by separately including the individual-level mean $(\bar{X}_i = \sum_{j=1}^{n_i} X_{ij}/n_i)$ (Begg & Parides, 2003):

$$\textbf{Eq. 1: } y_{ij} = \beta_0 + \beta_1(X_{ij} - \bar{X}_i) + \beta_2 \bar{X}_i + \upsilon_{0i} + \varepsilon_{ij}$$

To test the hypothesized buffering effects of social support, multiplicative interaction terms are included in the hybrid mixed-effects regression models. The interaction terms were decomposed into within-subject and between-subject effects using the same approach. First, the interaction term ($X_{ij} Z_{ij}$) was generated, second the subject level mean of the interaction term across all observations was generated ($\overline{X_i Z_i}$), third to generate the within subject level term the interaction term was cluster mean centered by subtracted the subject level mean from each

observation $(X_{ij}\, Z_{ij} - \overline{X_i Z_i})$ (Schunck, 2013). This results in the following equation for testing the two-way interaction:

Eq. 2: $$y_{ij} = \beta_0 + \beta_1(X_{ij} - \bar{X}_i) + \beta_2 \bar{X}_i + \beta_3(Z_{ij} - \bar{Z}_i) + \beta_4 \bar{Z}_i + \beta_5(X_{ij}\, Z_{ij} - \overline{X_i Z_i}) + \beta_6(\overline{X_i Z_i}) + \upsilon_{0i} + \varepsilon_{ij}$$

The between-subject effects indicate the averaged association between the independent variables and the dependent variable across all observations: e.g. the extent to which an individual's average perceived social support is associated with an individual's average mood level. Whereas within-subject effects indicate the extent to which changes in the explanatory variable within the same individual are related to changes in the individual's outcome variable: e.g. how changes in the individual's perception of social support across observations are related to situational variations in the individual's mood.

Standard random effects models do not distinguish between and within estimators, implicitly assuming that they are identical. However, in cases where they differ, the resulting average of these two effects can be difficult to interpret. In contrast, hybrid mixed models combine the advantages of between-effects and fixed-effects regressions (Bell et al., 2019). The demeaning of the variables ensures that omitted variables at the individual level (between effects) cannot introduce bias into the within estimators. However, using pure fixed effects models would have the consequence that the "… de-meaned FE specification reveals almost nothing about the level-2 entities in the model" (Bell et al., 2019, p. 1058).

Missing values on variables relevant to the analyses were treated with listwise deletion. The proportion of missing values is 0.19. No restrictions were applied with respect to completeness across all observations. Therefore, for each individual, all time points with complete information on all relevant variables were included.

3.3 Results

3.3.1 Descriptive statistics

Table 6 presents descriptive statistics at the signal level from the experience sampling data and at the respondent level from the first ENTRA wave and the pre-survey. In the overall sample, the gender ratio is balanced. However, there is a higher proportion of men among Syrian respondents (69.7%) and a higher proportion of women among Polish respondents (70.5%). The average age is around 29 years. At the time of the first ENTRA wave, the Syrian participants had been in Germany for an average of 3.28 years, the Turkish participants for 1.87 years, and the Polish participants for about 2 years. In terms of the WHO-5 Well-

Being Index, the Syrian respondents have the best mean score (M=14.29), followed by the Turkish (M=13.33) and Polish (M=13.21) respondents.

Table 6: Descriptive statistics analysis sample

	Full sample		Syrian		Polish		Turkish	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Experience sampling data								
Mood	3.795	.718	3.767	.723	3.906	.725	3.677	.683
Discrimination (last hour)	.062	.241	.085	.279	.045	.207	.063	.244
Perceived support	3.703	.911	3.606	.821	3.828	.95	3.631	.919
Same-ethnic interaction partner *	.506	.5	.619	.486	.476	.5	.477	.5
Supportive interaction*	3.836	1.213	3.75	1.167	3.787	1.256	3.967	1.164
Time	.	.	.	.	.	.	.	.
Morning	.335	.472	.333	.472	.342	.475	.327	.469
Afternoon	.333	.471	.342	.475	.326	.469	.335	.472
Evening	.332	.471	.324	.468	.332	.471	.338	.473
Weekday	.	.						
Mon	.175	.38	.178	.382	.172	.377	.175	.380
Tue	.16	.367	.168	.374	.158	.365	.156	.363
Wed	.149	.356	.15	.357	.149	.356	.15	.357
Thu	.14	.347	.141	.348	.139	.346	.141	.348
Fri	.128	.334	.124	.33	.129	.336	.129	.335
Sat	.124	.329	.12	.325	.128	.334	.123	.328
Sun	.125	.33	.121	.326	.126	.332	.127	.333
N (signals)	9282		2614		3753		2915	
Pre-survey/wave 1 ENTRA								
Gender	.	.	.	.	.	.	.	.
Divers	.003	.052	.	.	.004	.060	.004	.066
Male	.489	.5	.697	.461	.292	.455	.520	.501
Female	.509	.5	.303	.461	.705	.457	.476	.501
Age	29.192	5.211	28.823	5.085	29.637	4.913	29.017	5.657
Years of education	15.871	3.315	15.121	3.335	16.47	2.736	15.893	3.774
Income	4.128	2.942	2.061	1.568	5.577	2.791	4.437	3.005
Length of stay (years)	2.356	1.237	3.281	.97	1.996	1.073	1.865	1.155
Language proficiency	3.551	1.171	3.104	1.02	3.687	1.254	3.834	1.08
Well-Being	13.586	5.006	14.294	5.136	13.214	4.844	13.328	5.015
N (individuals)	741		231		281		229	

Note: * Mean and SD refer only to those signals with reported interaction (N full sample= 4797, N Syrians = 975, N Pols = 2320, N Turks = 1502)

For the EMA measures, slight mean differences are observed for mood. Polish respondents have a slightly higher mean (M=3.91), followed by Syrian (M=3.77) and Turkish respondents (M=3.68). Syrian respondents reported experiencing discrimination in 8.5% of signals, Turkish respondents in 6.3% and Polish respondents in 4.5% of signals. On average, Polish respondents reported more perceived social support (M=3.83) than Turkish (M=3.63)

and Syrian (M=3.61) respondents. Considering only those signals in which an interaction took place in the last hour, on average, the Turkish respondents found their interaction partner the most supportive (M=3.97), followed by the Polish (M=3.79) and Syrian (M=3.75) respondents. When an interaction occurred, it was with an interaction partner of the same ethnicity in 61.9% of signals for the Syrians, but only in 47.7% of signals for the Turks and in 47.6% of signals for the Poles.

3.3.2 Hybrid mixed models

3.3.2.1 Recent discrimination and situational perceived social support

The hypothesized role of perceived social support in mitigating the negative impact of perceived discrimination experiences is tested through interaction effects. Table 7 presents results from hybrid mixed-effects regression models, including an interaction between experiences of discrimination within the last hour and perceived situational social support. (see online appendix for main effect models). The results in Model 1 are based on the full sample, while the results for Syrian respondents are presented in Model 2, for Polish respondents in Model 3, and for Turkish respondents in Model 4.

With regard to the between subject effects, the results indicate no significant interaction between recent discrimination and perceived social support. As shown in Figure 11, individuals who report many discrimination experiences across the signals tend to report lower mood scores than those individuals who report few discrimination experiences. With regard to social support, the graph suggests that individuals with on average high perceived social support across the signals tend to report higher mood values than individuals with on average low perceived social support. However, the mood difference between respondents with low or high occurrence of discrimination is not substantially different between individuals with a high mean of perceived social support. A slight buffering tendency is only visible for the Poles, for whom the mood difference between individuals with a lot and little discrimination is somewhat smaller for individuals with a high average social support perception ($p = 0.139$). A different trend is indicated for the Turks. Individuals with little and much experience of discrimination differ more strongly in their mood if they have a higher average support perception ($p = 0.236$).

The effects at the within-subject level shown in Table 7 indicate a significant interaction effect for the full sample, as well as the Poles and Turks. Figure 12 provides a graphical representation. At the within subject level, situations with a lot of discrimination are

associated with worse mood than those with little discrimination. Moreover, within all levels of discrimination, mood is always better when situational perceived social support is high. The difference in mood between situations with a lot and little perceived support is larger in situations with discrimination. Thus, the decline in mood seems to be greater when there is low perceived social support compared to high perceived support availability.

However, the magnitude of this difference is relatively small. For the full sample the predicted margins show that the difference in mood between sampling moments with low (-1SD) and high (+1SD) perceptions of social support only increased by 0.03 scale points between situations with low (-1SD) and high (+1SD) discrimination.

Table 7: Hybrid mixed-effects linear regression, two-way interaction effects perceived social support and discrimination, full sample (all signals)

	Full sample (1) Mood [a]	Syrians (2) Mood [b]	Poles (3) Mood [b]	Turks (4) Mood [b]
Between subject effects:				
Discrimination	-.545*	-.449	-1.446***	.389
	(.292)	(.553)	(.523)	(.469)
Perceived support	.317***	.319***	.294***	.37***
	(.021)	(.044)	(.033)	(.035)
Discrimination*support	.059	.026	.263	-.172
	(.089)	(.159)	(.178)	(.145)
Within subject effects:				
Discrimination	-.512***	-.305**	-.598***	-.596***
	(.076)	(.145)	(.128)	(.127)
Perceived support	.437***	.442***	.439***	.424***
	(.011)	(.021)	(.016)	(.02)
Discrimination*support	.078***	.021	.096**	.103***
	(.023)	(.044)	(.04)	(.039)
Constant	1.901***	1.883***	2.394***	1.54***
	(.136)	(.301)	(.218)	(.21)
var(_cons)	.120***	.123***	.120***	.103***
	(.008)	(.014)	(0.012)	(.012)
var(Residual)	.184	.182***	.187***	.179***
	(.003)	(.005)	(.005)	(.005)
N (level 1)	9282	2614	3753	2915
N (level 2)	741	231	281	229

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

[ab] random effects adjusted for time of day, weekday, gender, years of education, income, length of stay, language proficiency, well-being

[a] random effects also adjusted for country of origin

Figure 11: Hybrid mixed-effects linear regression, between subject effects; two-way interaction discrimination, and perceived social support (low=mean-1SD; high=mean+1SD)

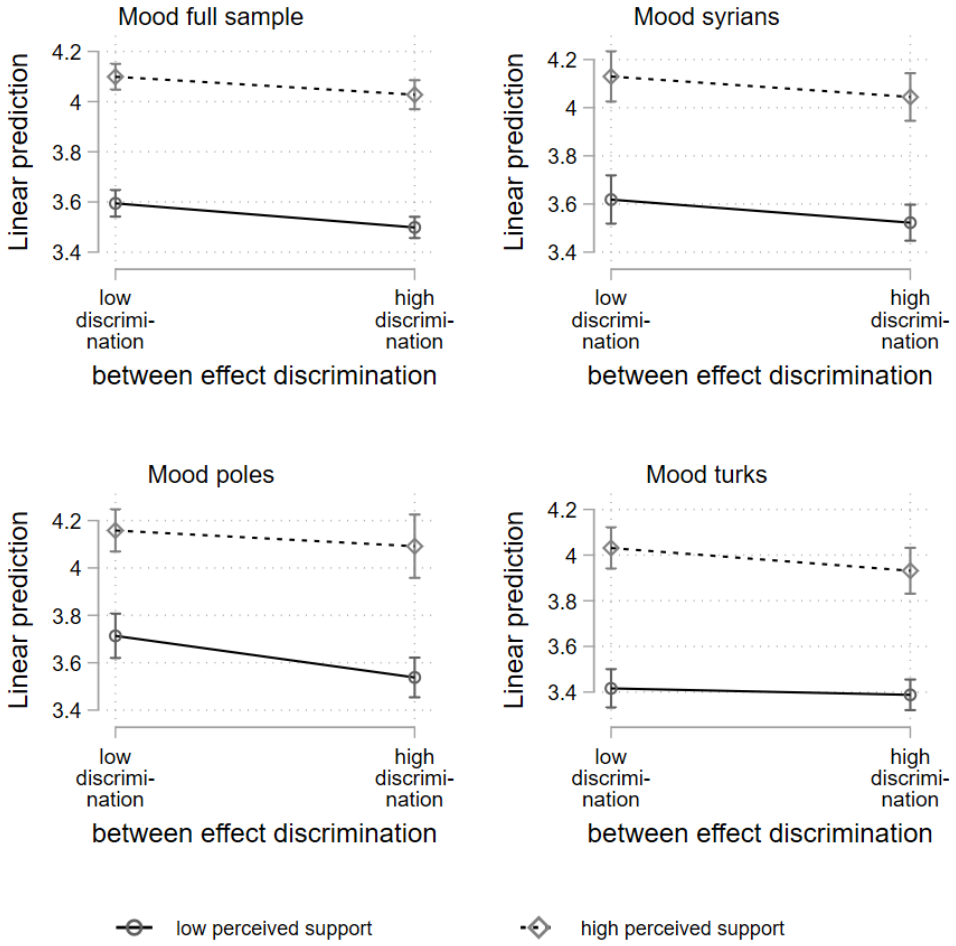
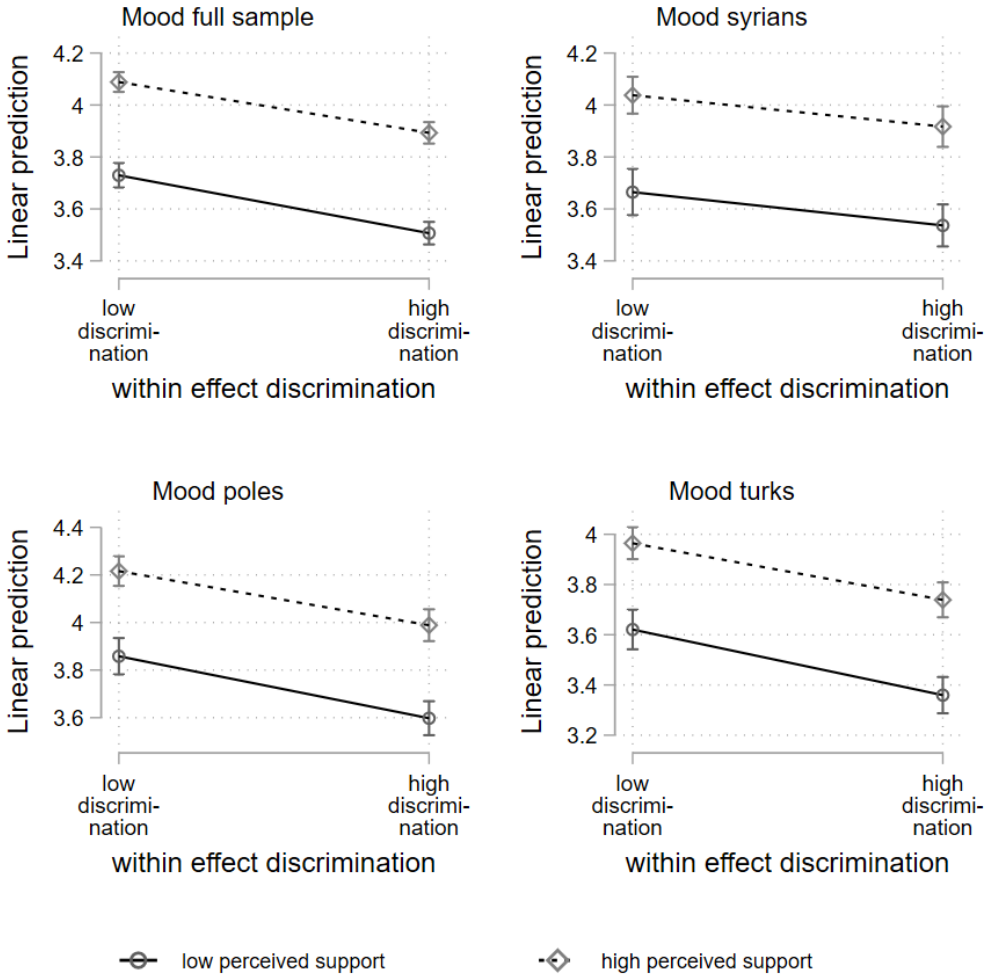


Figure 12: Hybrid mixed-effects linear regression, within subject effects; two-way interaction discrimination, and perceived social support (low=mean-1SD; high=mean+1SD)



3.3.2.2 Recent discrimination and situational intra- and inter-ethnic support

Testing the role of the ethnicity of the support provider for the hypothesized buffering effect of situational social support requires the estimation of three-way interactions. Table 8 presents the results of hybrid mixed-effects regression models depicting the multiplicative interaction between discrimination experiences within the last hour, situational social support from the interaction partner and the ethnicity of the support provider (see online appendix for main effect models). The analyses were calculated for the full sample (Model 1) as well as separately for the subsample of Syrians (Model 2), Poles (Model 3), and Turks (Model 4).

The results of the between subjects effects from Table 8 are presented in Figure 13. The main effect of social support is still evident when the ethnicity of the interaction partner is taken into account. Individuals who report high mean levels of support from their interaction partners are more likely to report higher mean mood scores. For Poles and Turks, individuals with more inter-ethnic contact tend to have higher mood scores; for Syrians, a high proportion of intra-ethnic contact is associated with better mood scores. For the full sample, as well as for the Poles and Turks, there is also a tendency for mood differences to be smaller between individuals with many reported experiences of discrimination than for individuals with low reported experiences of discrimination. However, compared to Figure 11, the slopes show less pronounced trends with greater overlap of confidence intervals.

The effects at the within subject level shown in Table 8 indicate partially significant interaction terms, but the graphical representation of the results in Figure 14 illustrates that the confidence intervals strongly overlap. In addition, the slopes are relatively close to each other indicating only minor effect differences. Within the full sample and the three subgroup analyses, there is a negative relationship between situations with discrimination above the personal average and mood. Overall, there is no marked buffering effect of social support on the negative impact of discrimination experiences. However, there is evidence of a main effect of social support on mood. For this operationalization, the results indicate that situations with high perceived support from the interaction partner are associated with better mood scores than situations in which the interaction partner is perceived as less supportive, irrespective of discrimination. In the full sample model, the highest mood scores are associated with support from an inter-ethnic interaction partner, although greater heterogeneity and overlap are evident in the subgroup analyses.

Table 8: Hybrid mixed-effects linear regression, three-way interaction effects support, inter/intra-ethnic contact and discrimination (time points with interactions only)

	Full sample (1) Mood [a]	Syrians (2) Mood [b]	Poles (3) Mood [b]	Turks (4) Mood [b]
Between subject effect:				
Discrimination	-.072	-.709**	.673	.174
	(.198)	(.297)	(.485)	(.348)
Support (interaction)	.198***	.024	.271***	.235***
	(.029)	(.061)	(.046)	(.046)
Same-ethnic interaction partner (interaction)	.146	-.632*	1.098***	-.465
	(.198)	(.353)	(.317)	(.344)
Discrimination*ethnicity	-.119	-.017	-1.17	1.275*
	(.433)	(.729)	(.826)	(.74)
Discrimination*support	-.088*	.112	-.513***	-.169*
	(.052)	(.078)	(.16)	(.09)
Support*same ethnic	-.048	.154*	-.266***	.078
	(.047)	(.086)	(.075)	(.081)
Discrimination*support*same ethnic	-.005	-.008	.251	-.296
	(.119)	(.189)	(.275)	(.202)
Within subject effect:				
Discrimination	-.39***	-.769***	-.318**	-.339**
	(.084)	(.182)	(.14)	(.133)
Support (interaction)	.062***	.033	.075***	.044**
	(.01)	(.03)	(.013)	(.019)
Same-ethnic interaction partner (interaction)	-.103*	-.236*	-.111	-.026
	(.061)	(.138)	(.085)	(.121)
Discrimination*ethnicity	-.07	.172	.235	-.599*
	(.164)	(.304)	(.256)	(.315)
Discrimination*support	-.023	.107*	-.067	-.032
	(.027)	(.058)	(.047)	(.042)
Support*same ethnic	.021	.053	.023	.004
	(.015)	(.037)	(.021)	(.029)
Discrimination*support*same ethnic	.056	-.045	.009	.189**
	(.046)	(.089)	(.073)	(.082)
Constant	2.377***	3.121***	2.53***	2.122***
	(.171)	(.368)	(.265)	(.255)
var(_cons)	.122***	.124***	.116***	.091***
	(.009)	(.019)	(.013)	(.014)
var(Residual)	.221***	.207***	.226***	.214***
	(.005)	(.011)	(.007)	(.009)
N (level 1)	4797	975	2320	1502
N (level 2)	702	210	273	219

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

[ab] random effects adjusted for time of day, weekday, gender, years of education, income, length of stay, language proficiency, well-being

[a] random effects also adjusted for country of origin

Figure 13: Hybrid mixed-effects linear regression, between subject effects; three-way interaction discrimination, support interaction partner, and ethnicity of interaction partner (low=mean-1SD; high=mean+1SD)

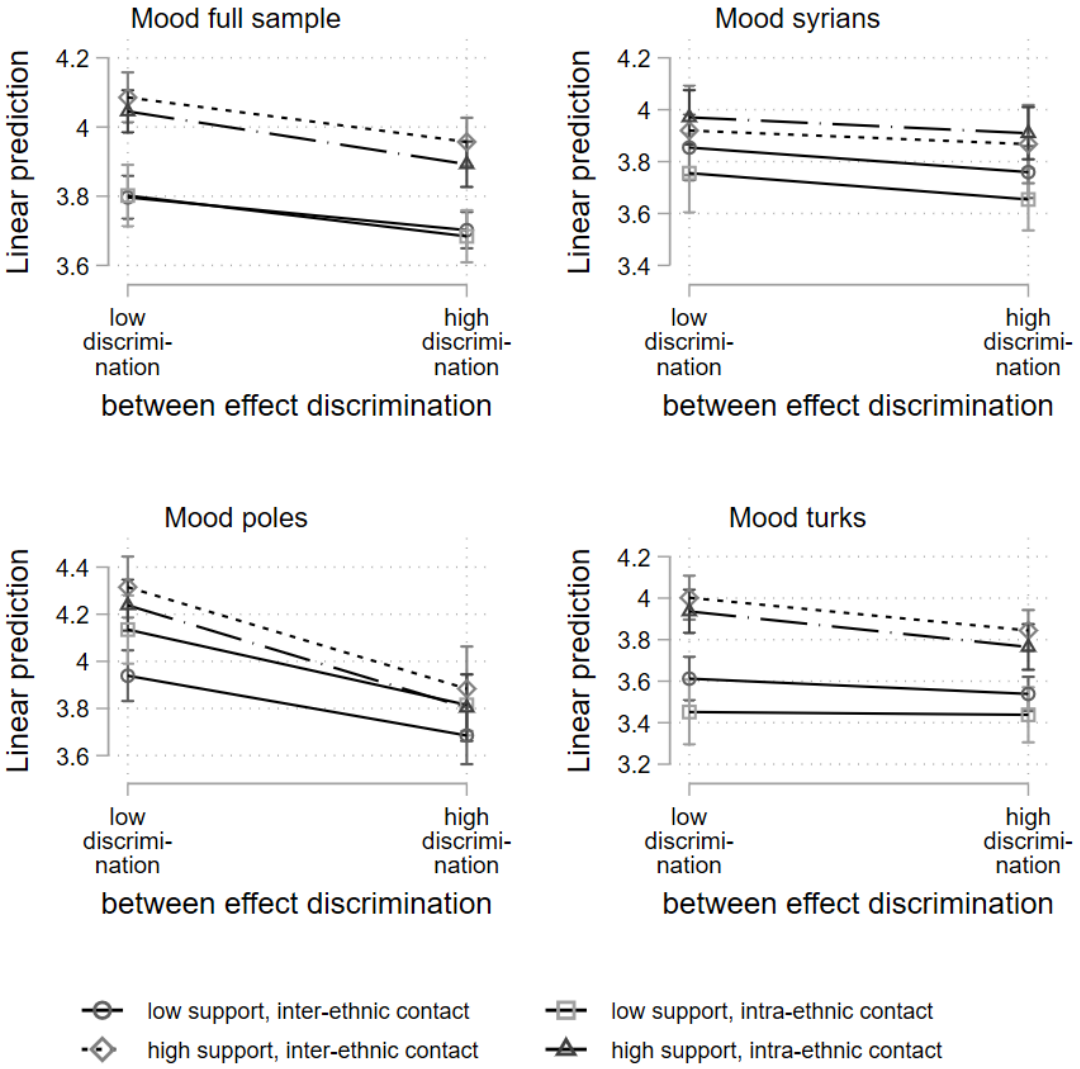
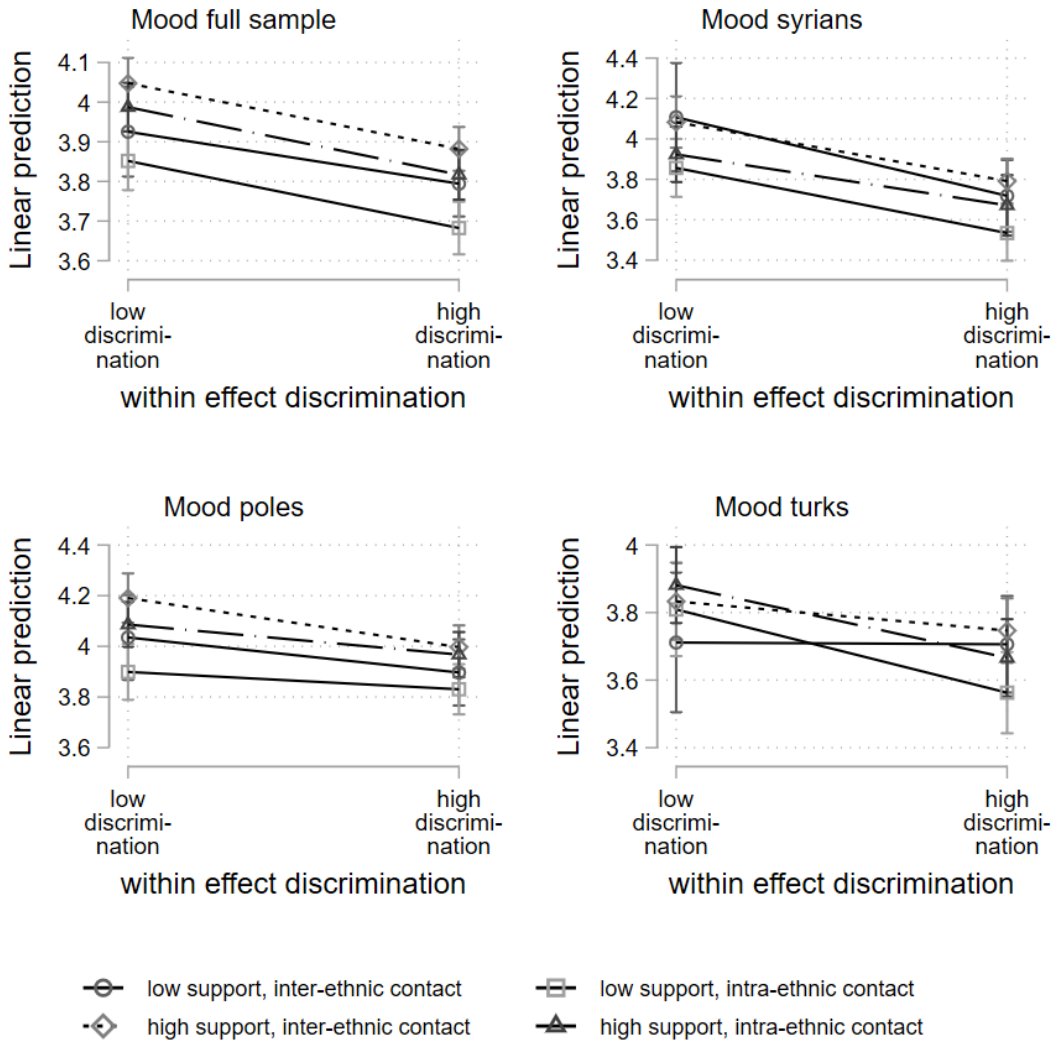


Figure 14: Hybrid mixed-effects linear regression, within subject effects; three-way interaction discrimination, support interaction partner, and ethnicity of interaction partner (low=mean-1SD; high=mean+1SD)



3.4 Discussion

The aim of this study was to examine the extent to which perceived social support can mitigate the negative effects of discrimination among first-generation Syrian, Polish and Turkish immigrants in Germany. The study extends the existing literature by using smartphone-based experience data, which allows situational variation to be examined rather than aggregated information. In addition, the study investigated the importance of the ethnic background of the interaction partner.

The findings indicate that social support is an important resource for mood, independent of the occurrence of (perceived) discrimination. Thus, the results support the main effect model of social support. According to this model, the availability of social support has a positive effect on mental health even in the absence of stressor (Cohen & Wills, 1985; Thoits, 2011). The analyses also provide evidence for a buffering effect of the negative impact of discrimination by perceived social support, but the effect is of a minor magnitude.

Intra-ethnic support seems to be more relevant for Syrian respondents, while Poles and Turks tend to benefit more from inter-ethnic support in terms of mood, especially in contexts of high discrimination. However, the magnitude of the differences between intra-ethnic and inter-ethnic support is rather small in all models, suggesting that it is not so much ethnicity as the level of perceived social support that matters for mood. The findings here contrast with previous cross-sectional research suggesting differences in the importance of intra- and inter-ethnic support (Jasinskaja-Lahti et al., 2006; Juang et al., 2016; Kim & Noh, 2016; Mossakowski & Zhang, 2014). As the results of previous research suggest heterogeneity in importance across ethnic groups, they may be indicative of group differences in access to social resources. By using individual fixed effects, the present study should provide estimates that are less biased with respect to these issues.

In addition, situational changes in the perceived availability of social support appear to be more relevant to mood than perceived support from specific interaction partners. The findings are consistent with previous research suggesting that general perceptions of the availability of social support are a more consistent predictor of mental health than actual support received (Wills & Shinar, 2000).

3.4.1 Limitations and future research

This study is subject to several limitations. First, the assumed direction of influence is not the only theoretically possible one. It is conceivable that lower mood may lead to a

different evaluation of interactions, so that they are more likely to be classified as discriminatory or unsupportive. Previous research indicates that support is perceived to be less available and that the changed social behavior of depressed individuals may lead to a loss of relationships and thus objectively reduce the available social support (Elmer & Stadtfeld, 2020; Leskelä et al., 2008). Therefore, it would be of interest for future research to determine which causal direction is of greater relevance.

Second, a more objective measure of available social support might help to address this causality issue, at least in part. However, previous research suggests that objective measures of social support have significantly less explanatory power for mental health than measures of perceived social support (Prati & Pietrantoni, 2010). The reason for this is that the level of support received tends to be higher when the need for support increases due to the acute onset of a stressor (Melrose et al., 2015) - in circumstances that are typically associated with poorer mental health. Future research using smartphone-based experience sampling approaches may provide new insights to better understand which objective indicators of social interactions and relationships are relevant to subjective perceptions of social support.

Third, the questionnaire only allowed participants to describe a maximum of one interaction partner. This restriction was made in order not to extend the length of the questionnaire too much and thus increase attrition between signals. It is quite possible that the question about the last interaction was related to the discrimination situation. Thus, perceptions of social support may be related to the interaction with the discriminator. However, this is likely to be a conservative bias that may lead to an underestimation of the effect.

Fourth, the distinction between inter- and intra-ethnic support is particularly important in the context of racial discrimination in order to counteract feelings of exclusion and rejection. Although participants in this study reported the perceived reasons for discrimination, it is not always possible to clearly identify whether these reasons were perceived as racially motivated. For future research, a larger number of observations with experiences of discrimination would be necessary for a detailed examination. It would also be important to determine whether ethnicity is a determining factor and to collect further information on the ethnic background of the discriminator.

Future research should also exploit the potential of ecological momentary assessment studies to gain further insight into other mechanisms that support first-generation immigrants'

coping capabilities. Research based on annual longitudinal analyses indicates that positive affect may be important as an intermediate (Demirer et al., 2022).

3.4.2 Conclusion

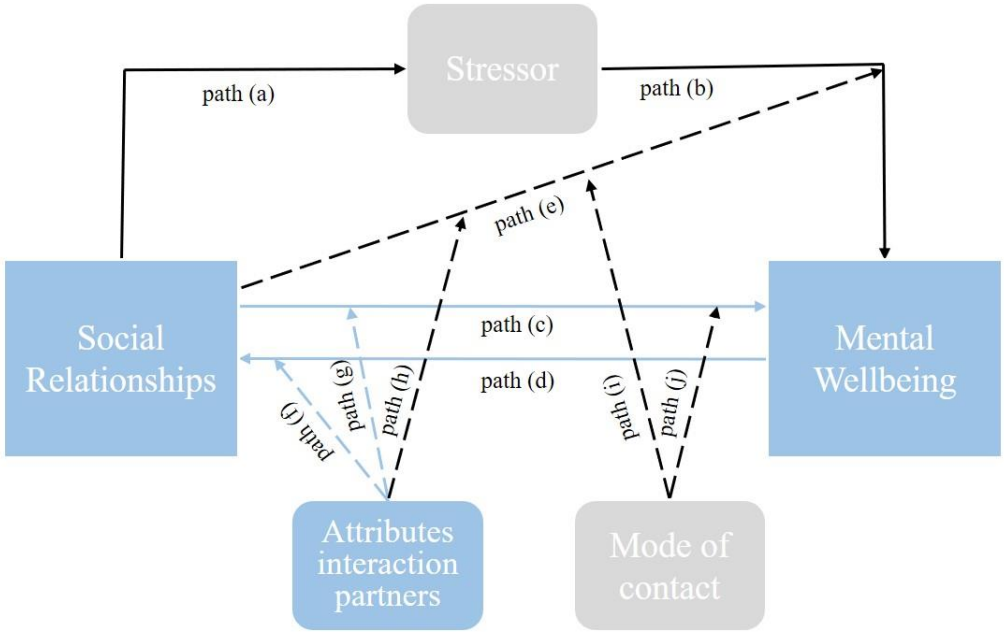
The results of this study once again highlight the negative consequences of discriminatory experiences. However, they also illustrate the importance of being embedded in a supportive network in everyday life, regardless of stressors. The study also suggests that the level of perceived support is more important for immigrants than the ethnic origin of the support provider.

A finding with potential policy relevance is that the prevalence of experiences of discrimination differs considerably between ethnic groups. Therefore, promoting positive integration into social networks is particularly important for certain migrant groups. This could help to cushion negative long-term consequences for health, as well as prevent the formation of reinforced in-groups and out-groups barriers.

Chapter 4

Exploring the complex relationship between social integration, loneliness and mental health in adolescence: A longitudinal study using social cognitive mapping [6]

Figure 15: Theoretical framework pertaining paper 3



[6] This research was funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 716461). I would like to thank my co-author Robert Krause.

4. Exploring the complex relationship between social integration, loneliness and mental health in adolescence: A longitudinal study using social cognitive mapping

Abstract

Objective: Previous research identified selection and social influence effects in the context of mental health among adolescents and young adults. However, a common limitation in existing studies is their reliance on self-reported friendship networks, which may be prone to perception biases, leading to discrepancies between perceived and actual relationship patterns.

Method: In this study, we address these limitations by leveraging a two-year panel survey with complete social network data from the SOCIALBOND project. The study draws from data collected from 37 schools in the Nord Rhine Westphalia region of Germany. To mitigate the impact of self-report biases, the social cognitive mapping approach is employed as a proxy measure for social interactions within the school cohort. By utilizing stochastic actor oriented models, the co-development of social cognitive maps, and loneliness as well as social cognitive maps, and mental health among adolescents is investigated. Thereby the study focuses on feedback processes between network structure, individuals' structural positions within peer networks, and changes in loneliness and mental health.

Results: Concerning groups of peers with whom adolescents spend their leisure time or breaks, the results support neither social selection nor social influence effects for mental health. However, higher levels of loneliness are associated with an increase of clique members. The results do not indicate social influence processes for loneliness either.

Keywords: social isolation, social integration, loneliness, mental health, adolescence, longitudinal network analysis, RSiena

4.1 Introduction

Loneliness poses an acute and widespread threat to the physical and mental health of the Western world. Social isolation and loneliness increase the risk for early mortality (Holt-Lunstad et al., 2015), coronary heart diseases (Valtorta et al., 2016), and dementia (Lara et al., 2019) as well as mental illnesses (Erzen & Çikrikci, 2018). Mental disorders are considered among the diseases that cause considerable health-related burden worldwide. Particularly in young and middle adulthood, depressive disorders are among the top ten conditions affecting disability-adjusted life-years DALYs (Vos et al., 2020).

Loneliness impacts development already in childhood and adolescence in the form of sleep problems and lower self-reported health in general (Eccles et al., 2020; Harris et al., 2013). The adolescent phase of life is also particularly marked by an increase in mental disorders (de Girolamo et al., 2012). Loneliness is further associated with the occurrence of hyperactivity, conduct, and emotional problems (Lempinen et al., 2018). Due to the impairment of mental health, such as the association with depressive symptoms, loneliness further indirectly affects self-harm behaviors (Jones et al., 2011). Loneliness in adolescence also has ramifications for the further life course. In early adulthood, this effect manifests itself in the form of depressive symptoms, low self-rated health, and obesity (Goosby et al., 2013).

The objective extent of social integration is not congruent with the extent of loneliness. On the contrary, we are dealing with a complex co-dependency between social integration, loneliness, and mental health. Given the increasing importance of peers for development in adolescence, network analytic methods provide an opportunity to examine the dynamics between the individual and social structures. Previous studies provide evidence that there are selection effects as well as contagion effects in adolescence and young adulthood with respect to depressive symptoms (Cheadle & Goosby, 2012; Elmer et al., 2017; Guan & Kamo, 2015; Long et al., 2020; Schaefer et al., 2011). However, with regard to the relationship between social integration in friendship relationships and loneliness, the results are inconsistent (Dyal, 2016; Kornienko et al., 2020; Vanhalst et al., 2014). Most of the studies to date, however, are based on friendship networks generated from adolescents' self-reports.

However, prompted by research of Bernard, Killworth and Sailer (Bernard & Killworth, 2006; Bernard et al., 1979; Killworth & Bernard, 1976, 1979) a multitude of

research suggests that the traditional self-report network measures do not capture actual behavior networks and that they deviate due to different perception biases (Butts, 2003; David & Kistner, 2000; Lee et al., 2017; Neal, 2008). Some respondents show a self-representation bias and describe ideal rather than real relationship patterns (Neal, 2008). Other respondents might be subject to a self-serving bias and overestimate their own involvement in networks (David & Kistner, 2000; Hymel et al., 1993). Especially in the context of mental health, previous research indicates that in the presence of depression received support and embeddedness are often not recognized as such (Amann, 1991; Casciaro et al., 1999; Park et al., 2016).

These distortions are not problematic if the research aim is to investigate the relationship between individual level attributes and the perception of social ties. However, those biases are particularly problematic if the underlying theory tries to explain the association between objective reality and its impact on mental health. Accordingly, the use of self-report measures to examine the connection between social integration and mental health can lead to an overestimation or biased estimate of the association. Because the perceived relationships and not the theoretically implied actual network embeddedness are measured.

Other studies that captured social interaction among adolescents with greater objectivity, for instance by using radio-frequency identification (RFID) technology or daily interaction diaries, suggest that selection effects are of minor importance in adolescence (Block & Burnett Heyes, 2020; Pachucki et al., 2015). Due to the intensive survey design, these studies cover relatively short measurement periods of a few weeks.

However, long-term effects are of particular interest in the context of mental health. research. Because every now and then, everybody tends to feel lonely, but if chronic loneliness manifests itself, for example, from permanent social isolation, a more substantial impact on mental health is to be expected (Weiss, 1987).

The present study leverages data on complete social networks from a large-scale two-year panel survey to better understand the association between social integration and loneliness as well as mental health. To overcome the problem of self-reported ties, we use the social cognitive mapping approach (Cairns et al., 1985; Kindermann, 1998) as a proxy measurement for social interactions within the school cohort. Applying stochastic actor oriented models, we investigate the co-development of social integration and loneliness as well as social integration and mental health in adolescence. Thereby focusing on the feedback processes between network structure, structural positions within peer networks, and changes

in individuals' loneliness and mental health. The study is based on data from the SOCIALBOND project ("Social Integration and Boundary Making in Adolescence"), a longitudinal survey of 37 schools in the area of North Rhine Westphalia in Germany. Between the two waves is a one-year time lag, making it possible to examine the effects of continuous social isolation on loneliness and mental health. Due to the extensive amount of time spent within the school and due to compulsory schooling in Germany, the school context can be regarded as highly relevant for development in adolescence.

4.1.1 Social Isolation and Loneliness

Although social isolation and loneliness are related to each other, they are not congruent. Social isolation refers to the actual and objective characteristics of a social situation. Symptomatic for social isolation is the absence of social relationships and the lack of embeddedness into a community (de Jong Gierveld et al., 2018). However, loneliness is the personal experience of a social situation, which can deviate from the objective characteristic (de Jong Gierveld, 1987). Loneliness is often described as a form of social pain, triggered by the distress that occurs as a consequence of the perception that one is socially isolated. This can be intensified if the existing relationships are of low quality (Laursen & Hartl, 2013). From an evolutionary perspective, this reaction to the experience of social isolation is a necessary internal mechanism intended to lead to behavior change. Functioning as a motivator and signal to develop new social relationships, it is supposed to prevent individuals from facing the challenges of the environment alone in the long term (Cacioppo et al., 2006). Nevertheless, loneliness also triggers feelings of insecurity and changes cognition. The perception of the social environment becomes biased. The assessment of social interactions tends to be more critical, and there is an expectation that others are opposed to the individual. Subsequent behavior changes can then turn these expectations into self-fulfilling prophecies, creating a self-reinforcing loop of loneliness (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010). This effect is intensified by the circumstance that loneliness is often accompanied by sleep dysfunction, disturbing the hormone regulation, and thereby enhancing social withdrawal (Cacioppo & Hawkley, 2009; Laursen & Hartl, 2013).

The discrepancy between social integration and the individual's level of loneliness arises whenever there is a misfit between the desired level of social integration and the objective level of social embeddedness. Loneliness is further enhanced if the individual's capacity to change the social situation is low or if changes can only be achieved with great effort (Perlman & Peplau, 1981).

In mid-adolescence, the reference persons for the assessment of one's own social integration change. In the process of searching for autonomy, the family is becoming less critical, and the peer group, in particular, is gaining influence. As a result, adolescents in mid-adolescence are particularly at risk of experiencing loneliness, especially if the change occurs very quickly, and the peer group cannot meet these increased demands (Laursen & Hartl, 2013). Accordingly, loneliness has been found to increase in early and mid-adolescence and to decreases towards late adolescence and early adulthood (Heinrich & Gullone, 2006; Luhmann & Hawkley, 2016; Qualter et al., 2013).

4.1.2 Social Isolation and Mental Health

Social integration plays an essential role in the process of stress buffering. Pronounced social integration makes everyday life more predictable. Therefore, the probability of experiencing stressful situations decreases, and daily life becomes more stable. It also implies that social activities are undertaken more often, which tends to be associated with more joyful moments and experiences compared to time spent solitary (Berkman et al., 2000; Cohen & Wills, 1985). Also, in situations of acute stress, social relationships can buffer the impact on mental and physical health. This can be achieved by the provision of emotional or practical support. Moreover, the perception of being well-integrated and having a supportive network further enhances feelings of self-worth. Both mechanisms lead to more resilience whenever stressful situations occur, which decreases the vulnerability to mental illnesses (Cohen & Wills, 1985; de Jong Gierveld et al., 2018). In addition to the accumulation of positive experiences, social embeddedness is associated with social influence effects. Social influence may appear in the form of advice on nutrition practices or physical activities, promoting a healthy lifestyle (de Jong Gierveld et al., 2018). Social control can also promote the actual adoption and maintenance of healthier behavior patterns (Cacioppo et al., 2015). Both conscious choices to adopt behaviors or attitudes and unconscious adaptations to the social environment are common forms of social influence (Berkman et al., 2000). Due to the close link between physical and mental health (Biddle & Asare, 2011; Ohrnberger et al., 2017), this can also improve mental health. Alignment in how we manage everyday challenges is another important mechanism that enables social influence in relation to mental illness (Thoits, 2011). Peers with more depressive symptoms increase failure anticipation in adolescents, thereby mediating the influence of peers' depressive symptoms (van Zalk et al., 2010). Negative cognitions can be adopted within friendships as depressed adolescents tend to talk more

frequently about negative emotions and experiences and brooding, in particular, is indicative of symptoms of depression (Burwell & Shirk, 2007; van Zalk et al., 2010).

Additionally, mental health status also influences the level of social integration. Poor mental health reduces participation in daily social activities and the ability to maintain relationships. At the same time, openly displayed mental health problems might mobilize members of the social network to offer more support (Barrera, 1986) and thereby decrease social isolation. A turning point can occur in this relationship if social ties cannot meet the demand for help and become overwhelmed. This can lead to the dissolution of social relationships, which in turn increases social isolation (de Jong Gierveld et al., 2018).

Furthermore, mental illnesses such as depressive symptoms strongly influence how one's own situation and social interactions are evaluated. Perceptions are affected by cognitive distortions that lead individuals to evaluate life experiences and interactions negatively and to downplay positive thoughts and impressions (Beck, 1967). Lower accuracy is observed in the perception of one's own ties as well as in the quality of relationships (Overall & Hammond, 2013). Furthermore, one's individual competence and acceptance by peers are systematically underestimated (Cole et al., 1998; Kistner et al., 2006). There is evidence indicating that individuals with depressive symptoms tend to perceive the same feedback more negatively and are more likely to forget or downplay positive feedback when recalling personal evaluations (DeMonbreun & Craighead, 1977; Gotlib, 1983; Nelson & Craighead, 1977). This increases the probability of being dissatisfied with social relationships and feeling lonely independent of the actual level of social integration.

4.1.3 The Potential of Social Network Analysis

The theoretical foundation elucidates that not only are individuals themselves interconnected, but also that the individual's mental wellbeing is related to the social structure in which each individual is embedded. Especially in adolescence, the importance of the peer group for development increases. Actor-oriented models allow to explicitly model the co-dependence between social networks and individual-level attributes (Snijders et al., 2010). This is a clear advantage over methods that only correct for interdependencies within observations. By modeling the network dynamics and underlying mechanism actor-oriented models further allow to take into account general behavior tendencies. Behavior tendencies such as reciprocity and transitive closure can lead to change in social networks. Without explicitly modeling these endogenous network effects, they cannot be separated from

mechanisms of substantive interest like selection or social influence effects (Steglich et al., 2010).

Relational studies using friendship nomination networks indicate, that there are contagion effects of depressive symptoms as well as of loneliness in adolescence (e.g. Block & Burnett Heyes, 2020; Cacioppo et al., 2009; Cheadle & Goosby, 2012; Guan & Kamo, 2015; Kiuru et al., 2012; van Zalk et al., 2010). However, Giletta et al. (2011) only observed social influence effects in girls when female and male dyads were examined independently. Thus, the mood of peer group members seems to be a relevant factor for the development of adolescents' mood and emotions. However, contagion effects are only one reason for network autoregression. Homophily, the tendency that similar individuals are more likely to connect, structures relationships through every age group (McPherson et al., 2001). Previous studies using friendship nominations suggest that similarity in depressive symptoms is another factor, that makes it more likely for adolescents to befriend or not to dissolve ties (Elmer et al., 2017; Kiuru et al., 2012; van Zalk et al., 2010). Yet, when controlling for pubertal maturation, Yu et al. (2023) found no evidence of selection or social influence effects on depressive symptoms.

Depressive symptoms also seem to associate with smaller peer networks, tendencies to withdraw from friendships and with being less likely to form new relationships (e.g. Cheadle & Goosby, 2012; Elmer et al., 2017; Schaefer et al., 2011). Only in the case of especially large friendships networks, does the over-integration foster depressive symptoms (Falci & McNeely, 2009), indicating a u-shaped association between number of friends and mental health. These findings were not replicated for anxiety disorders; a study by Long et al. (2020) was unable to find either selection or influence effects. An analysis of anticipated friendship nominations even suggests directed heterophily, with highly anxious adolescents being more likely to nominate low level anxiety adolescents (Aboutalebi Karkavandi et al., 2022). However, similar patterns were found for loneliness. In previous studies loneliness in youth is associated with smaller friendship networks (Brown et al., 2021; Vanhalst et al., 2014) and friends tend to have similar levels of loneliness (Kornienko et al., 2020).

Another relational approach with more objective measures for social integration indicates somewhat different results for the impact on mental health. Using radio-frequency identification (RFID) technology to measure actual interaction patterns between 6th graders, Pachucki et al. (2015) did not find evidence for selection or influence effects in relation to adolescents mental health. For older adolescents, daily diary interaction records indicate that mood contagion of interaction partners becomes relevant (Block & Burnett Heyes, 2020).

However, other studies using RFID technology or other sensor techniques only found evidence that depressive symptoms influence interaction behavior or choice of interaction partners for university students (Elmer & Stadtfeld, 2020; Liu et al., 2020). These results suggest that the relevance of social influence versus selection effects changes during adolescence and young adulthood. A potential limitation is that studies using objective measures only collected data over a few weeks or months and were unable to differentiate between positive and negative interactions.

The present study employs social cognitive mapping to demonstrate a new approach to investigate the co-evolution of mental health and loneliness with social networks. This method allows for the integration of the advantages of panel studies, which can capture long-term developments, with the increased objectivity of a proxy indicator for behavioral social networks.

4.2 Methods

4.2.1 Study design and participants

The "Social Integration and Boundary Making in Adolescence" (SOCIALBOND) project is a panel study of German schools. All schools are located in the state of North Rhine-Westphalia in Germany. Data collection of wave 1 started at the beginning of the school year in autumn of 2018, and data collection of wave 2 followed one year later in autumn of 2019. Within each participating school, the complete seventh grade was surveyed in wave 1 and subsequently the entire eighth grade for wave 2. Audio supported tablet assisted self-interviews were conducted on-site within classrooms. 37 schools participated in both waves, and approximately 3500 students were interviewed. The survey covered all major types of school: lower secondary schools ("Hauptschulen"), secondary schools ("Realschulen"), comprehensive schools ("Gesamtschulen"), and grammar schools ("Gymnasien"). Students are 12-13 years old in wave 1 and 13-14 years old in wave 2. 52,03% of the interviewed students are female in wave 1 and 52,76% in wave 2. Written consent was obtained from parents before the survey was conducted. The students themselves were also asked for their consent on the day of the survey. The overall response rate is 75,99% in wave 1 and 80,48% in wave 2.

4.2.2 Measures

Mental Health: The Mental Health Inventory - 5 (MHI-5) is used to measure student's mental health. The MHI-5 is a subscale of the 36-Item Short Form Survey Instrument (SF-36). For this study the RAND 36-Item Health Survey 1.0 Version is used (Hays et al., 1993). The subscale is well proven to capture symptoms of depression and anxiety in children and adolescents (Rivera-Riquelme et al., 2019). The scale consists of five items e.g. “How much of the time during the past 4 weeks have you felt down hearted and blue?”, with six answer categories ranging from “all the time” to “none of the time”. Items are recoded so that high values on the index report low mental health. To meet the requirements for ordinal behavioral variables in RSiena co-evolution models, a mean score was calculated and then rounded to integer values (Ripley et al., 2023, p. 27). Since the distribution of the index is right skewed and the answer options “all the time”, “a little of the time” and “none of the time” are sparsely observed, we combined the answer categories “all the time” with “most of the time”, as well as “a little of the time” and “none of the time” with “some of the time” (see appendix Figure A1).

Loneliness: Student's perception of loneliness is measured with the item "How many times have you felt lonely in the past four weeks?" - six answer categories range from "all the time" to "none of the time". The answer categories “Some of the Time”, “A little of the Time”, and “none of the time” are combined, because the distribution is right skewed (see appendix Figure A2). After reversing the item, high values indicate high values of loneliness. Previous studies report a high correlation between direct measures of loneliness and indirect composite scores (Eccles et al., 2020; Nicolaisen & Thorsen, 2014; Shiovitz-Ezra & Ayalon, 2011). However, men are less likely to report loneliness using the single item, direct question. This trend is already evident in adolescence and young adults (Eccles et al., 2020; Nicolaisen & Thorsen, 2014).

Cliques: Building on the idea that a composite measure aggregating the perceptions of many is less likely to be impacted by the perception bias of a single individual (Butts, 2003; Neal, 2008), different approaches to measure social structures can be applied. Krackhardt (1987) introduces the cognitive social structures technique, which asks each actor of a network to indicate whether there is a relation between each dyad of individuals within the same network. The drawback of this method is that it constitutes an extensive effort for respondents in a larger network. In the context of schools, this method is therefore suitable at the class level (Krackhardt, 1987), but too demanding to measure relationships in the whole

school grade. An alternative measurement for larger networks is the social cognitive mapping or composite social maps approach (Cairns et al., 1985; Kindermann, 1998). With this approach, the actors are asked more directly to indicate which social structures exist within the network by reporting which people form a group and often hang out together. In the context of early adolescence, the perceived social clusters are closely related to non-negative interaction patterns and teacher reports (Cairns et al., 1985).

In preparation for the data collection, a list with all students within the grade was created, whereby each person was assigned a three-digit number. The students could be nominated based on this number. To measure the interaction patterns within the school cohort all students were asked: "Please think of your classmates from your grade and your break. In some grades there are groups or cliques that often hang out together or spend time together during the break. Are there cliques or groups in your grade?". Each student was able to describe up to five cliques and sort up to ten students into each one. There was no indication for minimum group size, and students could be sorted into more than one group. The resulting networks are undirected and weighted networks, capturing ties on the grade level. The weight represents how often a pair of students was nominated as being in one group. However, weighted networks can not be modeled within the RSiena framework (Ripley et al., 2023). A decision function was applied to determine the retention of a tie in the unweighted network from the weighted network. For each individual's first nine ties, at least two nominations of the relationship were required. Thereby a nomination is only valid, if it was confirmed by at least one other person than ego. For 10 to 15 additional ties four members of the cohort needed to nominate the tie. For 30 or more ties, at least six adolescents were required to report the relationship. This was done to ensure that the close association between self-nominations and mental health did not induce bias. The decision function also prevents the creation of artificial network isolates and conservation of unrealistically large outdegrees (for a comparison of descriptive between social cognitive maps after and before the use of the function described in operationalization see appendix).

Control Variables: Four factors are considered as possible confounders. Previous research indicates sex differences in levels of mental illness and feelings of loneliness in adolescence (Koenig et al., 1994; Wichstrøm, 1999). It is also advisable to include loneliness as a control variable, as boys show different response behavior to single item loneliness questions (Eccles et al., 2020; Nicolaisen & Thorsen, 2014). It can also be assumed that the amount of friends outside the year group in school is associated with the social integration

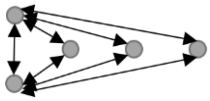
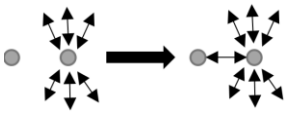
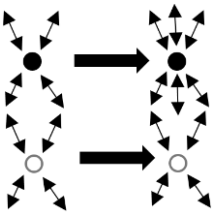
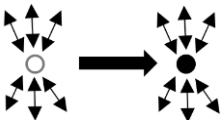
within the year group. If adolescents have more friends outside the year group, this should also influence their mental health and feelings of loneliness. Therefore, a dummy variable is included as a control variable, indicating whether the participants have the most friends outside the year group or not. The mean value between the first and the second wave was computed. Both confounders are added as time-constant covariates, because within RSiena changing covariates are not possible with only two waves (Ripley et al., 2023). As mental health and loneliness influence each other (Joshanloo, 2022), and social network structures are likely to be influenced by levels of mental health (de Jong Gierveld et al., 2018) and loneliness (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010), the respective other variable is included as a confounder in the co-evolution model of the other. Lastly, the same class effect is added as a confounding variable, because clique formation is much more likely between students of the same class.

4.2.3 Analytical Strategy

To explicitly model the interdependence between the clique networks and loneliness as well as the clique networks and mental health stochastic actor-oriented models (SAOM) are computed with RSiena (Ripley et al., 2023). RSiena is currently the state-of-the-art method for analyzing the codependence between individual level attributes and network dynamics using longitudinal network data. Co-evolution models allow for the joint analysis of dynamics of non-directed networks (cliques) and behavior variables (loneliness/mental health).

In the case of non-directed network models, ties between actors are bidirectional and there is no differentiation between sending and receiving actors. The applied model type for non-directed networks is a unilateral initiative model with reciprocal confirmation. For this specific model type the assumption is, that each actor can initiate or dissolve a tie. However, in the case of new ties the relationships cannot be imposed, the other actor has to confirm the tie (Snijders, 2008; Snijders & Pickup, 2017). Applied to the clique networks this assumption implies, that each adolescent can propose to another to hang out together. To establish this relationship both have to agree, but each of the actor can dissolve the tie without confirmation.

Table 9: Included effects and their interpretation

Parameter	Graphical representation	Interpretation
Network part cliques		
Basic rate parameter		Speed by which the actor gets the opportunity to change ties between wave 1 and 2
Outdegree (density)		General tendency to have ties
GWESP		Tendency for triadic closure
Degree (activity + popularity)		Tendency that actors, which have a lot of ties, are more likely to get new ties
Same varname		Tendency that actors sharing the same value of varname are more prone to be nominated as belonging to a peer group
Varname - ego		Tendency that actors with higher levels of varname tend to be more/less likely to be nominated as belonging to a peer group
Varname -similarity		Tendency that actors with similar values of the respective trait are more/less likely to be nominated as belonging to a peer group
Behavior part		
Rate varname (period 1)		Speed by which the actor gets the opportunity to change values of varname between wave 1 and 2
Varname linear shape		Tendency for higher values in varname
Varname quadratic shape		Tendency for a quadratic function of varname
Effect from varname		Main effect of the covariate varname on the dependent behavioral variable
Varname degree		Effect of the actors number of ties on varname
Varname average similarity		Tendency of actors to become similar in regard to varname to one's group members levels of varname

Alterations within the network are modeled as actor-oriented. The intervals between measured observations are segmented into micro-steps, assuming that the network evolves continuously between time points. With each micro-step, an actor can maintain, add or dissolve a tie and adjust the individual level attribute upward or downward. The network and behavioral micro-steps are modeled as conditionally interdependent. All actor choices are modeled on the basis of the current state of the networks. Structural network effects are added - so called endogenous network effects - which only depend on the network structure (Ripley et al., 2023; Snijders et al., 2010). They ensure that general behavioral tendencies do not bias effects of interest.

The structural parameters were selected using forward selection by choosing theoretically meaningful structural parameters and backward selection if these were not significant, worsened the model fit or led to less converged school models. Table 9 further illustrates all included structural effects.

In the context of the present study, a co-evolution model is run for each grade separately. Excluded are 7 schools with a participation rate under 70 percent in both waves, because a higher share of missing values would lead to unreliable presentations of the network structure and thus biased results (Kossinets, 2006).

In the next step, a meta-analysis was implemented with the siena08() function by Snijders and Baervelt (2003), estimating the mean and variance of all parameters. However, only schools achieving a maximum convergence ratio of less than 0.25 are included in the meta-analysis. Higher values of the maximum convergence ratio would indicate, that the deviations between the simulated values and their observed values within the given data are to large (Ripley et al., 2023, p. 67).

4.3 Results

4.3.1 Descriptive statistics

Descriptive statistics for the analysis sample are presented in Table 10. On average each grade network consists of 94 students, the smallest school has 41 students and the biggest school 173. The mean number of clique members is 4.04 in wave one and 4.73 in wave two. This corresponds to changes in density. On average density in the clique networks slightly increases from 0.04 to 0.05 in wave two, whereas tendencies for transitivity slightly decrease. Averaged over both waves, 57.1% of the young people state that they have more

friends outside their own cohort than in it. The mean statistics show an increase in the average level of poor mental health and an increase in loneliness from wave one to wave two.

Table 10: Descriptive statistics for individuals level attributes and social networks

	N	Mean	St. Dev.	Min	Max
Mental health (t1)	2,708	1.653	0.750	1	3
Mental health (t2)	2,972	1.719	0.770	1	3
Loneliness (t1)	2,623	1.780	1.030	1	4
Loneliness (t2)	2,877	1.921	1.108	1	4
Sex (girls)	3,474	0.466	0.499	0	1
Age (t1)	3,465	12.428	0.695	8	18
Friends outside grade (t1/t2)	3,474	0.571	0.495	0	1
Cliquen Outdegree (t1)	3,479	4.043	3.557	0	16
Cliquen Outdegree (t2)	3,479	4.730	3.634	0	18
Cliquen Density (t1)	37	0.044	0.016	0.017	0.092
Cliquen Density (t2)	37	0.054	0.019	0.017	0.103
Cliquen Transitivity (t1)	37	0.782	0.090	0.596	0.974
Cliquen Transitivity (t2)	37	0.749	0.077	0.621	0.957
Network size	37	94.027	35.744	41	173

Table 11: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Mental health (t1)	1	.	.	.	.	.	.	.	.
(2) Mental health (t2)	.428	1	.	.	.	.	.	.	.
(3) Loneliness (t1)	.598	.344	1	.	.	.	.	.	.
(4) Loneliness (t2)	.369	.598	.402	1	.	.	.	.	.
(5) Sex (girls)	.195	.248	.174	.222	1	.	.	.	.
(6) Age (t1)	.062	.059	.026	.035	-.052	1	.	.	.
(7) Friends o. grade (t1/2)	.065	.067	.042	.056	-.020	.104	1	.	.
(8) Outdegree cliques (t1)	-.078	-.076	-.097	-.090	-.043	-.165	-.142	1	.
(9) Outdegree cliques (t2)	-.082	-.112	-.110	-.127	-.113	-.127	-.075	.349	1

Table 11 presents the bivariate correlates on the individual level. As expected, there is a strong positive correlation between poor mental health and loneliness. Girls seem to report higher levels of loneliness as well as higher values of low mental health. This association is more pronounced in the second wave. Age is positively correlated with both loneliness and low mental health, but negatively associated with the number of outdegrees. The bivariate association between loneliness and outdegree in cliques is negative. This is also evident for mental health, more nominations for clique members are negatively associated with poor mental health. However, having the majority of friends outside the grade is positively

associated with poorer mental health and feelings of loneliness. As expected having more friends outside the grade is negatively correlated with the clique outdegree.

4.3.2 RSiena co-evolution models

Table 12 presents the results of the meta-analysis of all converged R-Siena co-evolution model for mental health and clique networks, while the converged co-evolution model for loneliness and clique networks are shown in Table 13.

Out of the 30 school cohort networks with an acceptable participation rate, 6 networks fell below the set maximum convergence ratio values for the co-evolution models with mental health and 6 networks for the co-evolution models with loneliness and were therefore included in the meta-analysis.

Table 12: Meta-analyses RSiena co-evolution models for mental health and clique networks

	β	SE	0.95 CI
Network Dynamics			
Basic rate parameter	15.666	NaN	NaN
Degree(density)	-1.808***	0.176	[-2.279, -1.420]
GWESP	1.767***	0.087	[1.589, 2.021]
Degree (act+pop)	-0.083***	0.018	[-0.122, -0.046]
Same sex	0.357***	0.065	[0.211, 0.548]
Same class	0.530***	0.107	[0.300, 0.809]
Mental health ego	-0.116	0.066	[-0.438, 0.250]
Mental health similarity	-0.248	0.283	[-0.997, 0.544]
Mental Health Dynamics			
Rate (period 1)	1.424***	0.152	[0.928, 1.957]
Linear shape	-0.386**	0.092	[-1.071, 0.323]
Quadratic shape	0.324**	0.118	[-0.328, 0.976]
Degree	-0.032	0.030	[-0.174, 0.109]
Average similarity	1.051	1.029	[-1.877, 4.355]
Effect from sex	0.202	0.137	[-0.399, 0.829]
Effect from other friends	0.064	0.134	[-0.581, 0.709]
Effect from loneliness	0.207**	0.077	[-0.050, 0.477]

Estimates according to Snijders and Baerveldt (2003); *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

In terms of structural parameters, both RSiena meta-analyses show similarities. The negative degree density parameter in both models is reflective of the low density of positive relationship networks. The density parameter has the role of an intercept and models the general tendency to form clique ties. The significant and positive GWESP parameter confirms that the captured clique structures show tendencies for triadic closure. The negative degree activity plus popularity effect parameter suggests that adolescents who are already connected to many clique members are not likely to get more clique members. The significant same sex

parameter supports the assumption of gender homophily, girls are more likely to hang out with girls and boys are more likely to form a clique with other boys. Being together in a clique is also more likely when two students are in the same class.

Concerning the central theoretical research question of selection effects, the network dynamics part supports the assumption that levels of loneliness influence the tendency of clique group formation. Surprisingly, higher levels of loneliness are associated with becoming more connected to peers.

For mental health, the results show no indication that egos levels of mental health are of relevance when adolescents form relationships. The similarity parameter for loneliness as well as mental health are not significant in the meta-analysis, suggesting that similarity in regard to levels of loneliness or mental health is of no relevance for the selection of clique members in middle adolescence.

Table 13: Meta-analyses RSiena co-evolution models for loneliness and clique networks

	β	SE	0.95 CI
Network Dynamics			
Basic rate parameter	15.614	NaN	NaN
Degree(density)	-1.609***	0.171	[-2.177, -1.120]
GWESP	1.911***	0.023	[1.652, 2.171]
Degree (act+pop)	-0.083***	0.007	[-0.105, -0.060]
Same sex	0.352***	0.067	[0.148, 0.529]
Same class	0.581***	0.116	[0.251, 0.953]
Loneliness ego	0.191***	0.026	[0.036, 0.331]
Loneliness similarity	0.283	0.187	[-0.402, 0.983]
Loneliness Dynamics			
Rate (period 1)	3.870**	1.088	[1.167, 7.223]
Linear shape	-0.370	0.296	[-1.091, 0.574]
Quadratic shape	0.228**	0.073	[-0.027, 0.480]
Degree	-0.052	0.028	[-0.182, 0.085]
Average similarity	0.821	1.402	[-3.413, 4.696]
Effect from sex	0.096	0.111	[-0.320, 0.528]
Effect from other friends	0.107	0.155	[-0.315, 0.616]
Effect from mental health	0.172	0.107	[-0.062, 0.447]

Estimates according to Snijders and Baerveldt (2003); *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

The behaviour dynamics part of each model addresses the theoretical hypotheses concerning peer influence effects and the number of clique members ego is connected with. For both loneliness and mental health, the meta-analysis presents no significant average similarity effect for either loneliness nor mental health. The results therefore do not support the hypothesis of peer influence effects. Over the course of one year the adolescents do not become more similar in their levels of mental health to the level of mental health their clique

members report. The degree effect is also insignificant within both meta-analyses, suggesting that the number of clique members with whom ego spends time does not lead to changes in mental health or loneliness.

To adjust for possible confounding influences in the behaviour dynamics we included sex and the information whether ego has more friends outside the grade level as control variables. For model 1 and model 2 the respective other behaviour variable was added as another control variable. Higher values of loneliness are predictive of higher values of poorer mental health. The other factors are not significant.

In order to evaluate the accuracy of RSiena models, it is essential to consider the goodness of fit (GOF). In the case of co-evolution models, the GOF function can be used to examine whether the simulated clique networks and behavioural data are a good representation of the observed data. The p-values are a recommended criterion for assessing the goodness of fit. These assess whether the distribution of the simulated data deviates to a significant amount from the observed data. The aim is for the p-value to be > 0 (Ripley et al., 2023, pp. 63-64).

For the results of the present study, the GOF statistics indicate an adequate fit for the behaviour variables loneliness and mental health as well as for the triad census, whereby the values of the simulated networks hardly deviate from the observed values for all schools. For the geodesic distance, the target value of $p > 0$ can be achieved for 6 out of 6 schools for the mental health models and 4 out of 6 for the loneliness models. For the clique census the criteria are met for 5 out of 6 schools for mental health models and 4 out of 6 for the loneliness models. The outdegree distribution, on the other hand, only shows the desired $p > 0$ values for 3 out of 6 schools for both model specifications, but only for 1 school cohort does the red line of the observed values leave the dashed grey lines of the violin plots, which mark the 95% probability band for the simulated distribution.

In summary, whilst the simulated data sets correspond very well to the observed data for some of the parameters considered, there are weaknesses in the representation of the degree distribution, and to some extend of the geodesic distance and clique census (see appendix for all GOF plots).

4.4 Discussion

This study is the first to use social cognitive mapping to investigate the co-evolution of mental health and loneliness with social networks. The primary aim of this research was to

examine the importance of loneliness and mental health in tie selection, i.e. if similarity on these attributes makes it more likely that adolescents form a clique. The secondary aim was to assess the effects of social influence while controlling for selection effects. The study investigated the extent to which adolescents' mental health or loneliness tend to adjust to that of their clique members over time and the extent to which the number of clique members is a predictor. The perceptions of all adolescents in the school cohort were used to aggregate nominations of the existing clique structures with the aim of obtaining a proxy measurement of behavioural clique networks. RSiena co-evolution models were estimated based on complete social networks from a two-year panel survey. The SOCIALBOND project provides network information from about 3500 adolescents in 37 German school cohorts and thus an opportunity to test the research question in a large number of social settings.

The overall finding of the current study is, that for adolescents aged 12 to 14 higher levels of loneliness are associated with an increase in clique members ego spends time with. No indication for similarity effects within the school grade is found. The similarity with respect to loneliness or mental health does not seems to be of relevance for clique formation. Furthermore, the average level of mental health and loneliness of those with whom ego spends time at school does not seem to impact egos development of the respective traits.

With regard to the lack of evidence for selection effects, the results of this study are consistent with a previous study of Pachucki et al. (2015), who found no similarity effect or social influence effects using interaction networks collected with RFID chips. Differences exist with regard to findings which observed similarity effects in interaction data of university students (Elmer & Stadtfeld, 2020) or mood contagion in adolescence daily diary data (Block & Burnett Heyes, 2020). However, despite the fact that these two studies assessed behavioral network data, they were restricted to observation periods of only a few weeks, unlike the present study.

More pronounced discrepancies exist with regard to previous studies, which used self-report friendship nomination data. They tend to find evidence that depressive symptoms in adolescents are relevant for friendship selection processes (Cheadle & Goosby, 2012; Elmer et al., 2017; Kiuru et al., 2012; Schaefer et al., 2011; van Zalk et al., 2010). Studies surveying adolescents and not students, show consistent results in that they also found evidence for influence effects (Cheadle & Goosby, 2012; Kiuru et al., 2012; Schaefer et al., 2011; van Zalk et al., 2010). The use of the aggregate clique measure could be a possible explanation for the discrepancy in results, as it is less influenced by egos perceptions und measures social groups

with whom the adolescents spend time with. These individuals do not necessarily have to be significant others who are seen as close friends.

With regard to loneliness, the results do not replicate previous findings from Cacioppo et al. (2009), which found contagion effects for loneliness. On a theoretical level, however, the results of this study confirm the assumption of the evolutionary perspective of loneliness (Cacioppo et al., 2006), according to which the social pain of loneliness represents an internal mechanism that should encourage individuals to become more social. In line with this assumption, the present findings show that lonely adolescents form relationships with more clique members during the observation period. These results are also consistent with a study by Kornienko et al. (2020), which found longitudinal evidence that lonely students nominated more friends.

4.4.1 Limitations and future research

The strengths of the present study lie in its ability to test the relationship between social integration and mental health and loneliness without having to rely on ego's perceptions alone and without the need for the complex collection of observational data. In addition, the SOCIALBOND project allows to investigate the codependence of social integration, loneliness, and mental health within one study. The theoretical assumptions suggest a complex codependency between the three factors (e.g. de Jong Gierveld et al., 2018), this has been explicitly investigated with the present data.

The used clique measurement also has weaknesses. Even though Cairn et al. (1985) research indicates that social cognitive maps highly overlap with non-negative interaction network data, it must be clarified that they do not equate with it. The collection of perceptions from each member of the social network also depends on attributes beyond mental health. Empirical research on network accuracy also highlights that different factors influence accuracy, such as the relevance of network centrality (Bondonio, 1998), having predominantly strong ties (Ouellette, 2008) or gender of the observer (Neal et al., 2016). As these factors also associate with mental health, they provide potential sources for bias. The perception of who spends a lot of time with whom is also presumable slow in relation to change - it is conceivable that changes are only perceived by the entire year group with a considerable time lag between depression or loneliness onset and recognition of changes in social connectedness.

Some methodological limitations in our study should be acknowledged. Firstly, due to the research design only social relationships within the year group are captured. Undoubtedly,

school represents an important context for the development of adolescents due to the regularity and long-term nature of the encounters. However, the present study cannot provide evidence on how, the influence of other contexts, competes or interacts with that of the school. Previous research indicates that during adolescence, social support from family and parents continues to have a positive impact on mental health which is replicated across studies (Gariépy et al., 2016b). When social support from family, teachers and peers are considered in combination, empirical evidence suggests that family and teacher support are predominantly predictive of depressive symptoms (Pössel et al., 2018).

Secondly, because all participants are in the same grade, the data only provides insights for a specific age group. Furthermore, two measurement periods offer only limited possibilities for investigating causal relationships. Data sets with more measurement periods would be desirable for the present research question. In the course of adolescence, mental illnesses such as depression occur more frequently as they are promoted by developmental factors and hormonal changes (Thapar et al., 2012). The importance of peers for development is also constantly changing (Laursen & Hartl, 2013). Thus, it is likely that the importance of selection and influence effects will change throughout adolescence and young adulthood. Inconsistent findings across age groups in previous research using interaction data offer preliminary evidence for this (Block & Burnett Heyes, 2020; Elmer & Stadtfeld, 2020; Pachucki et al., 2015). Further research is necessary that utilises panel data with complete social networks which cover extended phases of adolescence, to investigate alterations in the importance of peers regarding selection and social influence parameters within one and the same study design.

Another limitation concerns the utilized measurements. The mental health scale (MHI-5) includes items for different dimensions of mental health such as depression and anxiety (Ware et al., 1993). It would be of interest to examine the relationship between social cognitive maps and each of the dimensions separately in future studies. Opposing associations could bias the estimates of effects. While pervious research largely supports that individuals with depressive symptoms show distorted cognition of social interactions and ties (e.g. Gotlib, 1983; Kistner et al., 2006; Overall & Hammond, 2013), anxiety does not seem to be associated with changes in network perception accuracy (Aboutalebi Karkavandi et al., 2022; Ouellette, 2008).

Lastly, the small number of converged co-evolution models at the school level constitutes a marked limitation. When comparing the school cohorts that did not meet the

convergence criteria with those that achieved convergence (see appendix Table A2), it becomes apparent that smaller schools, schools with slightly higher density and those with a smaller number of isolates are more likely to converge. This could also be an indication that social cognitive mapping is easier and more appropriately implemented in smaller schools. Together the notably limited number of converged models and the partial restrictions in goodness of fit limit the robustness of the present results.

4.4.2 Conclusion

The present study introduced social cognitive maps (Cairns et al., 1985; Kindermann, 1998) as a measure, that can contribute to the empirical literature on feedback processes between mental health and social networks. Reduced reliance on egos and alters possible distorted perception of their relationship is a considerable advantage of this approach compared to traditional nomination techniques and critical for mental health related research.

The findings indicate that for loneliness social selection is the predominant factor in adolescents' peer groups during middle adolescence. In the course of the observation period, adolescents with high levels of loneliness tended to increase the number of clique members they spend time with. In contrast, the present study finds no evidence that social selection or social influence mechanism are apparent for mental health in the school context.

Chapter 5

Discussion

5. Discussion

The aim of this thesis was to examine the interdependence between social ties and mental health, and the extent to which the mode of contact and the characteristics of the interaction partners are relevant moderators in this process. The introduction proposed a general theoretical framework and derived three empirical research questions. In the now following subchapters I summarize the substantial results gained from the empirical studies which utilised ecological momentary assessment and complete social network data and recapitulate their contribution to this thesis. The limitations and implications for future research arising from the approach taken throughout this dissertation are discussed in Chapter 5.5.

5.1 Summary Chapter 2

The first empirical study examined the impact of in-person contact and text messaging with friends on the mood of adolescents during the COVID-19 pandemic. Specifically, the research aimed to understand if the mood impact of peer interaction through these two modes of contact might vary by gender.

The study utilized fixed-effects regression models to examine data from two ecological momentary assessment sub-studies. For sub-study 1, data were collected in February 2021, during a period of home-based learning and with significant restrictions on in-person interactions. In comparison, the same adolescents participated in sub-study 2 in November 2021 under in-school learning conditions, with contact restrictions primarily influencing larger gatherings. The intensive longitudinal design allowed for the analysis of intraindividual changes, providing more reliable estimates of the associations between different forms of contact and adolescents' mood by accounting for time-constant unobserved heterogeneity.

The findings indicate that in-person contact with friends was positively associated with improved mood for adolescents, even during periods of strict contact restrictions (sub-study 1) and more lenient social distancing measures (sub-study 2). Text messaging with friends had a positive effect on mood during the strict lockdown, but this positive association diminished when schools were open and contact restrictions eased (sub-study 2), leading to a small, statistically insignificant negative association between text messaging and mood.

Gender differences were observed, with the associations generally being more pronounced for girls. While in-person contact consistently boosted the mood of both genders, girls appeared to benefit more from online communication during extensive contact restrictions. Under normalized opportunities for contact, only in-person interaction and mood exhibit a positive correlation for female adolescents, while text messaging shows no association. For males, the findings suggest that there is no longer any association between mode of contact and mood.

The first empirical study possesses several notable strengths. The application of ecological momentary assessment data allows the mechanisms formulated in the theory to be tested at a situational level. The study thereby maintains a high level of ecological validity. It captures adolescents' moods and social interactions in their everyday routines, offering real-world, nearly real-time insights into the relationship between communication modes and mood. By inquiring about current mood and interactions, the study effectively minimizes recall bias, in contrast to relying on retrospective questions covering past weeks or months usually employed in cross-sectional research. The distinct pandemic-related social situations in sub-study 1 and 2 present a valuable chance to explore exceptional fluctuations in the social environment's circumstances.

5.2 Summary Chapter 3

The second empirical study aims to examine the role of social support in mitigating the negative impact of experiences of discrimination among first-generation Syrian, Polish, and Turkish immigrants in Germany. The research utilizes ecological momentary assessment data of young-adult migrants collected in May 2021 to investigate the situational variation in the relationship between experiences of discrimination within the last hour, perceived social support, and mood. Additionally, it explores the importance of the ethnicity of the support provider.

The study presents results from hybrid mixed-effects regression models. Results at the between-subject level indicate that individuals reporting many discrimination experiences generally tend to have lower mood scores, while those with on average higher perceived situational social support tend to report better mood. However, a slight buffering tendency is only observed for the Polish respondents, where the mood difference between individuals with a low and high amount of discrimination experiences is somewhat smaller for those with on average high perceived social support. At the within-subject level, a significant interaction

effect between discrimination and perceived social support is observed for the full sample and the Polish and Turkish subsamples. The negative mood impact of discrimination is smaller in situations with a higher level of perceived social support.

The study also investigated the impact of the interaction partners ethnic background for the buffering effect. Findings indicate a positive association between supportive interaction partners and mood for both within and between-subject effects. Altogether, the results indicate that the ethnic background of the interaction partner plays a subordinate role in stress buffering of discrimination compared to the degree to which individual perceive the same partner to be supportive.

The second empirical study offers several key strengths. The research is based on a relatively large sample of first-generation migrants in Germany, a subset of a larger random sample. This diverse sample provides valuable insights into the experiences of individuals from various migration backgrounds. In addition, the research question has not yet been investigated in Germany, despite its prominent status as a major destination for global migration flows. Study two also benefits from using ecological momentary assessment data. This approach not only increases ecological validity and reduces recall bias, but also enables participants to report on their interactions within diverse social contexts in their daily lives, which provides nearly real time data on different interaction partners regardless of whether these are significant others or acquaintances.

5.3 Summary Chapter 4

The study aims to investigate the relationship between social integration, loneliness, and mental health in adolescents. The study is based on data from the in-school panel survey, which conducted a longitudinal survey in 37 schools in Nord Rhine Westphalia, Germany and collected complete social networks. The research employs the social cognitive mapping approach as a proxy measurement for social interactions within the school cohort and applies stochastic actor oriented models to explore the co-development of social integration into cliques and loneliness as well as social integration and mental health during adolescence. To this end, RSiena co-evolution models were initially estimated separately for each school, and subsequently, the results were grouped in a meta-regression. The focus is on understanding the feedback processes between network structure, structural positions within peer networks, and changes in individuals' loneliness and mental health.

In summary, the study's findings suggest that adolescents with increased levels of loneliness are more likely to establish connections with a greater number of clique members. However, the study does not find indications for similarity effects within the school grade. Similarity with respect to mental health and loneliness does not appear to be relevant for clique formation. In relation to the behaviour dynamics, the level of mental health and loneliness of individuals with whom adolescents form a clique has no influence on their development of the corresponding trait. The results are thus not in line with the assumption of peer influence effects for loneliness and mental health. There is also no evidence that the number of clique members at school is relevant for the development of mental health or loneliness.

The strength of the third empirical study lies in its ability to test the hypothesised reciprocity between social ties and mental health. RSiena models are currently the most rigorous method for analysing longitudinal network data and their co-dependence with individual-level attributes. The study uses data from a two-year panel survey that includes complete social networks and thus information on existing and non-existing ties that may have been formed. The panel's size enables testing theoretical hypotheses in numerous contexts, minimizing reliance on the composition of individual social networks. Moreover, the study utilises the social cognitive mapping approach to surpass limitations of self-reported ties, providing a substitute for measuring social interactions within the school cohort.

5.4 Comparative perspective

Having summarised the research questions and findings of the three empirical studies, I will now synthesise the findings and highlight their empirical and theoretical implications. To accomplish this, the outcomes will be situated within the broader theoretical model illustrated in Figure 2.

All three studies explored the potential direct impact of social relationships on mental health (path c). Study 1 analysed the influence of social interactions with friends on mood. Study 2 looked into the effect of situation-specific perceived social support and how variance in the supportiveness of current interaction partners impacts mood. Study 3 examined the relevance of the quantity of friends or clique members in the school context on mental health. The findings of the third study indicate that the number of clique members does not play a decisive role in promoting mental health or decreasing loneliness. Instead, study 1 and 2 indicate that it is in-person contact with significant others or the perceived level of social

support within our social environment that has a positive impact. The findings are aligned with the main effect model of social support (e.g. Cohen & Wills, 1985; Thoits, 2011), which highlights the significance of social support, as well as the value of enriching daily experiences facilitated by social engagements, for mental health.

Only study two investigated the assumption of the buffering hypothesis, which proposes that the negative impact of stressors on health (path b) can be alleviated by positive social relationships (path e). The empirical evidence supports that experiences of discrimination have a negative impact on mood. However, the results of study two support the buffering hypothesis (Cohen & Wills, 1985) only partially. The stress-reducing impact of perceived social support in response to discrimination is primarily evident on the intra-individual level with less explicit effects in the comparison of individuals with different support resources.

The impact of different modes of contact on social ties' influence on mental health (path j) could only be tested in study 1. The study differentiated between in-person contact and text messaging with friends during adolescence. The findings suggest that in-person contact has a positive correlation with mood, regardless of the circumstances. However, text messaging only shows a positive relationship with mood under conditions of strict restriction of in-person interactions. The findings concerning the impact of mode of contact thus appear consistent with the theory of compensatory internet usage (Kardefelt-Winther, 2014). The beneficial effects of online communication appear solely during lockdown when the opportunity to maintain relationships through in-person meetings is limited.

A key aspect of this thesis is the incorporation of the attributes of the interaction partners. All three empirical studies explored potential mechanisms. Study 1 examined gender differences in the relevance of social interactions for mental health (path g). The results are in line with the assumption that the influence of different modes of contact on mood is greater for female adolescents. In the context of the nearly complete removal of contact restrictions, contact with friends no longer seems to impact the mood of male adolescents. The findings align with prior studies, suggesting that the quality of relationships and communication within intimate social circles carry greater significance for females (Kiecolt-Glaser & Newton, 2001; Williams, 1988). Alternatively, women may possess a greater need for social involvement to fulfil their emotional needs (Umberson et al., 1996).

Study three also investigates the extent to which the attributes of the interaction partners are important for the impact social ties have on mental health (path g). Peer influence

processes were analysed with regard to mental health and loneliness. The evidence indicates that the psychological health of clique members has no impact on the mental health of adolescents. Peer influence could not be confirmed for loneliness either. Study 2, conversely, investigated how attributes of the interaction partners moderate the stress-buffering effect of social support (path h). Nevertheless, findings indicate that the ethnic background of the interaction partner is of minor significance in the stress-buffering process. These findings differ from prior research that suggested variances in the importance of inter- and intra-ethnic support (e.g. Kim & Noh, 2016; Marinucci et al., 2022; Mossakowski & Zhang, 2014), and emphasise the importance of overall social support perceptions for mental health

Another central premise of this thesis is the assumption of feedback processes between social relationships and mental health. Using longitudinal analysis of social influence and selection processes, Study 3 tested this premise. The hypothesis that mental health affects the development of individuals' social relationships (path d) lacked confirmation. Mental health did not bear any association with the number of friends or clique members. Nevertheless, the findings suggest that adolescents who experience loneliness are more likely to seek greater social involvement. The results are therefore in line with the evolutionary perspective of loneliness, which sees loneliness as social pain that should motivate individuals to be more sociable (Cacioppo et al., 2006). In contrast, the results contrast with the assumptions of the self-reinforcing loop of loneliness, which would have predicted a deterioration of social relationships (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010).

The relevance of the interaction partner's attributes for the impact mental health has on social relationships (path f) was assessed with social selection effects. The results indicate that the mental health status of individuals in a network has no effect on their likelihood of having friends. Additionally, there is no indication that similarity in mental health or loneliness is important for social relationships formation. It is possible that changes occurring within a year may not be sufficiently prolonged to activate a downward spiral of depression (Coyne, 1976). However, the absence of selection effects in the context of the proposed distorted thought processes (Beck, 1967, 1976) may also be due to the way social networks are measured in my study. By design the social cognitive maps were chosen because they are not solely based on the nominations of the respective ego. If, for instance, isolation effects stem primarily from distorted perception, they are hence not accounted for in the present analysis. Therefore, the outcomes of Study 3 might suggest that feelings of loneliness and poor mental health give rise

to perceived but not actual isolation in the adolescents being studied – findings which align with the cognitive perspective.

To summarise, the findings support the assumptions of the main effect model of social support, with only partial confirmation of the buffering hypothesis. Furthermore, the results demonstrate the significance of the mode of communication for the extent of the positive main effect. Concerning the attribute of the interaction partner, the impact of social interactions on mood varies depending on gender. The findings from the longitudinal network analysis do not uphold the notion of social influence processes regarding mental health and loneliness, nor do they indicate that similarities in these traits influence clique member selection.

5.5 Limitations and outlook for future research

In this section, the limitations of the thesis are discussed in greater detail, with a focus on how future research could address these issues. This will include investigating inconsistencies between theoretical assumptions and empirical testing, as well as exploring broader limitations arising from the chosen research strategy.

(I) Content restrictions

The theoretical framework of this thesis demonstrates the potential importance of interaction partners' attributes and the mode of contact regarding the association between social ties and mental health. Within the context of the three empirical studies, only a partial investigation of the assumed pathways was feasible. But the impact of the mode of contact and the attributes of the interaction partner may very well interact with each other. For instance, the significance of inter- versus intra-ethnic contact might vary based on whether communication occurs in-person or online. Especially within the field of migration research, the differentiation between in-person interactions with family members and online transnational communication has demonstrated its significance (e.g. Bacigalupe & Cámara, 2012; Baldassar & Wilding, 2020; Chen & Choi, 2011). Future research at the outlined junction would require eligible data sets with a considerable number of cases to test all cross-combinations, as well as a research design capable of capturing different groups of individuals in diverse social contexts.

Another constraint lies in the empirical implementation of the theoretical framework. Only the assumptions of the main effect model and the buffering hypothesis (Cohen & Wills, 1985; Thoits, 2011) were directly tested in the context of the three presented theoretical

models of social support. In contrast, this thesis did not explicitly measure or test the preventive effect of social support (Diewald & Sattler, 2010), which is assumed to lead to a lower level of stressors in daily life. The absence of empirical examination of postulated theoretical mechanisms also constrains the first empirical study. Although it assumes theoretical pathways between social interactions with friends and mood, such as through the generation of social support (Berkman et al., 2000; Demirer et al., 2021; Thoits, 2011), these mechanisms are not explicitly tested.

(II) Causality: Misperception of social relationships

The assumption that mental illness may cause perceptual distortions (Beck, 1967, 1976) in the assessment of social relationships was an important factor in the use of social cognitive maps (Cairns et al., 1985; Kindermann, 1998) in Chapter 4. Nonetheless, this dissertation does not contain a concrete examination of this assumption. Therefore, the results of the empirical studies presented in Chapters 2 and 3 do not yield any conclusive evidence regarding the causality of the investigated relationship. It is possible that adolescents in a negative mood prefer alternative means of communication compared to when they have a more positive mood. Additionally, it is possible that individuals may perceive the same social situations differently, which could influence whether an interaction is considered discriminatory. The classification of an interaction as discriminatory may therefore be dependent on the current mood. For example, prior studies indicate that self-esteem is a predictor of minimizing discrimination encounters, which in turn contributes to the maintenance of self-esteem (Ruggiero & Taylor, 1997).

Future research could focus explicitly on identifying the causal direction in these relationships. One potential method is to analyse network data to identify discrepancies in nomination behaviour. Sociometric records of both the reception and provision of support or discrimination behaviour could enable the investigation of determinants for divergent perceptions of the same social situation by ego and alter. Previous research by Tatum and Grund (2020) indicates that depressive symptoms are not a significant explanatory factor for inconsistencies in dual perspectives of bullying. However, further research is required to examine variations in positive relationship types and other forms of negative ties.

(III) Dark side of social ties and social support

Further limitating the present study are potential adverse effects of social support - dependent on the relationship between ego and alter - discussed in Chapter 1. The dark side of social ties argument suggests that the provision of social support does not necessarily have a

purely positive impact on mental health. Nonetheless, this aspect remains unexplored in the empirical analyses which focusses on the potential of benefiting effects. However, it is worth noting that previous research highlights that negative ties and relationships are far less common than positive ones (Offer, 2021; Schuster et al., 1990).

One potential avenue for future research is the explicit evaluation of the tenets of equity theory (Foa, 1971; Tilden & Galyen, 1987) for the study of the dynamics of dyadic relationships. Employing ecological momentary assessment studies of dyads or social groups, researchers could directly observe the perceived balance of exchanged support resources between individuals, the perceived cost of social support provision, and changes in relationship quality on the situational level and estimate their relation to mood changes. Previous research assessing social support provision and reception suggests that providing support to others and sequential reciprocity within the exchange are relevant to maintaining good mental health (Bracke et al., 2008; Ngai et al., 2021; Rzeszutek & Gruszczyńska, 2018).

New insights might also be gained by investigating the temporal concurrence of stressor onset, need for social support and emotional preparedness to receive support. A lack of alignment in these factors can foster detrimental impacts on mental health if supporters: "minimize the threatening aspects of the problem, insist on maintaining a positive outlook, or pressure the person to recover or problem solve before he or she is ready. These attempts at problem focused coping assistance can create resentment and resistance in the distressed individual" (Thoits, 2011, p. 153). Cross-lagged panel models (Newsom, 2015), with different specifications of lagged effects and high-frequency ecological momentary assessment data, could provide future researchers with a direct method to examine the importance of different temporal intervals between the onset of a stressor and the receipt of social support in terms of their influence on mood.

A possible moderator that becomes evident when examining situation-level data are the attributes of social context. This thesis also does not examine the possible influence of variation in social contexts. However, whether we are with a group of peers at school or alone at home with only one other individual could impact whether received social support has a positive or negative impact. Chapter 1.2.3 describes the potential danger of experiencing shame as a result of receiving excessive social support. If others are present during the reception, the negative impact could be amplified. During adolescence, individuals often compare themselves to their peers and consider their evaluation for their own self-assessment. Anticipated negative evaluations are an important indicator of shame (Reimer, 1996).

(IV) Incorporation of cultural differences

In this thesis, a specific geographical and cultural region is considered with the SOCIALBOND project. Cross-cultural research indicates that there are cultural differences in the evaluation of social support seeking: “Persons socialized in interdependent cultures avoid seeking support in order to maintain harmony, save face, and maintain norms that personal problems should be solved on one’s own; in contrast, individuals raised in Western independent cultures see support networks as resources that can be used to meet personal needs” (Thoits, 2011, p. 157). There is also evidence suggesting cultural variations in the favoured types of social support (Chen et al., 2012; Kim et al., 2008; Morling et al., 2015).

It is important to acknowledge that cultural disparities also exist in the concepts of mental health and illness (Bass et al., 2007; Gopalkrishnan, 2018). This can cause difficulties in evaluating individuals' mental health status in the context of migration research. Such difficulties may arise particularly when individuals would be evaluated differently in their host society compared to their origin society.

Although the present thesis leverages data from various young migrant groups in Germany, differences between groups in perception of social support or mood states due to culture differences have not been considered. Testing for measurement invariance is a prevalent method utilised for such aims. However, prior research on measurement invariance in mental health reveals cross-cultural validity for only a limited number of scales (Bieda et al., 2017; Stevanovic et al., 2017).

(V) Reactivity in ecological momentary assessment studies

Reactivity in the context of survey research refers to the possibility that the questioning of certain content may influence the participants' perception of this phenomenon (Myin-Germeys et al., 2018; Napa Scollon et al., 2009). This is a widely debated issue, particularly in ecological momentary assessment studies. As the frequency of surveys increases, the salience of the topic could increase, resulting in a higher risk of activating cognitive thought processes. The study of social interactions and mood could be susceptible to this phenomenon. Participants may alter their interaction behaviour upon realizing, through the short surveys, that they spend significant time alone. Furthermore, administering frequent mood surveys may have a negative impact on the participants' mood, as they are required to ruminate more on the negative emotions and associated negative events (Nolen-Hoeksema et al., 2008). However, studies examining reactivity in ecological momentary assessment designs for outcomes such as chronic pain (Cruise et al., 1996), smoking behaviour (Rowan et

al., 2007), or alcohol consumption (Hufford et al., 2002) have found minimal or no reactivity effects.

(VI) Boundaries in complete social networks

A widely debated issue regarding the analysis of complete social network data is deciding where to set the network boundary (Laumann et al., 1989). Methodologically, this is crucial in order to inform individuals within the network for which set of alteri they should report relationship information about. Therefore, avoiding setting the network boundary too far is important, particularly in the context of survey research, as it could overwhelm participants cognitively. In Chapter 4, I chose to focus on the network boundary of relationships within a school cohort. Therefore, I cannot specifically consider or focus on potentially relevant social relationships in the family, neighbourhood, or club context. Even if a strong embeddedness in these could compensate or at least mitigate a possible isolation in the school context.

A potential avenue for future research is to combine process-generated data with survey data. If data on behaviour networks is collected, it would be feasible to observe larger social groups, such as entire cities, without adding to the cognitive burden of participants. Promising approaches in this context involve monitoring mobile phone calls or interactions within communication apps (Sapiezynski et al., 2019; Saramäki & Moro, 2015), as well as utilising Bluetooth signal strength parameters to evaluate the intensity of social relationships (Sekara & Lehmann, 2014). However, to gather information on individual-level attributes that are not directly observable, such as mental health, a combination with survey data would still be necessary. In the future, machine learning might help to predict the onset of mental disorders by passively monitoring smartphone usage patterns and GPS mobility (Canzian & Musolesi, 2015; Cao et al., 2020; Ware et al., 2020).

5.6 Conclusion

This dissertation combined ecological momentary assessment data and complete social networks to investigate the links between social relationships and mental health in German adolescents and young adults. The aim of the empirical studies was to examine the reciprocal association between social networks and mental health, along with the importance of the attributes of the individuals involved in interactions and different modes of contact in influencing the effect of social interactions on mood in everyday life social settings.

The introduction to the theoretical framework of this thesis illustrated that there is no dearth of well-grounded theories in mental health research. However, there is a need for future research to better utilise new and future data sources and analytical innovations to test these proposed theoretical mechanisms more rigorously. A promising approach lies in process-generated data, to capture complete social network data and predict the onset of mental health problems. Furthermore, analytical methods such as machine learning and longitudinal social network analysis could enhance our understanding of mental health dynamics. The use of these new data sources and analytical techniques offers the advantage of examining complete social networks beyond narrowly defined network boundaries, allowing us to investigate individuals in a variety of everyday social settings. Blind spots of traditional panel surveys could be overcome by the continuous nature of these data sources, thus providing insights into the situational level of social interactions on which many theoretical arguments are based.[7]

[7] The DeepL Write AI and ChatGPT were used for the purposes of spell checking and language editing.

Appendix

I Appendix to Chapter 2

Figures

Figure A 1: Mean mood by day of month and wave

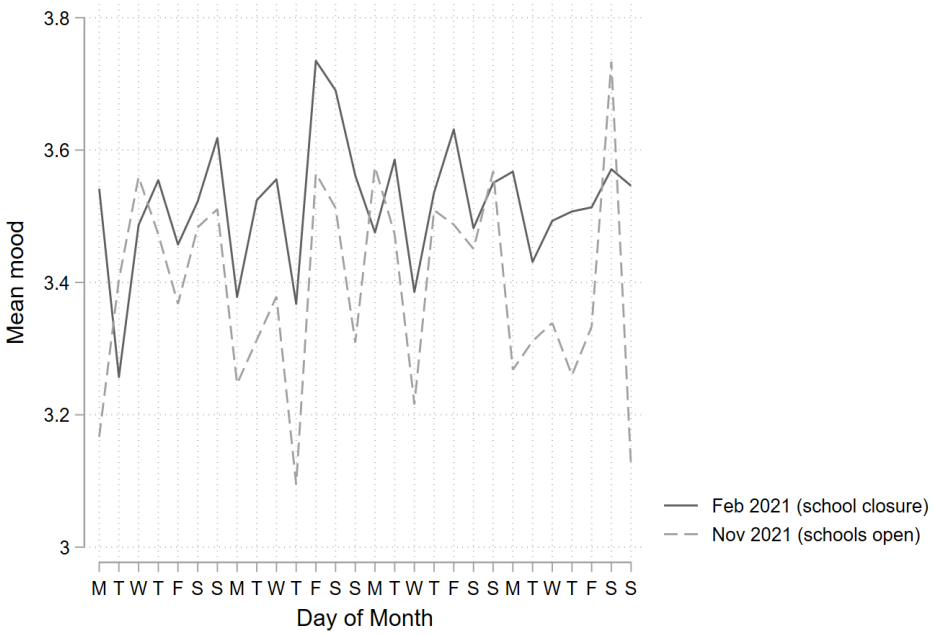
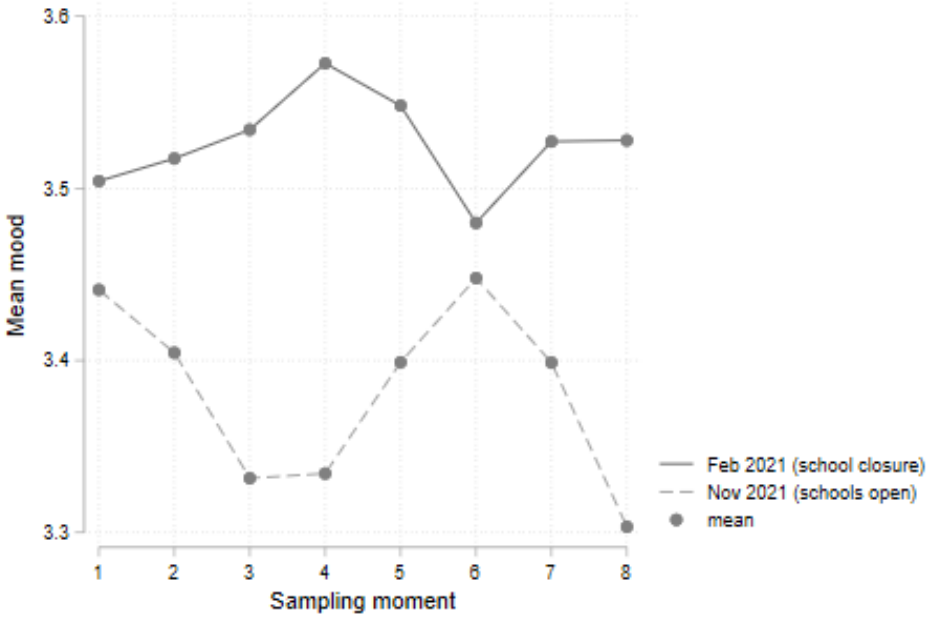


Figure A 2: Mean mood aggregated by signal number and wave



Tables

Table A1: Correlation matrix, Study 1

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Left home (today)	1.00								
(2) Social contact (today)	0.16	1.00							
(3) In-person contact friends (today)	0.30	0.26	1.00						
(4) Text messaging with friends (today)	0.02	0.36	0.07	1.00					
(5) Mood	0.08	0.05	0.10	0.05	1.00				
(6) Response time	0.09	0.07	0.08	0.03	-0.02	1.00			
(7) School day	-0.02	0.07	-0.07	0.12	-0.03	0.02	1.00		
(8) Sex	0.01	0.03	0.01	-0.10	-0.24	-0.00	0.04	1.00	
(9) Age	-0.00	-0.03	0.01	-0.07	0.02	0.04	-0.02	-0.05	1.00

Table A2: Correlation matrix, Study 2

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Left home (today)	1.00								
(2) Social contact (today)	0.28	1.00							
(3) In-person contact friends (last hour)	0.16	0.21	1.00						
(4) Text messaging with friends (last hour)	-0.06	0.03	-0.23	1.00					
(5) Mood	0.03	0.06	0.13	-0.04	1.00				
(6) Response time	0.02	0.10	0.02	-0.01	0.01	1.00			
(7) School day	0.39	0.11	0.09	-0.05	-0.07	-0.01	1.00		
(8) Sex	0.03	0.06	0.04	0.02	-0.15	-0.02	0.03	1.00	
(9) Age	0.02	0.03	-0.04	0.09	0.08	0.03	0.03	-0.18	1.00

Table A3: Robustness check: Fixed-effects regression of mood, Study 1

	(1) Full sample	(2) Boys	(3) Girls
Only in-person contact friends (today)	.15***	.026	.227***
	(.053)	(.067)	(.073)
Only text messaging with friends (today)	.053	-.023	.101*
	(.045)	(.066)	(.06)
Both in-person & text messaging with friends (today)	.313***	.267***	.356***
	(.072)	(.096)	(.1)
Any other contacts (today)	-.006	-.028	.02
	(.039)	(.053)	(.053)
Response time	-.011	.039**	-.041*
	(.015)	(.018)	(.021)
Weekday (ref. Mon)			
Tue	.052	.003	.077
	(.047)	(.074)	(.059)
Wed	.049	.106	.023
	(.05)	(.071)	(.069)
Thu	.023	.022	.024
	(.046)	(.057)	(.067)
Fri	.125***	.145**	.128*
	(.049)	(.064)	(.067)
Sat	.087	-.026	.164**
	(.055)	(.071)	(.076)
Sun	.096*	.011	.144*
	(.055)	(.069)	(.077)
School day	-.039	-.123**	.007
	(.043)	(.054)	(.06)
Constant	3.48***	3.717***	3.315***
	(.069)	(.101)	(.089)
Observations	1681	663	1018
Within R^2	.028	.046	.039

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

Table A4: Fixed-effects regression of mood including an interaction between mode of contact and gender, Study 1 and Study 2

	(1) Study 1	(2) Study 2
In-person contact with friends	.108	.1
	(.068)	(.102)
In-person contact with friends*Gender	.124	.171
	(.086)	(.116)
Gender (ref. boys; omitted)		
Text messaging with friends	.031	.014
	(.059)	(.114)
Text messaging with friends*Gender	.073	-.066
	(.075)	(.129)
Any other contact	-.003	.046
	(.036)	(.055)
Response time	-.011	-.008
	(.014)	(.02)
Weekday (ref. Mon)		
Tue	.052	.063
	(.048)	(.064)
Wed	.047	-.01
	(.049)	(.066)
Thu	.023	-.01
	(.048)	(.066)
Fri	.128***	.121*
	(.047)	(.066)
Sat	.084	.126
	(.055)	(.08)
Sun	.092*	.064
	(.056)	(.08)
School day	-.041	-.08
	(.041)	(.061)
Constant	3.476***	3.357***
	(.062)	(.088)
Observations	1681	1003
Within R^2	.029	.045

*Standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

II Appendix to Chapter 3

Tables

Table A1: Matrix of correlations (analysis sample, all signals)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Mood	1.00										
(2) Discrimination (last hour)	-0.22	1.00									
(3) Perceived support	0.56	-0.19	1.00								
(4) Time of day	0.02	-0.03	0.01	1.00							
(5) Weekday	0.02	-0.14	-0.01	0.02	1.00						
(6) Age	0.07	-0.01	0.03	-0.01	0.00	1.00					
(7) Years of education	0.04	-0.05	0.08	0.00	0.02	0.24	1.00				
(8) Income	0.12	-0.05	0.16	-0.00	0.01	0.30	0.24	1.00			
(9) Language proficiency	-0.01	-0.03	-0.02	-0.01	0.00	0.34	0.05	0.23	1.00		
(10) Length of stay (years)	0.04	0.02	-0.02	0.00	-0.01	0.03	-0.13	-0.24	-0.35	1.00	
(11) Well-Being	0.42	-0.07	0.35	0.00	-0.01	0.08	0.06	0.00	-0.08	0.04	1.00

Table A2: Matrix of correlations (analysis sample, time points with interactions only)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Mood	1.00												
(2) Discrimi. (last hour)	-0.27	1.00											
(3) Perceived support	0.55	-0.24	1.00										
(4) Same ethnicity	0.03	-0.05	-0.00	1.00									
(5) Supportive interaction	0.28	-0.19	0.38	0.25	1.00								
(6) Time of day	0.04	-0.03	0.02	0.09	0.03	1.00							
(7) Weekday	0.08	-0.12	0.04	0.08	0.04	0.06	1.00						
(8) Age	0.05	-0.01	0.00	0.04	-0.00	-0.00	0.04	1.00					
(9) Years of education	0.03	-0.05	0.06	-0.05	-0.01	-0.00	0.05	0.28	1.00				
(10) Income	0.09	-0.07	0.14	-0.06	0.07	-0.01	0.06	0.31	0.24	1.00			
(11) Length of stay (years)	0.02	0.05	-0.02	0.01	0.00	-0.01	-0.03	0.04	-0.12	-0.21	1.00		
(12) Language proficiency	-0.04	-0.04	-0.06	0.12	-0.00	-0.01	0.03	0.32	0.08	0.18	-0.28	1.00	
(13) Well-Being	0.42	-0.09	0.35	-0.02	0.15	-0.00	0.01	0.12	0.04	0.02	0.04	-0.05	1.00

Table A3: Between-cluster, and within-cluster variance, ICC

Variable	Between-cluster variance	Within-cluster variance	ICC
Mood	.301	.231	.566
Discrimination (last hour)	.019	.047	.291
Perceived support	.642	.197	.765
Same ethnicity	.082	.168	.330
Supportive interaction	.392	1.09	.264

Intra-class correlation is defined as: Variance level 2 /(variance level 1 + variance level 2)
Variance estimation based on empty mixed model

Table A4: Multilevel mixed-effects linear regression, main effects (analysis sample, all signals)

	Full sample (1) Mood [a]	Syrians (2) Mood [b]	Poles (3) Mood [b]	Turks (4) Mood [b]
Between subject effect:				
Discrimination	-.357***	-.36***	-.725***	-.145
	(.078)	(.113)	(.19)	(.129)
Perceived support	.322***	.322***	.307***	.356***
	(.02)	(.04)	(.032)	(.033)
Within subject effect:				
Discrimination	-.268***	-.237***	-.305***	-.276***
	(.022)	(.038)	(.04)	(.039)
Perceived support	.445***	.445***	.447***	.436***
	(.011)	(.02)	(.016)	(.019)
Constant	1.886***	1.867***	2.363***	1.574***
	(.134)	(.284)	(.218)	(.209)
var(_cons)	.120***	.123***	.121***	.103***
	(.008)	(.014)	(.012)	(.012)
var(Residual)	.184***	.182***	.187***	.179***
	(.003)	(.005)	(.005)	(.005)
N (level 1)	9282	2614	3753	2915
N (level 2)	741	231	281	229

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*
[a] adjusted for time of day, weekday, gender, country of origin, years of education, income, length of stay, language proficiency, well-being (all random effects)
[b] adjusted for time of day, weekday, gender, years of education, income, length of stay, language proficiency, well-being (all random effects)

Table A5: Multilevel mixed-effects linear regression, main effects (analysis sample, time points with interactions only)

	Full sample	Syrians	Poles	Turks
	(1)	(2)	(3)	(4)
	Mood [a]	Mood [b]	Mood [b]	Mood [b]
Between subject effect:				
Discrimination	-.447***	-.331**	-1.055***	-.315**
	(.099)	(.149)	(.236)	(.152)
Support (interaction)	.168***	.125***	.152***	.226***
	(.021)	(.04)	(.036)	(.034)
Ethnicity (interaction)	-.054	-.047	.019	-.107
	(.049)	(.096)	(.083)	(.079)
Within subject effect:				
Discrimination	-.412***	-.414***	-.427***	-.403***
	(.031)	(.059)	(.051)	(.055)
Support (interaction)	.07***	.076***	.079***	.048***
	(.008)	(.019)	(.01)	(.014)
Ethnicity (interaction)	-.018	-.045	-.009	-.009
	(.019)	(.044)	(.027)	(.033)
Constant	2.483***	2.724***	2.938***	2.124***
	(.154)	(.327)	(.248)	(.226)
var(_cons)	.124***	.124***	.128***	0.095***
	(.009)	(.019)	(.015)	(.014)
var(Residual)	.221***	.210***	.227***	.216***
	(.005)	(.011)	(.007)	(.009)
N (level 1)	4797	975	2320	1502
N (level 2)	702	210	273	219

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

[a] adjusted for time of day, weekday, gender, country of origin, years of education, income, length of stay, language proficiency, well-being (all random effects)

[b] adjusted for time of day, weekday, gender, years of education, income, length of stay, language proficiency, well-being (all random effects)

III Appendix to Chapter 4

Figures

Figure A1: Distribution of Mental Health Score

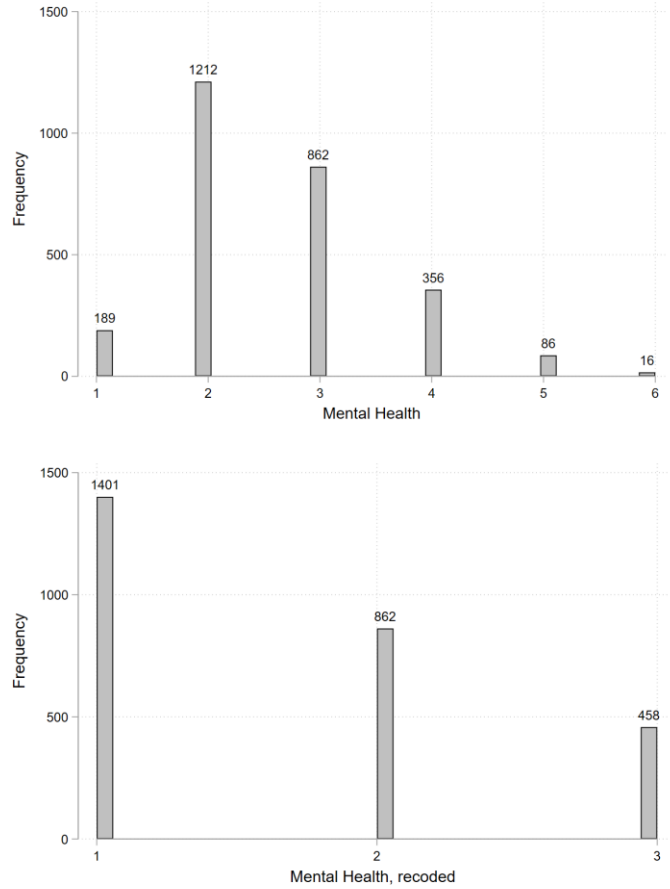
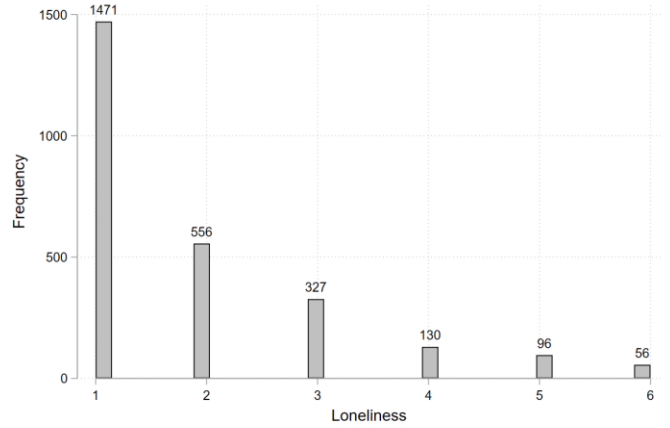


Figure A2: Distribution of Loneliness



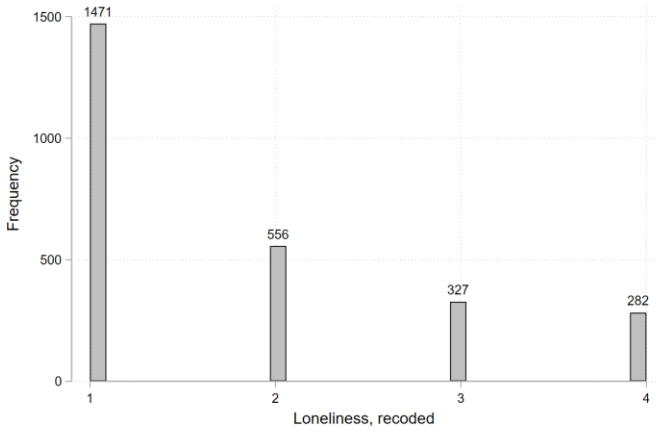


Figure A3: Goodness of Fit, co-evolution model loneliness and cliques: behavior

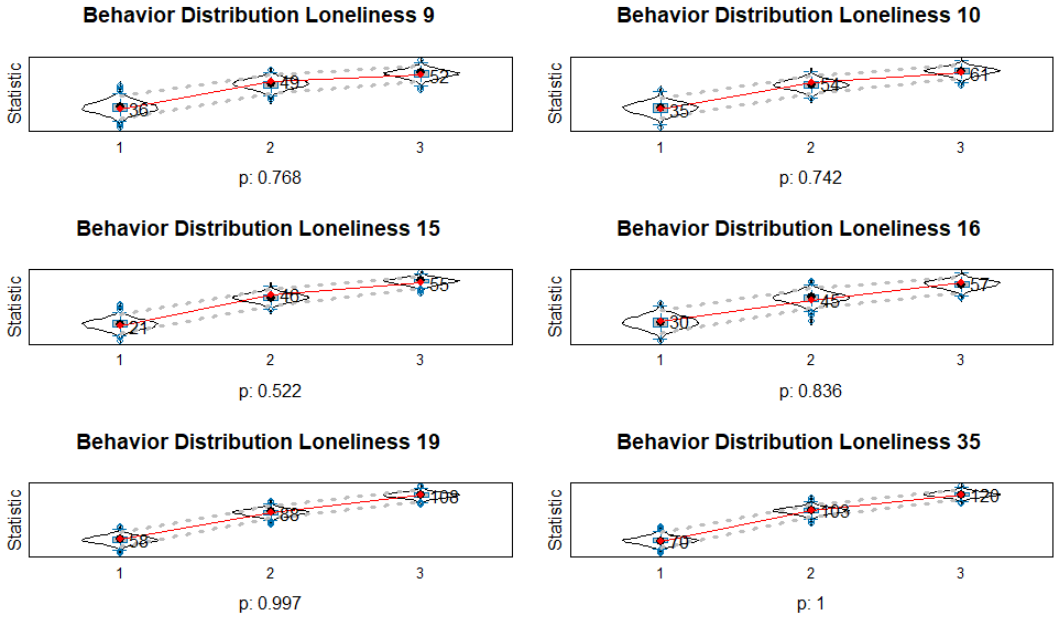


Figure A4: Goodness of Fit, co-evolution model loneliness and cliques: outdegree distribution

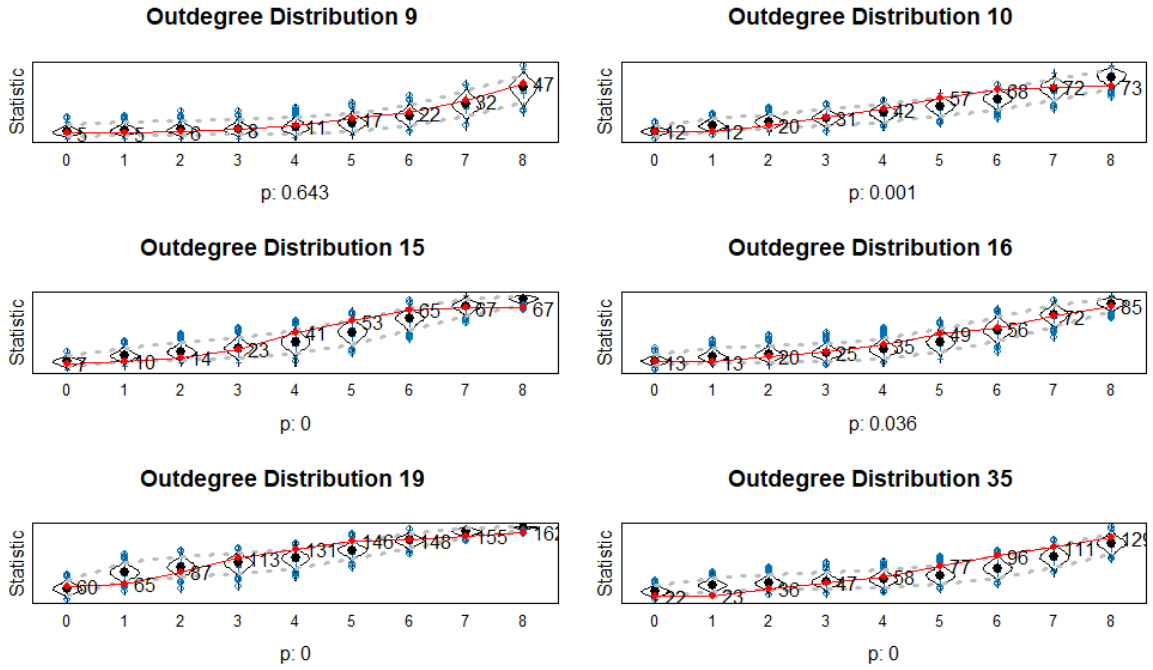


Figure A5: Goodness of Fit, co-evolution model loneliness and cliques: triad census

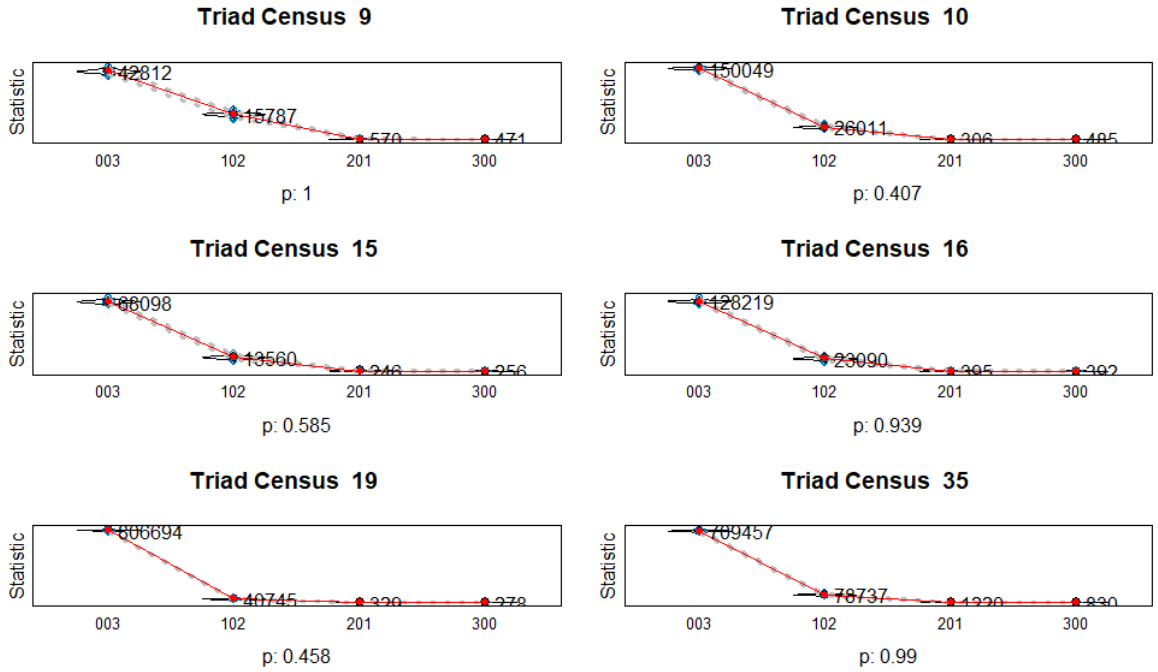


Figure A6: Goodness of Fit, co-evolution model loneliness and cliques: geodesic distance

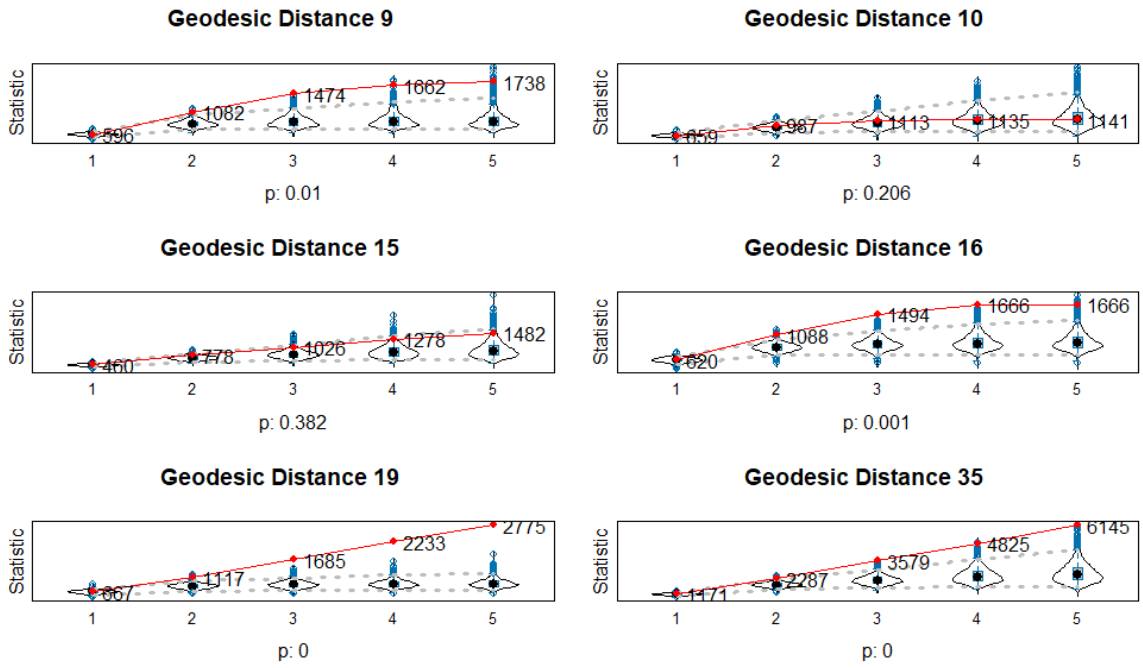


Figure A7: Goodness of Fit, co-evolution model loneliness and cliques: clique census

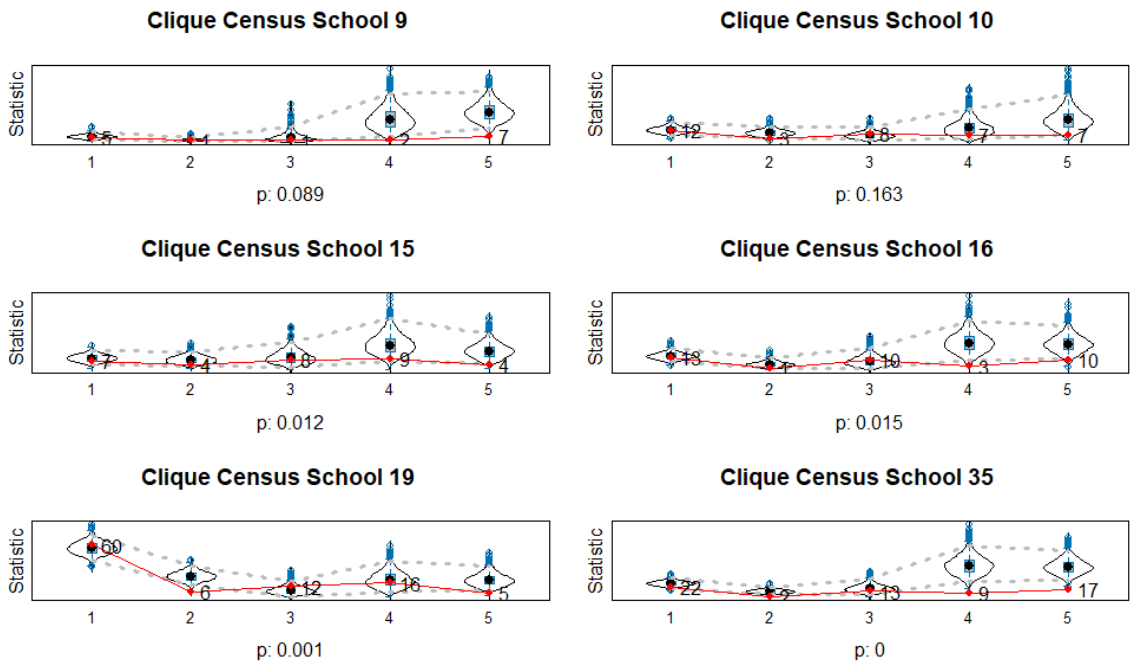


Figure A8: Goodness of Fit, co-evolution model mental health and cliques: behavior

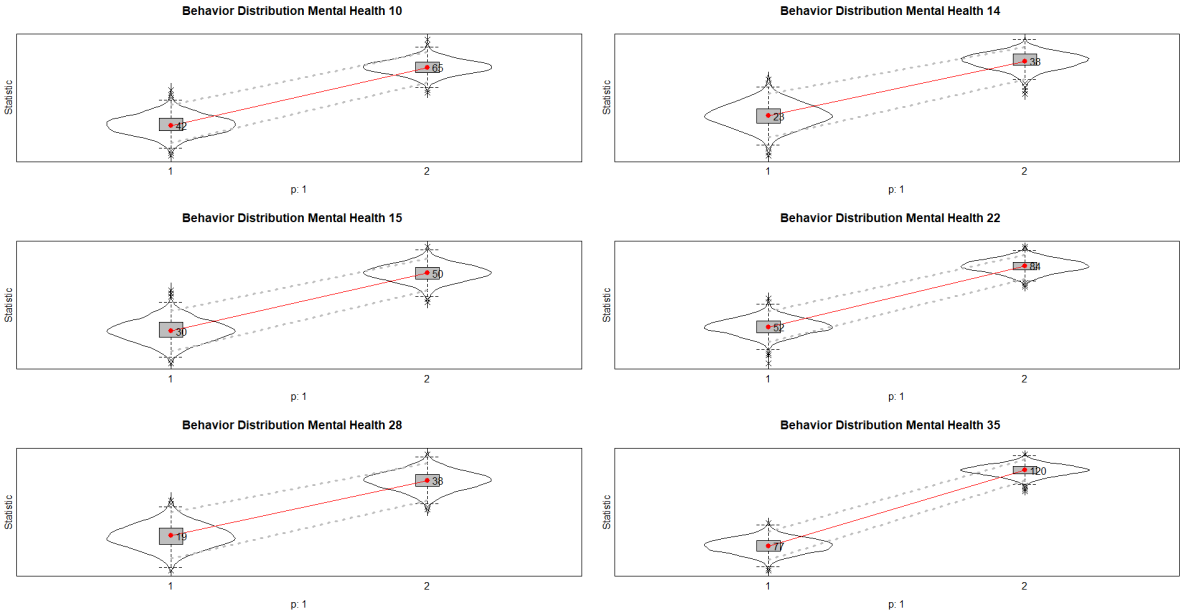


Figure A9: Goodness of Fit, co-evolution model mental health and cliques: outdegree distribution

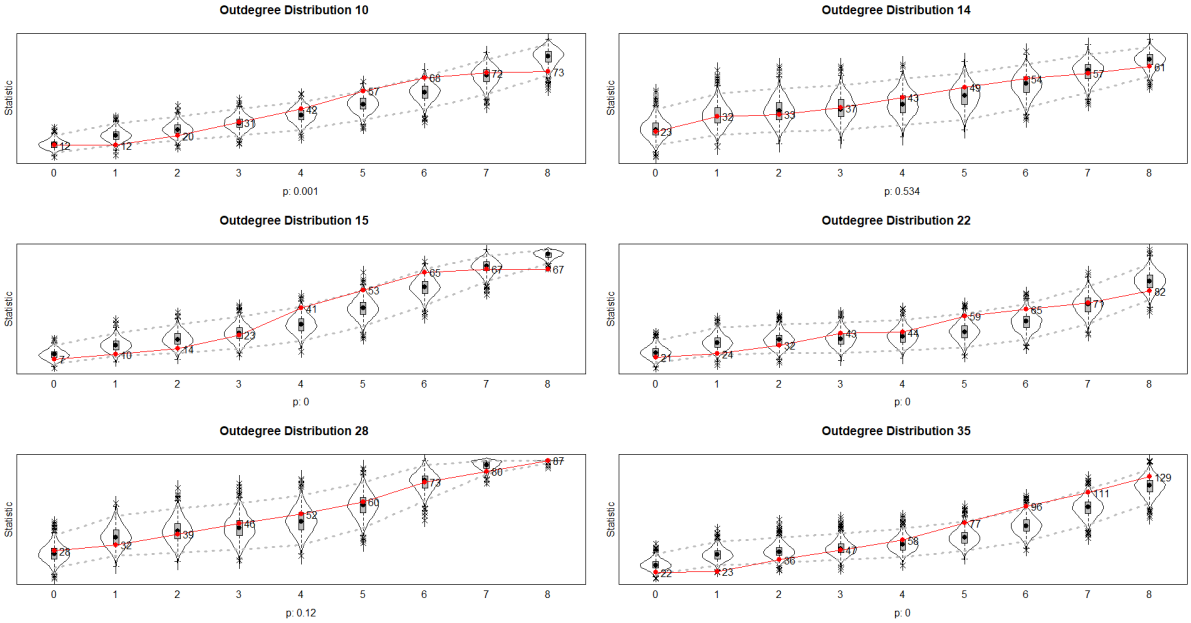


Figure A10: Goodness of Fit, co-evolution model mental health and cliques: triad census

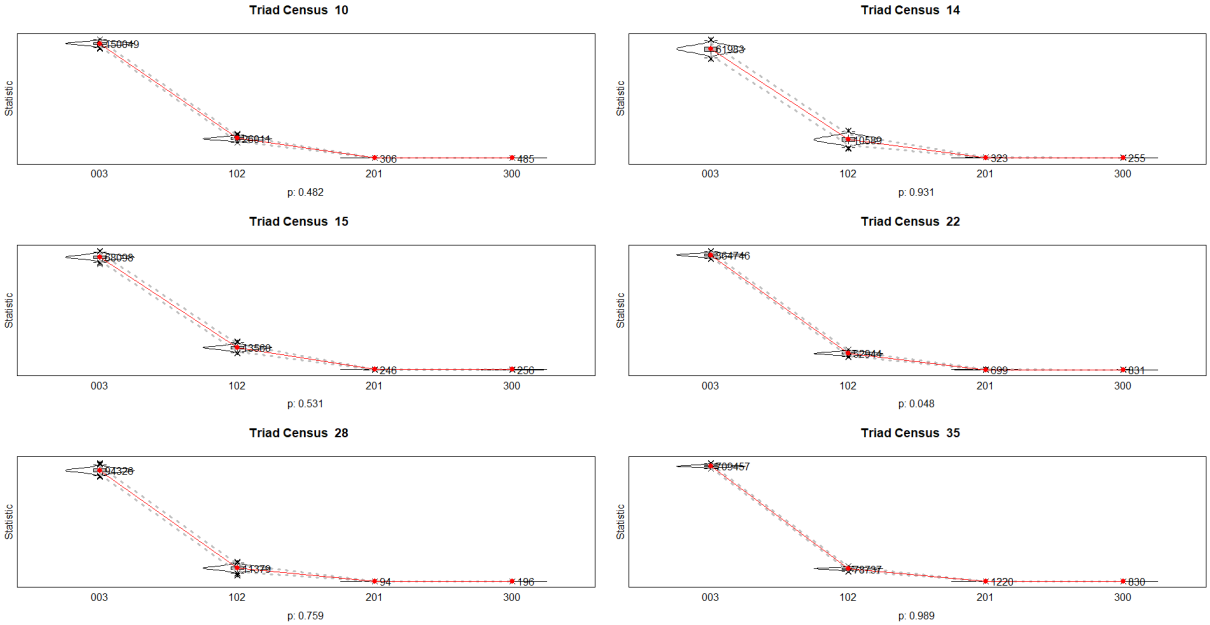


Figure A11: Goodness of Fit, co-evolution model mental health and cliques: geodesic distance

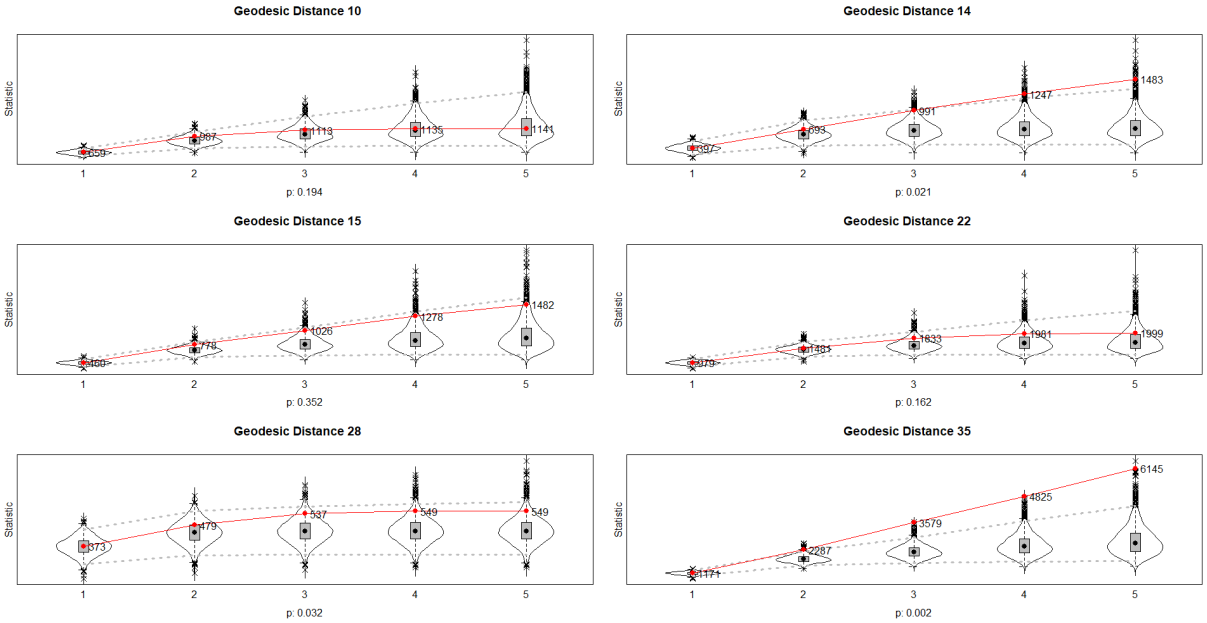
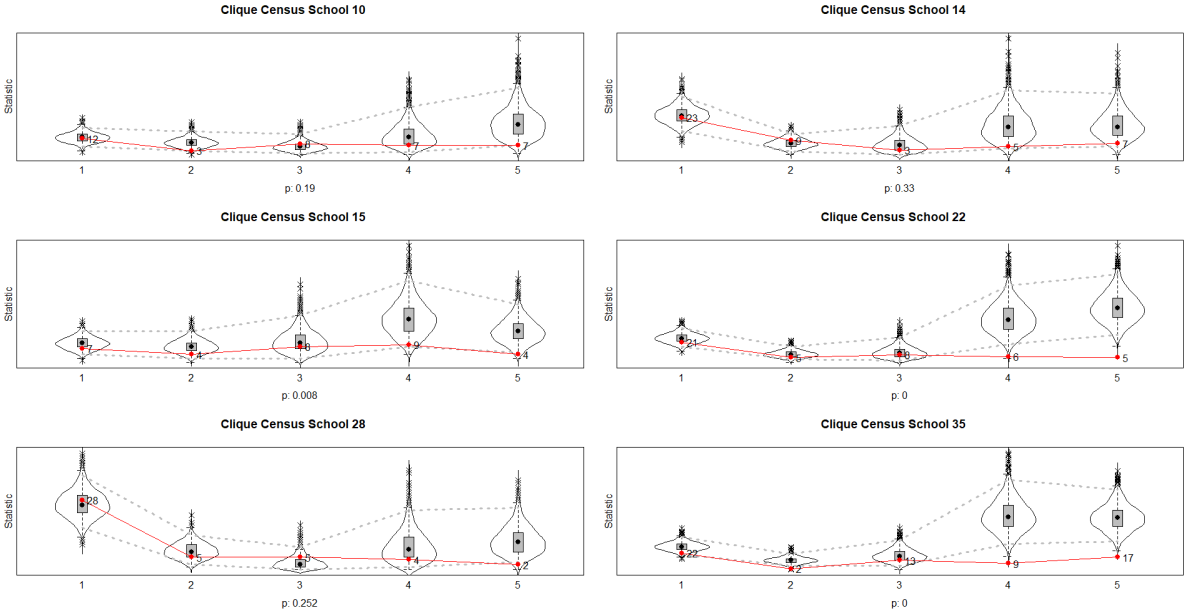


Figure A12: Goodness of Fit, co-evolution model mental health and cliques: clique census



Tables

Table A1: Comparison of descriptive between social cognitive maps after and before the use of function described in operationalization

	Cliques (function applied)	Cliques (no function applied, weights set to one)
Jaccard index t1-t2	0,265135135	0,25513514
Density t1	0,044166456	0,0801026
Density t2	0,053544274	0,0969005
Maximum outdegree t1	11,08108108	19,5675676
Maximum outdegree t2	11,89189189	20,8918919
Number of isolates per school coohort t1	27,94594595	22,1081081
Number of isolates per school coohort t2	21,35135135	14,7027027

Table A2: Descriptive comparison of schools which met the convergence criteria and those that did not (for the last four columns only those schools are considered with a participation rate > 70%)

	All schools	All schools with particpation rate > 70%	Schools with converged co-evolution models of mental health and networks	Schools that did NOT converge for co-evolution models of mental health and networks	Schools with converged co-evolution models of loneliness and networks	Schools that did NOT converge for co-evolution models of loneliness and networks
Jaccard index t1-t2	0,26513514	0,28366667	0,22166667	0,29708333	0,26666667	0,28583333
Density t1	0,04416646	0,0454119	0,05299381	0,04425107	0,04842533	0,04539319
Density t2	0,05354427	0,05333661	0,06562326	0,05094021	0,06296847	0,05160391
Maximum outdegree t1	11,0810811	11,6333333	9,83333333	11,875	11,3333333	11,5
Maximum outdegree t2	11,8918919	12,5666667	12,3333333	12,3333333	14,6666667	11,75
Number of isolates per school coohort t1	27,9459459	26,9666667	20,8333333	28,1666667	25	27,125
Number of isolates per school coohort t2	21,3513514	20,0666667	14	21,125	17,3333333	20,2916667
Participation rate t1	0,7444276	0,78935709	0,72977269	0,79337865	0,76487564	0,78460291
Participation rate t2	0,79837772	0,83369097	0,8076778	0,83128904	0,85028957	0,8206361
Number of students	94,027027	98,7333333	65	105,416667	86,6666667	100

References

References

Aboutalebi Karkavandi, M., Wang, P., Lusher, D., Bastian, B., McKenzie, V., & Robins, G. (2022). Perceived friendship network of socially anxious adolescent girls. *Social Networks*, *68*, 330-345. https://doi.org/https://doi.org/10.1016/j.socnet.2021.08.011

Ahn, D., & Shin, D.-H. (2013). Is the social use of media for seeking connectedness or for avoiding social isolation? Mechanisms underlying media use and subjective well-being. *Computers in Human Behavior*, *29*(6), 2453-2462. https://doi.org/https://doi.org/10.1016/j.chb.2012.12.022

Ajrouch, K. J., Reisine, S., Lim, S., Sohn, W., & Ismail, A. (2010). Perceived everyday discrimination and psychological distress: does social support matter? *Ethnicity & Health*, *15*(4), 417-434. https://doi.org/10.1080/13557858.2010.484050

Alcántara, C., Patel, S. R., Carnethon, M., Castañeda, S. F., Isasi, C. R., Davis, S., Ramos, A. R., Arredondo, E., Redline, S., Zee, P. C., & Gallo, L. C. (2017). Stress and sleep: Results from the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. *SSM - Population Health*, *3*, 713-721. https://doi.org/https://doi.org/10.1016/j.ssmph.2017.08.004

Allison, P. D. (2009). *Fixed effects regression models*. SAGE publications.

Alloy, L. B., & Abramson, L. Y. (1979). Judgment of contingency in depressed and nondepressed students: sadder but wiser? *Journal of Experimental Psychology: General*, *108*(4), 441-485. https://doi.org/10.1037//0096-3445.108.4.441

Amann, G. (1991). Social network and social support deficits in depressed patients: A result of distorted perception? *European Archives of Psychiatry and Clinical Neuroscience*, *241*(1), 49-56. https://doi.org/https://doi.org/10.1007/BF02193755

Angold, A., & Costello, E. J. (2006). Puberty and Depression. *Child and Adolescent Psychiatric Clinics of North America*, *15*(4), 919-937. https://doi.org/https://doi.org/10.1016/j.chc.2006.05.013

Angold, A., Costello, E. J., & Worthman, C. M. (1998). Puberty and depression: the roles of age, pubertal status and pubertal timing. *Psychological Medicine*, *28*(1), 51-61. https://doi.org/10.1017/S003329179700593X

Armey, M. F., Schatten, H. T., Haradhvala, N., & Miller, I. W. (2015). Ecological momentary assessment (EMA) of depression-related phenomena. *Current Opinion in Psychology*, *4*, 21-25. https://doi.org/10.1016/j.copsyc.2015.01.002

Arnold, S. V., Smolderen, K., G., Buchanan, D., M., Li, Y., & Spertus, J., A. (2012). Perceived Stress in Myocardial Infarction. *Journal of the American College of Cardiology*, *60*(18), 1756-1763. https://doi.org/10.1016/j.jacc.2012.06.044

Asher, M., Asnaani, A., & Aderka, I. M. (2017). Gender differences in social anxiety disorder: A review. *Clinical Psychology Review*, *56*, 1-12. https://doi.org/https://doi.org/10.1016/j.cpr.2017.05.004

Asscheman, J. S., Zanolie, K., Bexkens, A., & Bos, M. G. N. (2021). Mood Variability Among Early Adolescents in Times of Social Constraints: A Daily Diary Study During the COVID-19 Pandemic. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.722494

Bacigalupe, G., & Cámara, M. (2012). Transnational Families and Social Technologies: Reassessing Immigration Psychology. *Journal of Ethnic and Migration Studies*, *38*(9), 1425-1438. https://doi.org/10.1080/1369183X.2012.698211

Baerveldt, C., Van Duijn, M. A. J., Vermeij, L., & Van Hemert, D. A. (2004). Ethnic boundaries and personal choice. Assessing the influence of individual inclinations to

choose intra-ethnic relationships on pupils' networks. *Social Networks*, *26*(1), 55-74. https://doi.org/https://doi.org/10.1016/j.socnet.2004.01.003

Baldassar, L., & Wilding, R. (2020). Migration, Aging, and Digital Kinning: The Role of Distant Care Support Networks in Experiences of Aging Well. *The Gerontologist*, *60*(2), 313-321. https://doi.org/10.1093/geront/gnz156

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc.

Baptista, B. O., Beuter, M., Girardon-Perlini, N. M. O., Brondani, C. M., Budó, M. d. L. D., & Santos, N. O. d. (2012). Overload of family caregiver at home: an integrative literature review. *Revista Gaucha de Enfermagem*, *33*, 147-156.

Barendse, M. E. A., Flannery, J., Cavanagh, C., Aristizabal, M., Becker, S. P., Berger, E., Breaux, R., Campione-Barr, N., Church, J. A., Crone, E. A., Dahl, R. E., Dennis-Tiwary, T. A., Dvorsky, M. R., Dziura, S. L., van de Groep, S., Ho, T. C., Killoren, S. E., Langberg, J. M., Larguinho, T. L., . . . Pfeifer, J. H. (2023). Longitudinal Change in Adolescent Depression and Anxiety Symptoms from before to during the COVID-19 Pandemic. *Journal of Research on Adolescence*, *33*(1), 74-91. https://doi.org/https://doi.org/10.1111/jora.12781

Barney, L. J., Griffiths, K. M., Christensen, H., & Jorm, A. F. (2009). Exploring the nature of stigmatising beliefs about depression and help-seeking: Implications for reducing stigma. *BMC Public Health*, *9*(1), 61. https://doi.org/10.1186/1471-2458-9-61

Barrera, M. (1986). Distinctions between social support concepts, measures, and models. *American Journal of Community Psychology*, *14*(4), 413-445. https://doi.org/https://doi.org/10.1007/BF00922627

Bas-Sarmiento, P., Saucedo-Moreno, M. J., Fernández-Gutiérrez, M., & Poza-Méndez, M. (2017). Mental Health in Immigrants Versus Native Population: A Systematic Review of the Literature. *Archives of Psychiatric Nursing*, *31*(1), 111-121. https://doi.org/10.1016/j.apnu.2016.07.014

Bass, J. K., Bolton, P. A., & Murray, L. K. (2007). Do not forget culture when studying mental health. *Lancet*, *370*(9591), 918-919. https://doi.org/10.1016/s0140-6736(07)61426-3

Bates, L. C., Zieff, G., Stanford, K., Moore, J. B., Kerr, Z. Y., Hanson, E. D., Barone Gibbs, B., Kline, C. E., & Stoner, L. (2020). COVID-19 Impact on Behaviors across the 24-Hour Day in Children and Adolescents: Physical Activity, Sedentary Behavior, and Sleep. *Children*, *7*(9), 138. https://doi.org/10.3390/children7090138

Baum, F. E., & Ziersch, A. M. (2003). Social capital. *J Epidemiol Community Health*, *57*(5), 320-323. https://doi.org/10.1136/jech.57.5.320

Beck, A. T. (1967). *Depression*. Harper and Row.

Beck, A. T. (1976). *Cognitive Therapy and the Emotional Disorders*. International Universities Press.

Begg, M. D., & Parides, M. K. (2003). Separation of individual-level and cluster-level covariate effects in regression analysis of correlated data. *Statistics in Medicine*, *22*(16), 2591-2602. https://doi.org/10.1002/sim.1524

Bell, A., Fairbrother, M., & Jones, K. (2019). Fixed and random effects models: making an informed choice. *Quality & Quantity*, *53*(2), 1051-1074. https://doi.org/10.1007/s11135-018-0802-x

Berjot, S., & Gillet, N. (2011). Stress and Coping with Discrimination and Stigmatization [Hypothesis and Theory]. *Frontiers in Psychology*, *2*(33), 1-13. https://doi.org/10.3389/fpsyg.2011.00033

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

Bernard, H. R., & Killworth, P. D. (2006). Informant Accuracy in Social Network Data II. *Human Communication Research*, *4*(1), 3-18. https://doi.org/https://doi.org/10.1111/j.1468-2958.1977.tb00591.x

Bernard, H. R., Killworth, P. D., & Sailer, L. (1979). Informant accuracy in social network data IV: a comparison of clique-level structure in behavioral and cognitive network data. *Social Networks*, *2*(3), 191-218. https://doi.org/https://doi.org/10.1016/0378-8733(79)90014-5

Bernasco, E. L., Nelemans, S. A., van der Graaff, J., & Branje, S. (2021). Friend Support and Internalizing Symptoms in Early Adolescence During COVID-19. *Journal of Research on Adolescence*, *31*(3), 692-702. https://doi.org/https://doi.org/10.1111/jora.12662

Biddle, S. J. H., & Asare, M. (2011). Physical activity and mental health in children and adolescents: a review of reviews. *British Journal of Sports Medicine*, *45*(11), 886. https://doi.org/https://doi.org/10.1136/bjsports-2011-090185

Bieda, A., Hirschfeld, G., Schönfeld, P., Brailovskaia, J., Zhang, X. C., & Margraf, J. (2017). Universal happiness? Cross-cultural measurement invariance of scales assessing positive mental health. *Psychological Assessment*, *29*(4), 408-421. https://doi.org/10.1037/pas0000353

Biehle, S. N., & Mickelson, K. D. (2012). Provision and receipt of emotional spousal support: The impact of visibility on well-being. *Couple and Family Psychology: Research and Practice*, *1*(3), 244-251. https://doi.org/10.1037/a0028480

Blakemore, S.-J. (2019). Adolescence and mental health. *The Lancet*, *393*(10185), 2030-2031. https://doi.org/https://doi.org/10.1016/S0140-6736(19)31013-X

Block, P., & Burnett Heyes, S. (2020). Sharing the load: Contagion and tolerance of mood in social networks. *Emotion*. https://doi.org/https://doi.org/10.1037/emo0000952

Bondonio, D. (1998). Predictors of accuracy in perceiving informal social networks. *Social Networks*, *20*(4), 301-330. https://doi.org/https://doi.org/10.1016/S0378-8733(98)00007-0

Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network Analysis in the Social Sciences. *Science*, *323*(5916), 892-895. https://doi.org/doi:10.1126/science.1165821

Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). Greenwood Press.

Bowen, R. C., Wang, Y., Balbuena, L., Houmphan, A., & Baetz, M. (2013). The relationship between mood instability and depression: implications for studying and treating depression. *Medical Hypotheses*, *81*(3), 459-462. https://doi.org/10.1016/j.mehy.2013.06.010

Bracke, P., Christiaens, W., & Verhaeghe, M. (2008). Self-Esteem, Self-Efficacy, and the Balance of Peer Support Among Persons With Chronic Mental Health Problems. *Journal of Applied Social Psychology*, *38*(2), 436-459. https://doi.org/https://doi.org/10.1111/j.1559-1816.2008.00312.x

Brance, K., Chatzimpyros, V., & Bentall, R. P. (2022). Perceived Discrimination and Mental Health: The Role of Immigrant Social Connectedness during the COVID-19 Pandemic. *Journal of Migration and Health*, *6*, 100127. https://doi.org/https://doi.org/10.1016/j.jmh.2022.100127

Brault, M.-C., Meuleman, B., & Bracke, P. (2012). Depressive symptoms in the Belgian population: disentangling age and cohort effects. *Social Psychiatry and Psychiatric Epidemiology*, *47*(6), 903-915. https://doi.org/10.1007/s00127-011-0398-0

Brown, R. M., Roberts, S. G. B., & Pollet, T. V. (2021). Loneliness is negatively related to Facebook network size, but not related to Facebook network structure. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *15*(2), Article 6. https://doi.org/https://doi.org/10.5817/CP2021-2-6

Buchholz, E. S., & Catton, R. (1999). Adolescents' perceptions of aloneness and loneliness. *Adolescence*, *34*(133), 203-213.

Burke, M., & Kraut, R. E. (2016). The Relationship Between Facebook Use and Well-Being Depends on Communication Type and Tie Strength. *Journal of Computer-Mediated Communication*, *21*(4), 265-281. https://doi.org/https://doi.org/10.1111/jcc4.12162

Burwell, R. A., & Shirk, S. R. (2007). Subtypes of rumination in adolescence: associations between brooding, reflection, depressive symptoms, and coping. *Journal of Clinical Child & Adolescent Psychology*, *36*(1), 56-65. https://doi.org/10.1080/15374410709336568

Butts, C. T. (2003). Network inference, error, and informant (in)accuracy: a Bayesian approach. *Social Networks*, *25*(2), 103-140. https://doi.org/https://doi.org/10.1016/S0378-8733(02)00038-2

Cacioppo, J., Hawkley, L., Ernst, J., Burleson, M., Berntson, G., Nouriani, B., & Spiegel, D. (2006). Loneliness within a nomological net: An evolutionary perspective. Journal of Research in Personality, 40, 1054-1085. *Journal of Research in Personality*, *40*, 1054-1085. https://doi.org/https://doi.org/10.1016/j.jrp.2005.11.007

Cacioppo, J. T., & Cacioppo, S. (2018). Chapter Three - Loneliness in the Modern Age: An Evolutionary Theory of Loneliness (ETL). In J. M. Olson (Ed.), *Advances in Experimental Social Psychology* (Vol. 58, pp. 127-197). Academic Press. https://doi.org/https://doi.org/10.1016/bs.aesp.2018.03.003

Cacioppo, J. T., Cacioppo, S., Capitanio, J. P., & Cole, S. W. (2015). The Neuroendocrinology of Social Isolation. *Annual Review of Psychology*, *66*(1), 733-767. https://doi.org/https://doi.org/10.1146/annurev-psych-010814-015240

Cacioppo, J. T., Fowler, J. H., & Christakis, N. A. (2009). Alone in the crowd: the structure and spread of loneliness in a large social network. *Journal of personality and social psychology*, *97*(6), 977-991. https://doi.org/https://doi.org/10.1037/a0016076

Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends in cognitive sciences*, *13*(10), 447-454. https://doi.org/https://doi.org/10.1016/j.tics.2009.06.005

Cairns, R. B., Perrin, J. E., & Cairns, B. D. (1985). Social Structure and Social Cognition in Early Adolescence: Affiliative Patterns. *The Journal of Early Adolescence*, *5*(3), 339-355. https://doi.org/https://doi.org/10.1177/0272431685053007

Calling, S., Midlöv, P., Johansson, S.-E., Sundquist, K., & Sundquist, J. (2017). Longitudinal trends in self-reported anxiety. Effects of age and birth cohort during 25 years. *BMC Psychiatry*, *17*(1), 119. https://doi.org/10.1186/s12888-017-1277-3

Campbell, O. L. K., Bann, D., & Patalay, P. (2021). The gender gap in adolescent mental health: A cross-national investigation of 566,829 adolescents across 73 countries. *SSM - Population Health*, *13*, 100742. https://doi.org/https://doi.org/10.1016/j.ssmph.2021.100742

Canzian, L., & Musolesi, M. (2015). *Trajectories of depression: unobtrusive monitoring of depressive states by means of smartphone mobility traces analysis* Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing, Osaka, Japan. https://doi.org/10.1145/2750858.2805845

Cao, J., Truong, A. L., Banu, S., Shah, A. A., Sabharwal, A., & Moukaddam, N. (2020). Tracking and Predicting Depressive Symptoms of Adolescents Using Smartphone-Based Self-Reports, Parental Evaluations, and Passive Phone Sensor Data: Development and Usability Study. *JMIR Ment Health*, *7*(1), e14045. https://doi.org/10.2196/14045

Caroppo, E., Mazza, M., Sannella, A., Marano, G., Avallone, C., Claro, A. E., Janiri, D., Moccia, L., Janiri, L., & Sani, G. (2021). Will Nothing Be the Same Again?: Changes in Lifestyle during COVID-19 Pandemic and Consequences on Mental Health. *International Journal of Environmental Research and Public Health*, *18*(16), 8433. https://doi.org/10.3390/ijerph18168433

Casciaro, T., Carley, K. M., & Krackhardt, D. (1999). Positive Affectivity and Accuracy in Social Network Perception. *Motivation and Emotion*, *23*(4), 285-306. https://doi.org/https://doi.org/10.1023/A:1021390826308

Cave, L., Cooper, M. N., Zubrick, S. R., & Shepherd, C. C. J. (2020). Racial discrimination and child and adolescent health in longitudinal studies: A systematic review. *Social Science & Medicine*, *250*, 112864. https://doi.org/https://doi.org/10.1016/j.socscimed.2020.112864

Chaabane, S., Doraiswamy, S., Chaabna, K., Mamtani, R., & Cheema, S. (2021). The Impact of COVID-19 School Closure on Child and Adolescent Health: A Rapid Systematic Review. *Children*, *8*(5), 415. https://doi.org/10.3390/children8050415

Cheadle, J. E., & Goosby, B. J. (2012). The Small-school Friendship Dynamics of Adolescent Depressive Symptoms. *Society and Mental Health*, *2*(2), 99-119. https://doi.org/10.1177/2156869312445211

Chen, J. M., Kim, H. S., Mojaverian, T., & Morling, B. (2012). Culture and Social Support Provision:Who Gives What and Why. *Personality and Social Psychology Bulletin*, *38*(1), 3-13. https://doi.org/10.1177/0146167211427309

Chen, W., & Choi, A. S. K. (2011). Internet and social support among Chinese migrants in Singapore. *New Media & Society*, *13*(7), 1067-1084. https://doi.org/10.1177/1461444810396311

Chida, Y., Hamer, M., Wardle, J., & Steptoe, A. (2008). Do stress-related psychosocial factors contribute to cancer incidence and survival? *Nature Clinical Practice Oncology*, *5*(8), 466-475. https://doi.org/10.1038/ncponc1134

Chin, B. N., Kamarck, T. W., Kraut, R. E., Zhao, S., Hong, J. I., & Ding, E. Y. (2023). Longitudinal associations of social support, everyday social interactions, and mental health during the COVID-19 pandemic. *Journal of Social and Personal Relationships*, *40*(5), 1579-1600. https://doi.org/10.1177/02654075221130786

Chou, K. L. (2012). Perceived discrimination and depression among new migrants to Hong Kong: the moderating role of social support and neighborhood collective efficacy. *Journal of Affective Disorders*, *138*(1-2), 63-70. https://doi.org/10.1016/j.jad.2011.12.029

Close, C., Kouvonen, A., Bosqui, T., Patel, K., O'Reilly, D., & Donnelly, M. (2016). The mental health and wellbeing of first generation migrants: a systematic-narrative review of reviews. *Globalization and Health*, *12*(1), 47. https://doi.org/10.1186/s12992-016-0187-3

Clutton-Brock, T. (2021). Social evolution in mammals. *Science*, *373*(6561), eabc9699. https://doi.org/doi:10.1126/science.abc9699

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

Cole, D. A., Martin, J. M., Peeke, L. G., Seroczynski, A. D., & Hoffman, K. (1998). Are cognitive errors of underestimation predictive or reflective of depressive symptoms in

children: a longitudinal study. *Journal of Abnormal Psychology*, *107*(3), 481-496. https://doi.org/10.1037//0021-843x.107.3.481

Cole, D. A., Nick, E. A., Zelkowitz, R. L., Roeder, K. M., & Spinelli, T. (2017). Online social support for young people: Does it recapitulate in-person social support; can it help? *Computers in Human Behavior*, *68*, 456-464. https://doi.org/10.1016/j.chb.2016.11.058

Cole, P. M., Bruschi, C. J., & Tamang, B. L. (2002). Cultural Differences in Children's Emotional Reactions to Difficult Situations. *Child Development*, *73*(3), 983-996. https://doi.org/https://doi.org/10.1111/1467-8624.00451

Constant, A. F., García-Muñoz, T., Neuman, S., & Neuman, T. (2018). A "healthy immigrant effect" or a "sick immigrant effect"? Selection and policies matter. *The European Journal of Health Economics*, *19*(1), 103-121. https://doi.org/10.1007/s10198-017-0870-1

Correa-Velez, I., Gifford, S. M., & Barnett, A. G. (2010). Longing to belong: Social inclusion and wellbeing among youth with refugee backgrounds in the first three years in Melbourne, Australia. *Social Science & Medicine*, *71*(8), 1399-1408. https://doi.org/https://doi.org/10.1016/j.socscimed.2010.07.018

Coyne, J. C. (1976). Toward an interactional description of depression. *Psychiatry*, *39*(1), 28-40. https://doi.org/10.1080/00332747.1976.11023874

Coyne, S. M., Padilla-Walker, L. M., & Holmgren, H. G. (2018). A Six-Year Longitudinal Study of Texting Trajectories During Adolescence. *Child Development*, *89*(1), 58-65. https://doi.org/10.1111/cdev.12823

Cruise, C. E., Broderick, J., Porter, L., Kaell, A., & Stone, A. A. (1996). Reactive effects of diary self-assessment in chronic pain patients. *Pain*, *67*(2), 253-258. https://doi.org/https://doi.org/10.1016/0304-3959(96)03125-9

David, C. F., & Kistner, J. A. (2000). Do Positive Self-Perceptions Have a "Dark Side"? Examination of the Link between Perceptual Bias and Aggression. *Journal of Abnormal Child Psychology*, *28*(4), 327-337. https://doi.org/10.1023/A:1005164925300

de Girolamo, G., Dagani, J., Purcell, R., Cocchi, A., & McGorry, P. D. (2012). Age of onset of mental disorders and use of mental health services: needs, opportunities and obstacles. *Epidemiology and Psychiatric Sciences*, *21*(1), 47-57. https://doi.org/10.1017/S2045796011000746

de Jong Gierveld, J. (1987). Developing and testing a model of loneliness [doi:10.1037/0022-3514.53.1.119]. *Journal of Personality and Social Psychology*, *53*(1), 119-128. https://doi.org/10.1037/0022-3514.53.1.119

de Jong Gierveld, J., Van Tilburg, T. G., & Dykstra, P. A. (2018). New ways of theorizing and conducting research in the field of loneliness and social isolation. In *The Cambridge handbook of personal relationships, 2nd ed.* (pp. 391-404). Cambridge University Press. https://doi.org/10.1017/9781316417867.031

de la Haye, K., Robins, G., Mohr, P., & Wilson, C. (2011). Homophily and Contagion as Explanations for Weight Similarities Among Adolescent Friends. *Journal of Adolescent Health*, *49*(4), 421-427. https://doi.org/https://doi.org/10.1016/j.jadohealth.2011.02.008

De Silva, M., J., McKenzie, K., Harpham, T., & Huttly, S., R. A. (2005). Social capital and mental illness: a systematic review. *Journal of Epidemiology and Community Health*, *59*(8), 619. https://doi.org/10.1136/jech.2004.029678

de Vries, L. P., Baselmans, B. M. L., & Bartels, M. (2021). Smartphone-Based Ecological Momentary Assessment of Well-Being: A Systematic Review and Recommendations

for Future Studies. *Journal of Happiness Studies*, *22*(5), 2361-2408. https://doi.org/10.1007/s10902-020-00324-7

Demirer, I., Bethge, M., Spyra, K., Karbach, U., & Pfaff, H. (2021). Does social support mediate the effect of multimorbidity on mental wellbeing in the German working population? A longitudinal mediation analysis using structural equation modelling. *SSM - Population Health*, *13*, 100744. https://doi.org/10.1016/j.ssmph.2021.100744

Demirer, I., Kühhirt, M., Karbach, U., & Pfaff, H. (2022). Does positive affect mediate the association of multimorbidity on depressive symptoms? *Aging & Mental Health*, *26*(1), 65-76. https://doi.org/10.1080/13607863.2020.1870209

DeMonbreun, B. G., & Craighead, W. E. (1977). Distortion of perception and recall of positive and neutral feedback in depression. *Cognitive Therapy and Research*, *1*(4), 311-329. https://doi.org/10.1007/BF01663996

Devkota, H. R., Bhandari, B., & Adhikary, P. (2021). Perceived mental health, wellbeing and associated factors among Nepali male migrant and non-migrant workers: A qualitative study. *Journal of Migration and Health*, *3*, 100013. https://doi.org/https://doi.org/10.1016/j.jmh.2020.100013

Díaz-Morales, J. F., Escribano, C., & Jankowski, K. S. (2015). Chronotype and time-of-day effects on mood during school day. *Chronobiology International*, *32*(1), 37-42. https://doi.org/10.3109/07420528.2014.949736

Diewald, M., & Sattler, S. (2010). Soziale Unterstützungsnetzwerke. In C. Stegbauer & R. Häußling (Eds.), *Handbuch Netzwerkforschung* (pp. 689-699). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-92575-2_61

Długosz, P. (2023). War trauma and strategies for coping with stress among Ukrainian refugees staying in Poland. *Journal of Migration and Health*, *8*, 100196. https://doi.org/https://doi.org/10.1016/j.jmh.2023.100196

Dyal, S. R. (2016). *Adolescent Social Networks, Smoking; and Loneliness* University of Southern California].

Eales, L., Gillespie, S., Alstat, R. A., Ferguson, G. M., & Carlson, S. M. (2021). Children's screen and problematic media use in the United States before and during the COVID-19 pandemic. *Child Development*, *92*(5), e866-e882. https://doi.org/10.1111/cdev.13652

Eccles, A. M., Qualter, P., Madsen, K. R., & Holstein, B. E. (2020). Loneliness in the lives of Danish adolescents: Associations with health and sleep. *Scandinavian Journal of Public Health*, 1403494819865429. https://doi.org/10.1177/1403494819865429

Egloff, B., Tausch, A., Kohlmann, C.-W., & Krohne, H. W. (1995). Relationships between time of day, day of the week, and positive mood: Exploring the role of the mood measure. *Motivation and Emotion*, *19*(2), 99-110. https://doi.org/10.1007/BF02250565

Ehsan, A. M., & De Silva, M., J. (2015). Social capital and common mental disorder: a systematic review. *Journal of Epidemiology and Community Health*, *69*(10), 1021. https://doi.org/10.1136/jech-2015-205868

Elmer, T., Boda, Z., & Stadtfeld, C. (2017). The co-evolution of emotional well-being with weak and strong friendship ties. *Network Science*, *5*(3), 278-307. https://doi.org/10.1017/nws.2017.20

Elmer, T., & Stadtfeld, C. (2020). Depressive symptoms are associated with social isolation in face-to-face interaction networks. *Scientific Reports*, *10*(1), 1444. https://doi.org/10.1038/s41598-020-58297-9

Engeln, R., Loach, R., Imundo, M. N., & Zola, A. (2020). Compared to Facebook, Instagram use causes more appearance comparison and lower body satisfaction in college women. *Body Image*, *34*, 38-45. https://doi.org/https://doi.org/10.1016/j.bodyim.2020.04.007

Ernst, M., Niederer, D., Werner, A. M., Czaja, S. J., Mikton, C., Ong, A. D., Rosen, T., Brähler, E., & Beutel, M. E. (2022). Loneliness before and during the COVID-19 pandemic: A systematic review with meta-analysis. *American Psychologist*, *77*(5), 660-677. https://doi.org/10.1037/amp0001005

Erzen, E., & Çikrikci, Ö. (2018). The effect of loneliness on depression: A meta-analysis. *International Journal of Social Psychiatry*, *64*(5), 427-435. https://doi.org/10.1177/0020764018776349

Falci, C., & McNeely, C. (2009). Too Many Friends: Social Integration, Network Cohesion and Adolescent Depressive Symptoms. *Social Forces*, *87*(4), 2031-2061. https://doi.org/10.1353/sof.0.0189 %J Social Forces

Farrell, A. H., Vitoroulis, I., Eriksson, M., & Vaillancourt, T. (2023). Loneliness and Well-Being in Children and Adolescents during the COVID-19 Pandemic: A Systematic Review. *Children*, *10*(2), 279. https://www.mdpi.com/2227-9067/10/2/279

Feierabend, S., Rathgeb, T., Kheredmand, H., & Glöckler, S. (2023a). *JIM-Studie 2022. Jugend, Information, Medien. Basisuntersuchungzum Medienumgang12-bis 19-Jähriger*. M. F. S. (mpfs). https://www.mpfs.de/fileadmin/files/Studien/JIM/2022/JIM_2022_Web_final.pdf

Feierabend, S., Rathgeb, T., Kheredmand, H., & Glöckler, S. (2023b). *KIM 2022. Kindheit, Internet, Medien Basisuntersuchung zum Medienumgang 6- bis 13-Jähriger in Deutschland*. M. F. S. (mpfs). https://www.mpfs.de/fileadmin/files/Studien/KIM/2022/KIM-Studie2022_web_final.pdf

Festinger, L. (1962). Cognitive Dissonance. *Scientific American*, *207*(4), 93-106. http://www.jstor.org/stable/24936719

Flaherty, J., & Richman, J. (1989). Gender differences in the perception and utilization of social support: Theoretical perspectives and an empirical test. *Social Science & Medicine*, *28*(12), 1221-1228. https://doi.org/https://doi.org/10.1016/0277-9536(89)90340-7

Foa, U. G. (1971). Interpersonal and Economic Resources. *Science*, *171*(3969), 345-351. http://www.jstor.org/stable/1731116

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology*, *48*(1), 150–170. https://doi.org/https://doi.org/10.1037/0022-3514.48.1.150

Fone, K. C. F., & Porkess, M. V. (2008). Behavioural and neurochemical effects of post-weaning social isolation in rodents—Relevance to developmental neuropsychiatric disorders. *Neuroscience & Biobehavioral Reviews*, *32*(6), 1087-1102. https://doi.org/https://doi.org/10.1016/j.neubiorev.2008.03.003

Forsa. (2022). *Nutzung digitaler Medien im Kindes- und Jugendalter Wiederholungsbefragung. Ergebnisse einer Eltern-Kind-Befragung*. https://www.dak.de/dak/download/forsa-ergebnisse-2612378.pdf

Fournier, M. A. (2009). Adolescent Hierarchy Formation and the Social Competition Theory of Depression. *Journal of Social and Clinical Psychology*, *28*(9), 1144-1172. https://doi.org/10.1521/jscp.2009.28.9.1144

Gans, C., & Bell, C. J. (2001). Vertebrates, Overview. In S. A. Levin (Ed.), *Encyclopedia of Biodiversity (Second Edition)* (pp. 333-341). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-384719-5.00148-9

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

Gariépy, G., Honkaniemi, H., & Quesnel-Vallée, A. (2016b). 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, M. J., Russell, M. A., Piontak, J. R., & Odgers, C. L. (2018). Concurrent and Subsequent Associations Between Daily Digital Technology Use and High-Risk Adolescents' Mental Health Symptoms. *Child Development*, *89*(1), 78-88. https://doi.org/10.1111/cdev.12819

Gierveld, J. d. J., Tilburg, T. G. v., & Dykstra, P. A. (2018). New Ways of Theorizing and Conducting Research in the Field of Loneliness and Social Isolation. In A. L. Vangelisti & D. Perlman (Eds.), *The Cambridge Handbook of Personal Relationships* (2 ed., pp. 391-404). Cambridge University Press. https://doi.org/10.1017/9781316417867.031

Giletta, M., Scholte, R. H., Burk, W. J., Engels, R. C., Larsen, J. K., Prinstein, M. J., & Ciairano, S. (2011). Similarity in depressive symptoms in adolescents' friendship dyads: selection or socialization? *Developmental Psychology*, *47*(6), 1804-1814. https://doi.org/10.1037/a0023872

Girard, J. M., Cohn, J. F., Mahoor, M. H., Mavadati, S. M., Hammal, Z., & Rosenwald, D. P. (2014). Nonverbal social withdrawal in depression: Evidence from manual and automatic analyses. *Image and Vision Computing*, *32*(10), 641-647. https://doi.org/https://doi.org/10.1016/j.imavis.2013.12.007

Girault, C., Schramm, S., Tolstrup, J. S., Ekholm, O., & Bramming, M. (2023). Changes in loneliness prevalence in Denmark in the 21st century: Age-period-cohort analysis. *Scandinavian Journal of Public Health*, online first. https://doi.org/10.1177/14034948231182188

Goel, S., Mason, W., & Watts, D. J. (2010). Real and perceived attitude agreement in social networks. *Journal of Personality and Social Psychology*, *99*(4), 611-621. https://doi.org/10.1037/a0020697

Goosby, B. J., Bellatorre, A., Walsemann, K. M., & Cheadle, J. E. (2013). Adolescent Loneliness and Health in Early Adulthood. *Sociological Inquiry*, *83*(4), 505-536. https://doi.org/10.1111/soin.12018

Gopalkrishnan, N. (2018). Cultural Diversity and Mental Health: Considerations for Policy and Practice [Review]. *Frontiers in Public Health*, *6*. https://doi.org/10.3389/fpubh.2018.00179

Gorrese, A., & Ruggieri, R. (2013). Peer attachment and self-esteem: A meta-analytic review. *Personality and Individual Differences*, *55*(5), 559-568. https://doi.org/https://doi.org/10.1016/j.paid.2013.04.025

Gotlib, I. H. (1983). Perception and recall of interpersonal feedback: Negative bias in depression. *Cognitive Therapy and Research*, *7*(5), 399-412. https://doi.org/10.1007/BF01187168

Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: current status and future directions. *Annual Review of Clinical Psychology*, *6*, 285-312. https://doi.org/10.1146/annurev.clinpsy.121208.131305

Griffin, A. S. (2004). Social learning about predators: a review and prospectus. *Animal Learning & Behavior*, *32*(1), 131-140. https://doi.org/10.3758/BF03196014

Grund, T. U., & Densley, J. A. (2015). Ethnic Homophily and Triad Closure:Mapping Internal Gang Structure Using Exponential Random Graph Models. *Journal of Contemporary Criminal Justice*, *31*(3), 354-370. https://doi.org/10.1177/1043986214553377

Grunebaum, H., & Solomon, L. (1987). Peer Relationships, Self-Esteem, and the Self. *International Journal of Group Psychotherapy*, *37*(4), 475-513. https://doi.org/10.1080/00207284.1987.11491070

Guan, W., & Kamo, Y. (2015). Contextualizing Depressive Contagion: A Multilevel Network Approach. *Society and Mental Health*, *6*(2), 129-145. https://doi.org/10.1177/2156869315619657

Haber, M. G., Cohen, J. L., Lucas, T., & Baltes, B. B. (2007). The relationship between self-reported received and perceived social support: A meta-analytic review. *American Journal of Community Psychology*, *39*(1), 133-144. https://doi.org/10.1007/s10464-007-9100-9

Hammen, C. L., & Peters, S. D. (1978). Interpersonal consequences of depression: responses to men and women enacting a depressed role. *Journal of Abnormal Psychology*, *87*(3), 322-332. https://doi.org/https://doi.org/10.1037/0021-843X.87.8.322

Hao, Y., & Farah, M. J. (2020). The affective neuroscience of socioeconomic status: implications for mental health. *BJPsych Bulletin*, *44*(5), 202-207. https://doi.org/10.1192/bjb.2020.69

Harandi, T. F., Taghinasab, M. M., & Nayeri, T. D. (2017). The correlation of social support with mental health: A meta-analysis. *Electron Physician*, *9*(9), 5212-5222. https://doi.org/10.19082/5212

Harkness, J. (2003). Questionnaire Translation. In J. Harkness, F. J. R. van de Vijver, & P. P. Mohler (Eds.), *Cross-Cultural Survey Methods* (pp. 35–56). Wiley.

Harlow, H. F., Dodsworth, R. O., & Harlow, M. K. (1965). Total social isolation in monkeys. *Proc Natl Acad Sci U S A*, *54*(1), 90-97. https://doi.org/10.1073/pnas.54.1.90

Harris, R. A., Qualter, P., & Robinson, S. J. (2013). Loneliness trajectories from middle childhood to pre-adolescence: Impact on perceived health and sleep disturbance. *Journal of Adolescence*, *36*(6), 1295-1304. https://doi.org/https://doi.org/10.1016/j.adolescence.2012.12.009

Hartup, W. W. (2005). Peer Interaction: What Causes What? *Journal of Abnormal Child Psychology*, *33*(3), 387-394. https://doi.org/10.1007/s10802-005-3578-0

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*, *40*(2), 218-227. https://doi.org/10.1007/s12160-010-9210-8

Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The rand 36-item health survey 1.0. *2*(3), 217-227. https://doi.org/https://doi.org/10.1002/hec.4730020305

Hedeker, D., & Gibbons, R. D. (2006). Mixed-Effects Regression Models for Continuous Outcomes. In D. Hedeker & R. D. Gibbons (Eds.), *Longitudinal Data Analysis*. Wiley.

Heinrich, L. M., & Gullone, E. (2006). The clinical significance of loneliness: A literature review. *Clinical Psychology Review*, *26*(6), 695-718. https://doi.org/https://doi.org/10.1016/j.cpr.2006.04.002

Hill, D. C., Moss, R. H., Sykes-Muskett, B., Conner, M., & O'Connor, D. B. (2018). Stress and eating behaviors in children and adolescents: Systematic review and meta-analysis. *Appetite*, *123*, 14-22. https://doi.org/https://doi.org/10.1016/j.appet.2017.11.109

Hoehn-Hyde, D., Schlottmann, R. S., & Rush, A. J. (1982). Perception of social interactions in depressed psychiatric patients. *Journal of Consulting and Clinical Psychology*, *50*(2), 209-212. https://doi.org/https://doi.org/10.1037/0022-006X.50.2.209

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and Social Isolation as Risk Factors for Mortality: A Meta-Analytic Review.

Perspectives on Psychological Science, *10*(2), 227-237. https://doi.org/10.1177/1745691614568352

House, J. S., & Kahn, R. L. (1985). Measures and Concepts of Social Support. In S. Cohen & S. L. Syme. (Eds.), *Social Support and Health* (pp. 83–108). Academic Press.

Hsueh, Y.-C., Chen, C.-Y., Hsiao, Y.-C., & Lin, C.-C. (2019). A longitudinal, cross-lagged panel analysis of loneliness and depression among community-based older adults. *Journal of Elder Abuse & Neglect*, *31*(4-5), 281-293. https://doi.org/10.1080/08946566.2019.1660936

Hufford, M. R., Shields, A. L., Shiffman, S., Paty, J., & Balabanis, M. (2002). Reactivity to ecological momentary assessment: An example using undergraduate problem drinkers. *Psychology of Addictive Behaviors*, *16*(3), 205-211. https://doi.org/10.1037/0893-164X.16.3.205

Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No More FOMO: Limiting Social Media Decreases Loneliness and Depression. *Journal of Social and Clinical Psychology*, *37*(10), 751-768. https://doi.org/10.1521/jscp.2018.37.10.751

Hurrelmann, K. (1993). *Einführung in die Sozialisationstheorie: über den Zusammenhang von Sozialstruktur und Persönlichkeit* (4., überarb. und erg. Aufl. ed.). Beltz. https://swbplus.bsz-bw.de/bsz031523803inh.htm

Hyde, J. S., Mezulis, A. H., & Abramson, L. Y. (2008). The ABCs of depression: Integrating affective, biological, and cognitive models to explain the emergence of the gender difference in depression. *Psychological Review*, *115*(2), 291-313. https://doi.org/10.1037/0033-295X.115.2.291

Hymel, S., Bowker, A., & Woody, E. (1993). Aggressive versus Withdrawn Unpopular Children: Variations in Peer and Self-Perceptions in Multiple Domains. *Child Development*, *64*(3), 879-896. https://doi.org/10.2307/1131224

Jasini, A., De Leersnyder, J., Ceulemans, E., Gagliolo, M., & Mesquita, B. (2023). Do Minorities' Friendships with Majority Culture Members and Their Emotional Fit with Majority Culture Influence Each Other Over Time? *Social Psychological and Personality Science*, *Online first*, 19485506231190699. https://doi.org/10.1177/19485506231190699

Jasinskaja-Lahti, I., Liebkind, K., Jaakkola, M., & Reuter, A. (2006). Perceived Discrimination, Social Support Networks, and Psychological Well-being Among Three Immigrant Groups. *Journal of Cross-Cultural Psychology*, *37*(3), 293-311. https://doi.org/10.1177/0022022106286925

Jensen, M., George, M., Russell, M., & Odgers, C. (2019). Young Adolescents' Digital Technology Use and Mental Health Symptoms: Little Evidence of Longitudinal or Daily Linkages. *Clinical Psychological Science*, *7*(6), 1416-1433. https://doi.org/10.1177/2167702619859336

Johnson, D., Dupuis, G., Piche, J., Clayborne, Z., & Colman, I. (2018). Adult mental health outcomes of adolescent depression: A systematic review. *Depression and Anxiety*, *35*(8), 700-716. https://doi.org/https://doi.org/10.1002/da.22777

Joiner, T. E. (1996). Depression and Rejection:On Strangers and Friends, Symptom Specificity, Length of Relationship, and Gender. *Communication Research*, *23*(4), 451-471. https://doi.org/10.1177/009365096023004006

Jones, A. C., Schinka, K. C., van Dulmen, M. H. M., Bossarte, R. M., & Swahn, M. H. (2011). Changes in Loneliness during Middle Childhood Predict Risk for Adolescent Suicidality Indirectly through Mental Health Problems. *Journal of Clinical Child & Adolescent Psychology*, *40*(6), 818-824. https://doi.org/10.1080/15374416.2011.614585

Joshanloo, M. (2022). The longitudinal interplay of depressive symptoms and loneliness: causal effects work in both directions and decay to zero before six years. *Aging & Mental Health*, *26*(6), 1106-1111. https://doi.org/10.1080/13607863.2021.1897521

Juang, L., Ittel, A., Hoferichter, F., & Gallarin, M. (2016). Perceived racial/ethnic discrimination and adjustment among ethnically diverse college students: Family and peer support as protective factors. *Journal of College Student Development*, *57*(4), 380-394. https://doi.org/10.1353/csd.2016.0048

Juárez, S. P., Drefahl, S., Dunlavy, A., & Rostila, M. (2018). All-cause mortality, age at arrival, and duration of residence among adult migrants in Sweden: A population-based longitudinal study. *SSM - Population Health*, *6*, 16-25. https://doi.org/https://doi.org/10.1016/j.ssmph.2018.07.007

Juvonen, J., Lessard, L. M., Kline, N. G., & Graham, S. (2022). Young Adult Adaptability to the Social Challenges of the COVID-19 Pandemic: The Protective Role of Friendships. *Journal of Youth and Adolescence*, *51*(3), 585-597. https://doi.org/10.1007/s10964-022-01573-w

Juvonen, J., Schacter, H. L., & Lessard, L. M. (2021). Connecting electronically with friends to cope with isolation during COVID-19 pandemic. *Journal of Social and Personal Relationships*, *38*(6), 1782-1799. https://doi.org/10.1177/0265407521998459

Kaniasty, K., & Norris, F. H. (1995). Mobilization and deterioration of social support following natural disasters. *Current Directions in Psychological Science*, *4*(3), 94-98. https://doi.org/10.1111/1467-8721.ep10772341

Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior*, *31*, 351-354. https://doi.org/10.1016/j.chb.2013.10.059

Kennedy, S., Kidd, M. P., McDonald, J. T., & Biddle, N. (2015). The Healthy Immigrant Effect: Patterns and Evidence from Four Countries. *Journal of International Migration and Integration*, *16*(2), 317-332. https://doi.org/10.1007/s12134-014-0340-x

Kenny, D. A. (2014). Cross-Lagged Panel Design. In *Wiley StatsRef: Statistics Reference Online*. Wiley. https://doi.org/https://doi.org/10.1002/9781118445112.stat06464

Kessler, R. C. (2000). Proposedexplanations for gender differences in depression. In E. Frank (Ed.), *Gender and its effects on psychopathology* (Vol. 2000, pp. 61-84). American Psychiatric Press.

Kessler, R. C., McGonagle, K. A., Nelson, C. B., Hughes, M., Swartz, M., & Blazer, D. G. (1994). Sex and depression in the national comorbidity survey. II: Cohort effects. *Journal of Affective Disorders*, *30*(1), 15-26. https://doi.org/https://doi.org/10.1016/0165-0327(94)90147-3

Keyes, K. M., Nicholson, R., Kinley, J., Raposo, S., Stein, M. B., Goldner, E. M., & Sareen, J. (2014). Age, Period, and Cohort Effects in Psychological Distress in the United States and Canada. *American Journal of Epidemiology*, *179*(10), 1216-1227. https://doi.org/10.1093/aje/kwu029

Kiecolt-Glaser, J. K., & Newton, T. L. (2001). Marriage and health: his and hers. *Psychological Bulletin*, *127*(4), 472-503. https://doi.org/10.1037/0033-2909.127.4.472

Killworth, P. D., & Bernard, H. R. (1976). Informant Accuracy in Social Network Data. *Human Organization*, *35*(3), 269-286. www.jstor.org/stable/44125464

Killworth, P. D., & Bernard, H. R. (1979). Informant accuracy in social network data III: A comparison of triadic structure in behavioral and cognitive data. *Social Networks*, *2*(1), 19-46. https://doi.org/https://doi.org/10.1016/0378-8733(79)90009-1

Kim, H. S., Sherman, D. K., & Taylor, S. E. (2008). Culture and social support. *American Psychologist*, *63*(6), 518-526. https://doi.org/10.1037/0003-066X

Kim, I.-H., & Noh, S. (2016). Racial/ethnic variations in the main and buffering effects of ethnic and nonethnic supports on depressive symptoms among five ethnic immigrant groups in Toronto. *Ethnicity & Health*, *21*(3), 215-232. https://doi.org/10.1080/13557858.2015.1061101

Kindermann, T. (1998). Children's development within peer groups: Using composite social maps to identify peer networks and to study their influences. In W. M. Bukowski & A. H. Cillessen (Eds.), *New Directions for Child Development No. 80* (pp. 55-82). Jossey-Bass. https://doi.org/10.1002/cd.23219988105

Kistner, J. A., David-Ferdon, C. F., Repper, K. K., & Joiner, T. E. (2006). Bias and Accuracy of Children's Perceptions of Peer Acceptance: Prospective Associations with Depressive Symptoms. *Journal of Abnormal Child Psychology*, *34*(3), 336-348. https://doi.org/10.1007/s10802-006-9028-9

Kiuru, N., Burk, W. J., Laursen, B., Nurmi, J.-E., & Salmela-Aro, K. (2012). Is Depression Contagious? A Test of Alternative Peer Socialization Mechanisms of Depressive Symptoms in Adolescent Peer Networks. *Journal of Adolescent Health*, *50*(3), 250-255. https://doi.org/10.1016/j.jadohealth.2011.06.013

Knaevelsrud, C., Stammel, N., & Olff, M. (2017). Traumatized refugees: identifying needs and facing challenges for mental health care. *European Journal of Psychotraumatology*, *8*(sup2), 1388103. https://doi.org/10.1080/20008198.2017.1388103

Koenig, L. J., Isaacs, A. M., & Schwartz, J. A. J. (1994). Sex Differences in Adolescent Depression and Loneliness: Why Are Boys Lonelier if Girls Are More Depressed? *Journal of Research in Personality*, *28*(1), 27-43. https://doi.org/https://doi.org/10.1006/jrpe.1994.1004

Koneru, V. K., Weisman de Mamani, A. G., Flynn, P. M., & Betancourt, H. (2007). Acculturation and mental health: Current findings and recommendations for future research. *Applied and Preventive Psychology*, *12*(2), 76-96. https://doi.org/https://doi.org/10.1016/j.appsy.2007.07.016

Kornienko, O., Schaefer, D. R., Ha, T., & Granger, D. A. (2020). Loneliness and cortisol are associated with social network regulation. *Social Neuroscience*, 1-13. https://doi.org/10.1080/17470919.2019.1709540

Korous, K. M., Causadias, J. M., & Casper, D. M. (2017). Racial discrimination and cortisol output: A meta-analysis. *Social Science & Medicine*, *193*, 90-100. https://doi.org/https://doi.org/10.1016/j.socscimed.2017.09.042

Kossinets, G. (2006). Effects of missing data in social networks. *Social Networks*, *28*(3), 247-268. https://doi.org/https://doi.org/10.1016/j.socnet.2005.07.002

Krackhardt, D. (1987). Cognitive social structures. *Social Networks*, *9*(2), 109-134. https://doi.org/https://doi.org/10.1016/0378-8733(87)90009-8

Krieger, N. (2001). The ostrich, the albatross, and public health: an ecosocial perspective--or why an explicit focus on health consequences of discrimination and deprivation is vital for good science and public health practice. *Public health reports (Washington, D.C. : 1974)*, *116*(5), 419-423. https://doi.org/10.1093/phr/116.5.419

Kristen, C., & Seuring, J. (2021). Destination-language acquisition of recently arrived immigrants: Do refugees differ from other immigrants? *Journal of Educational Research Online*, *13*(1), 128-156. https://doi.org/. https://doi.org/10.31244/jero.2021.01.05

Kuczynski, A. M., Halvorson, M. A., Slater, L. R., & Kanter, J. W. (2022). The effect of social interaction quantity and quality on depressed mood and loneliness: A daily diary study. *Journal of Social and Personal Relationships*, *39*(3), 734-756. https://doi.org/10.1177/02654075211045717

Lakey, B., & Tanner, S. M. (2013). Social Influences in Negative Thinking and Affect. *Cognitive Therapy and Research*, *37*(1), 160-172. https://doi.org/10.1007/s10608-012-9444-9

Lakon, C. M., Wang, C., Butts, C. T., Jose, R., & Hipp, J. R. (2017). Cascades of emotional support in friendship networks and adolescent smoking. *PLoS One*, *12*(6), e0180204. https://doi.org/10.1371/journal.pone.0180204

Langner, C. A., Epel, E. S., Matthews, K. A., Moskowitz, J. T., & Adler, N. E. (2012). Social hierarchy and depression: the role of emotion suppression. *The Journal of Psychology*, *146*(4), 417-436. https://doi.org/10.1080/00223980.2011.652234

Laniado, D., Volkovich, Y., Kappler, K., & Kaltenbrunner, A. (2016). Gender homophily in online dyadic and triadic relationships. *EPJ Data Science*, *5*(1), 19.

Lara, E., Martín-María, N., De la Torre-Luque, A., Koyanagi, A., Vancampfort, D., Izquierdo, A., & Miret, M. (2019). Does loneliness contribute to mild cognitive impairment and dementia? A systematic review and meta-analysis of longitudinal studies. *Ageing Research Reviews*, *52*, 7-16. https://doi.org/https://doi.org/10.1016/j.arr.2019.03.002

Laumann, E. O., Marsden, P. V., & Prensky, D. (1989). The boundary specification problem in network analysis. In L. C. Freeman, D. R. White, & A. K. Romney (Eds.), *Research methods in social network analysis* (pp. 61-87). George Mason University Press.

Laursen, B., & Hartl, A. C. (2013). Understanding loneliness during adolescence: Developmental changes that increase the risk of perceived social isolation. *Journal of Adolescence*, *36*(6), 1261-1268. https://doi.org/https://doi.org/10.1016/j.adolescence.2013.06.003

Lazarsfeld, P., & Merton, R. (1954). Friendship as a social process: a substantive and methodological analysis. In M. Berger (Ed.), *Freedom and Control in Modern Society* (pp. 18–66). Van Nostrand.

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal and Coping*. Springer.

Leavy, R. L. (1983). Social support and psychological disorder: A review. *Journal of Community Psychology*, *11*(1), 3-21. https://doi.org/https://doi.org/10.1002/1520-6629(198301)11:1<3::AID-JCOP2290110102>3.0.CO;2-E

Lee, H. Y., Jamieson, J. P., Reis, H. T., Beevers, C. G., Josephs, R. A., Mullarkey, M. C., O'Brien, J. M., & Yeager, D. S. (2020). Getting Fewer "Likes" Than Others on Social Media Elicits Emotional Distress Among Victimized Adolescents. *Child Development*, *91*(6), 2141-2159. https://doi.org/10.1111/cdev.13422

Lee, R. (2019). Does the healthy immigrant effect apply to mental health? Examining the effects of immigrant generation and racial and ethnic background among Australian adults. *SSM - Population Health*, *7*, 100311. https://doi.org/https://doi.org/10.1016/j.ssmph.2018.10.011

Lee, S., Foote, J., Wittrock, Z., Xu, S., Niu, L., & French, D. C. (2017). Adolescents' perception of peer groups: Psychological, behavioral, and relational determinants. *Social Science Research*, *65*, 181-194. https://doi.org/https://doi.org/10.1016/j.ssresearch.2016.12.005

Lempinen, L., Junttila, N., & Sourander, A. (2018). Loneliness and friendships among eight-year-old children: time-trends over a 24-year period. *Journal of Child Psychology and Psychiatry*, *59*(2), 171-179. https://doi.org/10.1111/jcpp.12807

Leskelä, U., Melartin, T., Rytsälä, H., Sokero, P., Lestelä-Mielonen, P., & Isometsä, E. (2008). The Influence of Major Depressive Disorder on Objective and Subjective Social Support: A Prospective Study. *The Journal of Nervous and Mental Disease*, *196*(12). https://journals.lww.com/jonmd/Fulltext/2008/12000/The_Influence_of_Major_Depressive_Disorder_on.3.aspx

Lin, N. (2001). *Social capital*. Cambridge University Press.
Liu, D., Baumeister, R. F., Yang, C.-c., & Hu, B. (2019). Digital Communication Media Use and Psychological Well-Being: A Meta-Analysis. *Journal of Computer-Mediated Communication*, *24*(5), 259-273. https://doi.org/10.1093/jcmc/zmz013
Liu, S., Hachen, D., Lizardo, O., Poellabauer, C., Striegel, A., & Milenković, T. (2020). The power of dynamic social networks to predict individuals' mental health. *Pacific Symposium on Biocomputing*, *25*, 635-646. https://pubmed.ncbi.nlm.nih.gov/31797634
Liu, W., Sidhu, A., Beacom, A. M., & Valente, T. W. (2017). Social network theory. *The international encyclopedia of media effects*, 1-12.
Lomi, A., Snijders, T. A. B., Steglich, C. E. G., & Torló, V. J. (2011). Why are some more peer than others? Evidence from a longitudinal study of social networks and individual academic performance. *Social Science Research*, *40*(6), 1506-1520. https://doi.org/https://doi.org/10.1016/j.ssresearch.2011.06.010
Long, E., Gardani, M., McCann, M., Sweeting, H., Tranmer, M., & Moore, L. (2020). Mental health disorders and adolescent peer relationships. *Social Science & Medicine*, *253*, 112973. https://doi.org/https://doi.org/10.1016/j.socscimed.2020.112973
Lubbers, M. J., García, H. V., Castaño, P. E., Molina, J. L., Casellas, A., & Rebollo, J. G. (2020). Relationships Stretched Thin: Social Support Mobilization in Poverty. *The ANNALS of the American Academy of Political and Social Science*, *689*(1), 65-88. https://doi.org/10.1177/0002716220911913
Luhmann, M., & Hawkley, L. C. (2016). Age differences in loneliness from late adolescence to oldest old age. *Developmental Psychology*, *52*(6), 943-959. https://doi.org/10.1037/dev0000117
Macdonald, B., Luo, M., & Hülür, G. (2021). Daily social interactions and well-being in older adults: The role of interaction modality. *Journal of Social and Personal Relationships*, *38*(12), 3566-3589. https://doi.org/10.1177/02654075211052536
MacDonald, G., & Leary, M. R. (2005). Why Does Social Exclusion Hurt? The Relationship Between Social and Physical Pain [doi:10.1037/0033-2909.131.2.202]. *Psychological Bulletin*, *131*(2), 202-223. https://doi.org/10.1037/0033-2909.131.2.202
MacGeorge, E. L., Gillihan, S. J., Samter, W., & Clark, R. A. (2003). Skill Deficit or Differential Motivation?:Testing Alternative Explanations for Gender Differences in the Provision of Emotional Support. *Communication Research*, *30*(3), 272-303. https://doi.org/10.1177/0093650203030003002
Maddux, J. E., & Meier, L. J. (1995). Self-Efficacy and Depression. In J. E. Maddux (Ed.), *Self-Efficacy, Adaptation, and Adjustment: Theory, Research, and Application* (pp. 143-169). Springer US. https://doi.org/10.1007/978-1-4419-6868-5_5
Magis-Weinberg, L., Gys, C. L., Berger, E. L., Domoff, S. E., & Dahl, R. E. (2021). Positive and Negative Online Experiences and Loneliness in Peruvian Adolescents During the COVID-19 Lockdown. *Journal of Research on Adolescence*, *31*(3), 717-733. https://doi.org/https://doi.org/10.1111/jora.12666
Maier, C., Laumer, S., Eckhardt, A., & Weitzel, T. (2015). Giving too much social support: social overload on social networking sites. *European Journal of Information Systems*, *24*(5), 447-464. https://doi.org/10.1057/ejis.2014.3
Mann, F., Wang, J., Pearce, E., Ma, R., Schlief, M., Lloyd-Evans, B., Ikhtabi, S., & Johnson, S. (2022). Loneliness and the onset of new mental health problems in the general population. *Social Psychiatry and Psychiatric Epidemiology*, *57*(11), 2161-2178. https://doi.org/10.1007/s00127-022-02261-7
Marciano, L., Ostroumova, M., Schulz, P. J., & Camerini, A.-L. (2022). Digital Media Use and Adolescents' Mental Health During the Covid-19 Pandemic: A Systematic Review

and Meta-Analysis. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.793868

Marinucci, M., Mazzoni, D., Pancani, L., & Riva, P. (2022). To whom should I turn? Intergroup social connections moderate social exclusion's short- and long-term psychological impact on immigrants. *Journal of Experimental Social Psychology*, *99*, 104275. https://doi.org/https://doi.org/10.1016/j.jesp.2021.104275

McDowell, C. P., Meyer, J. D., Russell, D. W., Sue Brower, C., Lansing, J., & Herring, M. P. (2021). Bidirectional Associations Between Depressive and Anxiety Symptoms and Loneliness During the COVID-19 Pandemic: Dynamic Panel Models With Fixed Effects [Original Research]. *Frontiers in Psychiatry*, *12*. https://doi.org/10.3389/fpsyt.2021.738892

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology*, *27*(1), 415-444. https://doi.org/10.1146/annurev.soc.27.1.415

Melrose, K. L., Brown, G. D. A., & Wood, A. M. (2015). When is received social support related to perceived support and well-being? When it is needed. *Personality and Individual Differences*, *77*, 97-105. https://doi.org/https://doi.org/10.1016/j.paid.2014.12.047

Mesquita, B., & Frijda, N. H. (1992). Cultural variations in emotions: A review. *Psychological Bulletin*, *112*(2), 179-204. https://doi.org/10.1037/0033-2909.112.2.179

Mikkelsen, K., Stojanovska, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas*, *106*, 48-56. https://doi.org/https://doi.org/10.1016/j.maturitas.2017.09.003

Mikrut, E. E., Keating, L. H., Barnwell, P. V., Cioffi, L., Vega, D., Contrada, R. J., & Brondolo, E. (2022). Pathways from exposure to racial/ethnic discrimination to depression: Testing a social-cognitive model. *Social Science & Medicine*, *292*, 114558. https://doi.org/https://doi.org/10.1016/j.socscimed.2021.114558

Miller, D. B., & O'Callaghan, J. P. (2002). Neuroendocrine aspects of the response to stress. *Metabolism - Clinical and Experimental*, *51*(6), 5-10. https://doi.org/10.1053/meta.2002.33184

Mitchell, G. D., Raymond, E. J., Ruppenthal, G. C., & Harlow, H. F. (1966). Long-Term Effects of Total Social Isolation Upon Behavior of Rhesus Monkeys. *Psychological Reports*, *18*, 567 - 580.

Mohler, P., Dorer, B., de Jong, J., & Hu, M. (2016). *Translation: Overview. Guidelines for Best Practice in Cross-Cultural Surveys*. Survey Research Center, Institute for Social Research, University of Michigan. http://www.ccsg.isr.umich.edu/index.php/chapters/translation-chapter/translation-overview

Moore, S., & Kawachi, I. (2017). Twenty years of social capital and health research: a glossary. *Journal of Epidemiology & Community Health*, *71*(5), 513-517. https://doi.org/10.1136/jech-2016-208313

Morelli, S. A., Lee, I. A., Arnn, M. E., & Zaki, J. (2015). Emotional and instrumental support provision interact to predict well-being. *Emotion*, *15*(4), 484-493. https://doi.org/10.1037/emo0000084

Morling, B., Uchida, Y., & Frentrup, S. (2015). Social Support in Two Cultures: Everyday Transactions in the U.S. and Empathic Assurance in Japan. *PLoS ONE*, *10*(6), e0127737. https://doi.org/https://doi.org/10.1371/journal.pone.0127737

Mossakowski, K. N., & Zhang, W. (2014). Does Social Support Buffer the Stress of Discrimination and Reduce Psychological Distress Among Asian Americans? *Social Psychology Quarterly*, *77*(3), 273-295. https://doi.org/10.1177/0190272514534271

Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: new insights and technical developments. *World Psychiatry*, *17*(2), 123-132. https://doi.org/10.1002/wps.20513

Myin-Germeys, I., Peeters, F., Havermans, R., Nicolson, N. A., DeVries, M. W., Delespaul, P., & Van Os, J. (2003). Emotional reactivity to daily life stress in psychosis and affective disorder: an experience sampling study. *Acta Psychiatrica Scandinavica*, *107*(2), 124-131. https://doi.org/10.1034/j.1600-0447.2003.02025.x

Nam, S., Jeon, S., Lee, S.-J., Ash, G., Nelson, L. E., & Granger, D. A. (2022). Real-time racial discrimination, affective states, salivary cortisol and alpha-amylase in Black adults. *PLOS ONE*, *17*(9), e0273081. https://doi.org/10.1371/journal.pone.0273081

Napa Scollon, C., Prieto, C.-K., & Diener, E. (2009). Experience Sampling: Promises and Pitfalls, Strength and Weaknesses. In E. Diener (Ed.), *Assessing Well-Being: The Collected Works of Ed Diener* (pp. 157-180). Springer Netherlands. https://doi.org/10.1007/978-90-481-2354-4_8

Neal, J. W. (2008). "Kracking" the Missing Data Problem: Applying Krackhardt's Cognitive Social Structures to School-Based Social Networks. *Sociology of Education*, *81*(2), 140-162. https://doi.org/10.1177/003804070808100202

Neal, J. W., Neal, Z. P., & Cappella, E. (2016). Seeing and being seen: Predictors of accurate perceptions about classmates' relationships. *Social Networks*, *44*, 1-8. https://doi.org/https://doi.org/10.1016/j.socnet.2015.07.002

Nelson, R. E., & Craighead, W. E. (1977). Selective recall of positive and negative feedback, self-control behaviors, and depression. *Journal of Abnormal Psychology*, *86*(4), 379-388. https://doi.org/10.1037/0021-843X.86.4.379

Nesi, J., & Prinstein, M. J. (2015). Using Social Media for Social Comparison and Feedback-Seeking: Gender and Popularity Moderate Associations with Depressive Symptoms. *Journal of Abnormal Child Psychology*, *43*(8), 1427-1438. https://doi.org/10.1007/s10802-015-0020-0

Newsom, J. T. (2015). Cross-Lagged Panel Models. In J. T. Newsom (Ed.), *Longitudinal structural equation modeling: A comprehensive introduction* (pp. 122-151). Routledge.

Nezlek, J. B., Imbrie, M., & Shean, G. D. (1994). Depression and everyday social interaction. *J Pers Soc Psychol*, *67*(6), 1101-1111. https://doi.org/10.1037//0022-3514.67.6.1101

Ngai, S. S.-y., Cheung, C.-K., Mo, J., Chau, S. Y.-h., Yu, E. N.-h., Wang, L., & Tang, H.-y. (2021). Mediating Effects of Emotional Support Reception and Provision on the Relationship between Group Interaction and Psychological Well-Being: A Study of Young Patients. *International Journal of Environmental Research and Public Health*, *18*(22), 12110. https://www.mdpi.com/1660-4601/18/22/12110

Nicolaisen, M., & Thorsen, K. (2014). Who are Lonely? Loneliness in Different Age Groups (18–81 Years Old), Using Two Measures of Loneliness. *The International Journal of Aging and Human Development*, *78*(3), 229-257. https://doi.org/10.2190/AG.78.3.b

Noh, S., & Kaspar, V. (2003). Perceived discrimination and depression: moderating effects of coping, acculturation, and ethnic support. *American Journal of Public Health*, *93*(2), 232-238. https://doi.org/10.2105/ajph.93.2.232

Nolen-Hoeksema, S., & Hilt, L. M. (2009). Gender differences in depression. In *Handbook of depression, 2nd ed.* (pp. 386-404). The Guilford Press. https://doi.org/10.1097/00005053-200301000-00022

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on Psychological Science*, *3*(5), 400-424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

Norris, F. H., Baker, C. K., Murphy, A. D., & Kaniasty, K. (2005). Social Support Mobilization and Deterioration after Mexico's 1999 Flood: Effects of Context, Gender, and Time. *American Journal of Community Psychology*, *36*(1), 15-28. https://doi.org/10.1007/s10464-005-6230-9

Nuyen, J., Tuithof, M., de Graaf, R., van Dorsselaer, S., Kleinjan, M., & Have, M. t. (2020). The bidirectional relationship between loneliness and common mental disorders in adults: findings from a longitudinal population-based cohort study. *Social Psychiatry and Psychiatric Epidemiology*, *55*(10), 1297-1310. https://doi.org/10.1007/s00127-019-01778-8

O'Neil, A., Quirk, S. E., Housden, S., Brennan, S. L., Williams, L. J., Pasco, J. A., Berk, M., & Jacka, F. N. (2014). Relationship Between Diet and Mental Health in Children and Adolescents: A Systematic Review. *American Journal of Public Health*, *104*(10), e31-e42. https://doi.org/10.2105/ajph.2014.302110

Offer, S. (2021). Negative Social Ties: Prevalence and Consequences. *Annual Review of Sociology*, *47*(1), 177-196. https://doi.org/10.1146/annurev-soc-090820-025827

Ohannessian, C. M. (2009). Media Use and Adolescent Psychological Adjustment: An Examination of Gender Differences. *Journal of Child and Family Studies*, *18*(5), 582-593. https://doi.org/10.1007/s10826-009-9261-2

Ohrnberger, J., Fichera, E., & Sutton, M. (2017). The relationship between physical and mental health: A mediation analysis. *Social Science & Medicine*, *195*, 42-49. https://doi.org/https://doi.org/10.1016/j.socscimed.2017.11.008

Olson, D. A., & Shultz, K. S. (1994). Gender Differences in the Dimensionality of Social Support1. *Journal of Applied Social Psychology*, *24*(14), 1221-1232. https://doi.org/https://doi.org/10.1111/j.1559-1816.1994.tb00555.x

Oppedal, B., Røysamb, E., & Sam, D. L. (2004). The effect of acculturation and social support on change in mental health among young immigrants. *International Journal of Behavioral Development*, *28*(6), 481-494. https://doi.org/10.1080/01650250444000126

Orben, A., Tomova, L., & Blakemore, S.-J. (2020). The effects of social deprivation on adolescent development and mental health. *The Lancet Child & Adolescent Health*, *4*(8), 634-640. https://doi.org/10.1016/S2352-4642(20)30186-3

Ouellette, D. M. (2008). *Shadows on the cave wall: The cognitive accuracy of social network perception* Virginia Commonwealth University]. Richmond, Virginia. https://scholarscompass.vcu.edu/cgi/viewcontent.cgi?article=2565&context=etd

Overall, N. C., & Hammond, M. D. (2013). Biased and Accurate: Depressive Symptoms and Daily Perceptions Within Intimate Relationships. *Personality and Social Psychology Bulletin*, *39*(5), 636-650. https://doi.org/10.1177/0146167213480188

Pachucki, M. C., Ozer, E. J., Barrat, A., & Cattuto, C. (2015). Mental health and social networks in early adolescence: A dynamic study of objectively-measured social interaction behaviors. *Social Science & Medicine*, *125*, 40-50. https://doi.org/https://doi.org/10.1016/j.socscimed.2014.04.015

Padgett, D. A., & Glaser, R. (2003). How stress influences the immune response. *Trends in Immunology*, *24*(8), 444-448. https://doi.org/10.1016/S1471-4906(03)00173-X

Pandya, A., & Lodha, P. (2021). Social Connectedness, Excessive Screen Time During COVID-19 and Mental Health: A Review of Current Evidence [Review]. *Frontiers in Human Dynamics*, *3*. https://doi.org/10.3389/fhumd.2021.684137

Panza, G. A., Puhl, R. M., Taylor, B. A., Zaleski, A. L., Livingston, J., & Pescatello, L. S. (2019). Links between discrimination and cardiovascular health among socially stigmatized groups: A systematic review. *PLOS ONE*, *14*(6), e0217623. https://doi.org/10.1371/journal.pone.0217623

Paradies, Y., Ben, J., Denson, N., Elias, A., Priest, N., Pieterse, A., Gupta, A., Kelaher, M., & Gee, G. (2015). Racism as a Determinant of Health: A Systematic Review and Meta-Analysis. *PLOS ONE*, *10*(9), e0138511. https://doi.org/10.1371/journal.pone.0138511

Park, J., Lee, D. S., Shablack, H., Verduyn, P., Deldin, P., Ybarra, O., Jonides, J., & Kross, E. (2016). When perceptions defy reality: The relationships between depression and actual and perceived Facebook social support. *Journal of Affective Disorders*, *200*, 37-44. https://doi.org/https://doi.org/10.1016/j.jad.2016.01.048

Parker, G., & Brotchie, H. (2010). Gender differences in depression. *International Review of Psychiatry*, *22*(5), 429-436. https://doi.org/10.3109/09540261.2010.492391

Parker, H. W., Abreu, A. M., Sullivan, M. C., & Vadiveloo, M. K. (2022). Allostatic Load and Mortality: A Systematic Review and Meta-Analysis. *American Journal of Preventive Medicine*, *63*(1), 131-140. https://doi.org/https://doi.org/10.1016/j.amepre.2022.02.003

Patel, R., Lloyd, T., Jackson, R., Ball, M., Shetty, H., Broadbent, M., Geddes, J., R., Stewart, R., McGuire, P., & Taylor, M. (2015). Mood instability is a common feature of mental health disorders and is associated with poor clinical outcomes. *BMJ Open*, *5*(5), e007504. https://doi.org/10.1136/bmjopen-2014-007504

Pearce, J., Rafiq, S., Simpson, J., & Varese, F. (2019). Perceived discrimination and psychosis: a systematic review of the literature. *Social Psychiatry and Psychiatric Epidemiology*, *54*(9), 1023-1044. https://doi.org/10.1007/s00127-019-01729-3

Pearlin, L. I. (1999). The Stress Process Revisited. In C. S. Aneshensel & J. C. Phelan (Eds.), *Handbook of the Sociology of Mental Health* (pp. 395-415). Springer US. https://doi.org/10.1007/0-387-36223-1_19

Peeters, F., Nicolson, N. A., Berkhof, J., Delespaul, P., & deVries, M. (2003). Effects of daily events on mood states in major depressive disorder. *Journal of Abnormal Psychology*, *112*(2), 203-211. https://doi.org/10.1037/0021-843x.112.2.203

Perlman, D., & Peplau, L. A. (1981). Toward a Social Psychology of Loneliness. In R. Gilmour & S. Duck (Eds.), *Personal Relationships: 3. Relationships in Disorder* (pp. 31–56). Academic Press.

Piccinelli, M., & Wilkinson, G. (2000). Gender differences in depression: Critical review. *The British Journal of Psychiatry*, *177*(6), 486-492. https://doi.org/10.1192/bjp.177.6.486

Portes, A., & Sensenbrenner, J. (1993). Embeddedness and Immigration: Notes on the Social Determinants of Economic Action. *American Journal of Sociology*, *98*(6), 1320-1350. https://doi.org/10.1086/230191

Pössel, P., Burton, S. M., Cauley, B., Sawyer, M. G., Spence, S. H., & Sheffield, J. (2018). Associations between Social Support from Family, Friends, and Teachers and depressive Symptoms in Adolescents. *Journal of Youth and Adolescence*, *47*(2), 398-412. https://doi.org/10.1007/s10964-017-0712-6

Pouraghajan, S., Ullrich, J., & Morina, N. (2023). Mental health of asylum seekers and refugees: The role of trauma and postmigration living difficulties and the moderating effect of intergroup contact. *Current Research in Ecological and Social Psychology*, *4*, 100118. https://doi.org/https://doi.org/10.1016/j.cresp.2023.100118

Pouwels, J. L., Valkenburg, P. M., Beyens, I., van Driel, I. I., & Keijsers, L. (2021). Social media use and friendship closeness in adolescents' daily lives: An experience sampling study. *Developmental Psychology*, *57*(2), 309-323. https://doi.org/10.1037/dev0001148

Prati, G., & Pietrantoni, L. (2010). The relation of perceived and received social support to mental health among first responders: a meta-analytic review. *Journal of Community Psychology*, *38*(3), 403-417. https://doi.org/https://doi.org/10.1002/jcop.20371

Price, J., Sloman, L., Gardner, R., Jr., Gilbert, P., & Rohde, P. (1994). The social competition hypothesis of depression. *The British Journal of Psychiatry*, *164*(3), 309-315. https://doi.org/10.1192/bjp.164.3.309

Prochnow, T., Patterson, M., & Hartnell, L. (2020). Social support, depressive symptoms, and online gaming network communication. *Mental Health and Social Inclusion*, *24*, 49-58. https://doi.org/10.1108/MHSI-11-2019-0033

Przybylski, A. K., & Weinstein, N. (2013). Can you connect with me now? How the presence of mobile communication technology influences face-to-face conversation quality. *Journal of Social and Personal Relationships*, *30*(3), 237-246. https://doi.org/10.1177/0265407512453827

Quadt, L., Esposito, G., Critchley, H. D., & Garfinkel, S. N. (2020). Brain-body interactions underlying the association of loneliness with mental and physical health. *Neuroscience & Biobehavioral Reviews*, *116*, 283-300. https://doi.org/https://doi.org/10.1016/j.neubiorev.2020.06.015

Qualter, P., Brown, S. L., Rotenberg, K. J., Vanhalst, J., Harris, R. A., Goossens, L., Bangee, M., & Munn, P. (2013). Trajectories of loneliness during childhood and adolescence: Predictors and health outcomes. *Journal of Adolescence*, *36*(6), 1283-1293. https://doi.org/https://doi.org/10.1016/j.adolescence.2013.01.005

Ram, N., Brinberg, M., Pincus, A. L., & Conroy, D. E. (2017). The Questionable Ecological Validity of Ecological Momentary Assessment: Considerations for Design and Analysis. *Research in Human Development*, *14*(3), 253-270. https://doi.org/10.1080/15427609.2017.1340052

Reevy, G. M., & Maslach, C. (2001). Use of Social Support: Gender and Personality Differences. *Sex Roles*, *44*(7), 437-459. https://doi.org/10.1023/A:1011930128829

Reimer, M. S. (1996). "Sinking Into the Ground": The Development and Consequences of Shame in Adolescence. *Developmental Review*, *16*(4), 321-363. https://doi.org/https://doi.org/10.1006/drev.1996.0015

Rens, E., Smith, P., Nicaise, P., Lorant, V., & Van den Broeck, K. (2021). Mental Distress and Its Contributing Factors Among Young People During the First Wave of COVID-19: A Belgian Survey Study. *Frontiers in Psychiatry*, *12*, 575553. https://doi.org/10.3389/fpsyt.2021.575553

Richard, J., Rebinsky, R., Suresh, R., Kubic, S., Carter, A., Cunningham, J. E. A., Ker, A., Williams, K., & Sorin, M. (2022). Scoping review to evaluate the effects of peer support on the mental health of young adults. *BMJ Open*, *12*(8), e061336. https://doi.org/10.1136/bmjopen-2022-061336

Ripley, R. M., Snijders, T. A. B., Boda, Z., Vörös, A., & Preciado, P. (2023). *Manual for RSiena. For RSiena version version 1.3.27*. University of Oxford. http://www.stats.ox.ac.uk/~snijders/siena/RSiena_Manual.pdf

Rivera-Riquelme, M., Piqueras, J. A., & Cuijpers, P. (2019). The Revised Mental Health Inventory-5 (MHI-5) as an ultra-brief screening measure of bidimensional mental health in children and adolescents. *Psychiatry Research*, *274*, 247-253. https://doi.org/https://doi.org/10.1016/j.psychres.2019.02.045

Rogeness, G. A., & McClure, E. B. (1996). Development and neurotransmitter-environmental interactions. *Development and Psychopathology*, *8*(1), 183-199. https://doi.org/10.1017/S0954579400007033

Rowan, P. J., Cofta-Woerpel, L., Mazas, C. A., Vidrine, J. I., Reitzel, L. R., Cinciripini, P. M., & Wetter, D. W. (2007). Evaluating reactivity to ecological momentary assessment during smoking cessation. *Experimental and Clinical Psychopharmacology*, *15*(4), 382-389. https://doi.org/10.1037/1064-1297.15.4.382

Rueger, S. Y., Malecki, C. K., Pyun, Y., Aycock, C., & Coyle, S. (2016). A meta-analytic review of the association between perceived social support and depression in childhood and adolescence. *Psychological Bulletin*, *142*, 1017-1067. https://doi.org/10.1037/bul0000058

Ruggiero, K. M., & Taylor, D. M. (1997). Why minority group members perceive or do not perceive the discrimination that confronts them: the role of self-esteem and perceived control. *Journal of personality and social psychology*, *72 2*, 373-389.

Rzeszutek, M., & Gruszczyńska, E. (2018). Paradoxical effect of social support among people living with HIV: A diary study investigating the buffering hypothesis. *Journal of Psychosomatic Research*, *109*, 25-31. https://doi.org/https://doi.org/10.1016/j.jpsychores.2018.03.006

Sabato, H., Abraham, Y., & Kogut, T. (2021). Too Lonely to Help: Early Adolescents' Social Connections and Willingness to Help During COVID-19 Lockdown. *Journal of Research on Adolescence*, *31*(3), 764-779. https://doi.org/https://doi.org/10.1111/jora.12655

Sahi, R. S., Schwyck, M. E., Parkinson, C., & Eisenberger, N. I. (2021). Having more virtual interaction partners during COVID-19 physical distancing measures may benefit mental health. *Scientific Reports*, *11*(1), 18273. https://doi.org/10.1038/s41598-021-97421-1

Sandler, I. N., & Barrera, M. (1984). Toward a Multimethod Approach to Assessing the Effects of Social Support. *American Journal of Community Psychology*, *12*(1), 37. https://doi.org/10.1007/BF00896927

Sapiezynski, P., Stopczynski, A., Lassen, D. D., & Lehmann, S. (2019). Interaction data from the Copenhagen Networks Study. *Scientific Data*, *6*(1), 315. https://doi.org/10.1038/s41597-019-0325-x

Saramäki, J., & Moro, E. (2015). From seconds to months: an overview of multi-scale dynamics of mobile telephone calls. *The European Physical Journal B*, *88*(6), 164. https://doi.org/10.1140/epjb/e2015-60106-6

Schaefer, D. R., Kornienko, O., & Fox, A. M. (2011). Misery Does Not Love Company: Network Selection Mechanisms and Depression Homophily. *American Sociological Review*, *76*(5), 764-785. https://doi.org/10.1177/0003122411420813

Schafer, M. H., & Vargas, N. (2016). The Dynamics of Social Support Inequality: Maintenance Gaps by Socioeconomic Status and Race? *Social Forces*, *94*(4), 1795-1822. http://www.jstor.org/stable/24754294

Schunck, R. (2013). Within and between Estimates in Random-Effects Models: Advantages and Drawbacks of Correlated Random Effects and Hybrid Models. *The Stata Journal*, *13*(1), 65-76. https://doi.org/10.1177/1536867X1301300105

Schuster, T. L., Kessler, R. C., & Aseltine, R. H. (1990). Supportive interactions, negative interactions, and depressed mood. *American Journal of Community Psychology*, *18*(3), 423-438. https://doi.org/10.1007/BF00938116

Schwarz, N. (2007). Retrospective and Concurrent Self-Reports: The Rationale for Real-Time Data Capture. In A. A. Stone, S. Shiffman, A. A. Atienza, & L. Nebeling (Eds.), *The Science of Real-time Data Capture: Self-reports in Health Research* (pp. 11-26). Oxford University Press. https://doi.org/10.1201/9781584888901.ch2

Scully, M., Swords, L., & Nixon, E. (2020). Social comparisons on social media: online appearance-related activity and body dissatisfaction in adolescent girls. *Irish Journal of Psychological Medicine*, 1-12. https://doi.org/10.1017/ipm.2020.93

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

Sekara, V., & Lehmann, S. (2014). The Strength of Friendship Ties in Proximity Sensor Data. *PLOS ONE*, *9*(7), e100915. https://doi.org/10.1371/journal.pone.0100915

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological Momentary Assessment. *Annual Review of Clinical Psychology*, *4*(1), 1-32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Shiovitz-Ezra, S., & Ayalon, L. (2011). Use of Direct Versus Indirect Approaches to Measure Loneliness in Later Life. *Research on Aging*, *34*(5), 572-591. https://doi.org/10.1177/0164027511423258

Slepian, M. L., & Jacoby-Senghor, D. S. (2020). Identity Threats in Everyday Life: Distinguishing Belonging From Inclusion. *Social Psychological and Personality Science*, *12*(3), 392-406. https://doi.org/10.1177/1948550619895008

Small, M. L. (2017). *Someone to Talk to*. Oxford University Press.

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

Snijders, T. A. B. (2008). Statistical modeling of dynamics of non-directed networks. Revised version. Presentation at the XXV International Sunbelt Social Networks Conference 2005, Los Angeles.

Snijders, T. A. B., & Baerveldt, C. (2003). A Multilevel Network Study of the Effects of Delinquent Behavior on Friendship Evolution. *The Journal of Mathematical Sociology*, *27*(2-3), 123-151. https://doi.org/10.1080/00222500305892

Snijders, T. A. B., & Pickup, M. (2017). Stochastic Actor-Oriented Models for Network Dynamics. In J. N. Victor, A. H. Montgomery, & M. Lubell (Eds.), *Oxford Handbook of Political Networks*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190228217.013.10

Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to Stochastic Actor-Based Models for Network Dynamics. *Social Networks*, *32*(1), 44-60. https://doi.org/https://doi.org/10.1016/j.socnet.2009.02.004

Sowislo, J. F., & Orth, U. (2013). Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. *Psychological Bulletin*, *139*(1), 213-240. https://doi.org/10.1037/a0028931

Steglich, C., Snijders, T. A. B., & Pearson, M. (2010). 8. Dynamic Networks and Behavior: Separating Selection from Influence. *Sociological Methodology*, *40*(1), 329-393. https://doi.org/10.1111/j.1467-9531.2010.01225.x

Stehlé, J., Charbonnier, F., Picard, T., Cattuto, C., & Barrat, A. (2013). Gender homophily from spatial behavior in a primary school: A sociometric study. *Social Networks*, *35*(4), 604-613. https://doi.org/https://doi.org/10.1016/j.socnet.2013.08.003

Stevanovic, D., Jafari, P., Knez, R., Franic, T., Atilola, O., Davidovic, N., Bagheri, Z., & Lakic, A. (2017). Can we really use available scales for child and adolescent psychopathology across cultures? A systematic review of cross-cultural measurement invariance data. *Transcultural Psychiatry*, *54*(1), 125-152. https://doi.org/10.1177/1363461516689215

Stone, A., Shiffman, S., Atienza, A., & Nebeling, L. (2007). *The science of real-time data capture: Self-reports in health research*. Oxford University Press.

Stone, A. A., Schneider, S., & Harter, J. K. (2012). Day-of-week mood patterns in the United States: On the existence of 'Blue Monday', 'Thank God it's Friday' and weekend effects. *The Journal of Positive Psychology*, *7*(4), 306-314. https://doi.org/10.1080/17439760.2012.691980

Stopforth, S., Kapadia, D., Nazroo, J., & Bécares, L. (2022). The enduring effects of racism on health: Understanding direct and indirect effects over time. *SSM - Population Health*, *19*, 101217. https://doi.org/https://doi.org/10.1016/j.ssmph.2022.101217

Stults-Kolehmainen, M. A., & Sinha, R. (2014). The Effects of Stress on Physical Activity and Exercise. *Sports Medicine*, *44*(1), 81-121. https://doi.org/10.1007/s40279-013-0090-5

Tatum, T. G., & Grund, T. U. (2020). Accusation and confession discrepancies in bullying: Dual-perspective networks and individual-level attributes. *Social Networks*, *60*, 61-70. https://doi.org/10.1016/j.socnet.2019.09.001

Thapar, A., Collishaw, S., Pine, D. S., & Thapar, A. K. (2012). Depression in adolescence. *The Lancet*, *379*(9820), 1056-1067. https://doi.org/https://doi.org/10.1016/S0140-6736(11)60871-4

Thoits, P. A. (1995). Stress, Coping, and Social Support Processes: Where Are We? What Next? *Journal of Health and Social Behavior*, 53-79. https://doi.org/10.2307/2626957

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

Thorisdottir, I. E., Sigurvinsdottir, R., Asgeirsdottir, B. B., Allegrante, J. P., & Sigfusdottir, I. D. (2019). Active and Passive Social Media Use and Symptoms of Anxiety and Depressed Mood Among Icelandic Adolescents. *Cyberpsychology, Behavior, and Social Networking*, *22*(8), 535-542. https://doi.org/10.1089/cyber.2019.0079

Thornton, A., & Clutton-Brock, T. (2011). Social learning and the development of individual and group behaviour in mammal societies. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *366*(1567), 978-987. https://doi.org/doi:10.1098/rstb.2010.0312

Thränhardt, D. (1995). Germany: An undeclared immigration country. *Journal of Ethnic and Migration Studies*, *21*(1), 19-35. https://doi.org/10.1080/1369183X.1995.9976470

Tilden, V. P., & Galyen, R. D. (1987). Cost and Conflict:The Darker Side of Social Support. *Western Journal of Nursing Research*, *9*(1), 9-18. https://doi.org/10.1177/019394598700900103

Titzmann, P. F., & Silbereisen, R. K. (2009). Friendship homophily among ethnic German immigrants: A longitudinal comparison between recent and more experienced immigrant adolescents [doi:10.1037/a0015493]. *Journal of Family Psychology*, *23*(3), 301-310. https://doi.org/10.1037/a0015493

Toegel, G., Kilduff, M., & Anand, N. (2013). Emotion Helping by Managers: An Emergent Understanding of Discrepant Role Expectations and Outcomes. *Academy of Management Journal*, *56*(2), 334-357. https://doi.org/10.5465/amj.2010.0512

Trepte, S., Reinecke, L., & Juechems, K. (2012). The social side of gaming: How playing online computer games creates online and offline social support. *Computers in Human Behavior*, *28*(3), 832-839. https://doi.org/10.1016/j.chb.2011.12.003

Trotman, H. D., Holtzman, C. W., Ryan, A. T., Shapiro, D. I., MacDonald, A. N., Goulding, S. M., Brasfield, J. L., & Walker, E. F. (2013). The development of psychotic disorders in adolescence: A potential role for hormones. *Hormones and Behavior*, *64*(2), 411-419. https://doi.org/https://doi.org/10.1016/j.yhbeh.2013.02.018

Trzesniewski, K. H., & Donnellan, M. B. (2010). Rethinking "Generation Me": A Study of Cohort Effects from 1976-2006. *Perspectives on Psychological Science*, *5*(1), 58-75. https://doi.org/10.1177/1745691609356789

Turner, H. A. (1994). Gender and social support: Taking the bad with the good? *Sex Roles*, *30*(7), 521-541. https://doi.org/10.1007/BF01420800

Turner, R. J., Wheaton, B., & Lloyd, D. A. (1995). The Epidemiology of Social Stress. *American Sociological Review*, *60*(1), 104-125. https://doi.org/10.2307/2096348

Twenge, J. M. (2020). Increases in Depression, Self-Harm, and Suicide Among U.S. Adolescents After 2012 and Links to Technology Use: Possible Mechanisms.

Psychiatric Research and Clinical Practice, *2*(1), 19-25. https://doi.org/10.1176/appi.prcp.20190015

Twenge, J. M., & Martin, G. N. (2020). Gender differences in associations between digital media use and psychological well-being: Evidence from three large datasets. *Journal of Adolescence*, *79*, 91-102. https://doi.org/10.1016/j.adolescence.2019.12.018

Twenge, J. M., Spitzberg, B. H., & Campbell, W. K. (2019). Less in-person social interaction with peers among U.S. adolescents in the 21st century and links to loneliness. *Journal of Social and Personal Relationships*, *36*(6), 1892-1913. https://doi.org/10.1177/0265407519836170

Umberson, D., Chen, M. D., House, J. S., Hopkins, K., & Slaten, E. (1996). The Effect of Social Relationships on Psychological Well-Being: Are Men and Women Really So Different? *American Sociological Review*, *61*(5), 837-857. https://doi.org/10.2307/2096456

United Nations. (2020). *International Migration 2020 Highlights (ST/ESA/SER.A/452)*. https://www.un.org/development/desa/pd/news/international-migration-2020

Uvnäs-Moberg, K. (1998). Oxytocin may mediate the benefits of positive social interaction and emotions. *Psychoneuroendocrinology*, *23*(8), 819-835. https://doi.org/https://doi.org/10.1016/S0306-4530(98)00056-0

Valtorta, N. K., Kanaan, M., Gilbody, S., Ronzi, S., & Hanratty, B. (2016). Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. *Heart*, *102*(13), 1009. https://doi.org/10.1136/heartjnl-2015-308790

van Rijsewijk, L., Dijkstra, J. K., Pattiselanno, K., Steglich, C., & Veenstra, R. (2016). Who Helps Whom? Investigating the Development of Adolescent Prosocial Relationships. *Developmental Psychology*, *52*(6), 894-908. https://doi.org/10.1037/dev0000106

van Tubergen, F. (2015). Ethnic Boundaries in Core Discussion Networks: A Multilevel Social Network Study of Turks and Moroccans in the Netherlands. *Journal of Ethnic and Migration Studies*, *41*(1), 101-116. https://doi.org/10.1080/1369183X.2014.886955

van Zalk, M. H., Kerr, M., Branje, S. J., Stattin, H., & Meeus, W. H. (2010). Peer contagion and adolescent depression: the role of failure anticipation. *Journal of Clinical Child & Adolescent Psychology*, *39*(6), 837-848. https://doi.org/10.1080/15374416.2010.517164

Vanhalst, J., Luyckx, K., & Goossens, L. (2014). Experiencing Loneliness in Adolescence: A Matter of Individual Characteristics, Negative Peer Experiences, or Both? *Social Development*, *23*(1), 100-118. https://doi.org/10.1111/sode.12019

Vaughan, C. A., Foshee, V. A., & Ennett, S. T. (2010). Protective Effects of Maternal and Peer Support on Depressive Symptoms during Adolescence. *Journal of Abnormal Child Psychology*, *38*(2), 261-272. https://doi.org/10.1007/s10802-009-9362-9

Verduyn, P., Lee, D. S., Park, J., Shablack, H., Orvell, A., Bayer, J., Ybarra, O., Jonides, J., & Kross, E. (2015). Passive Facebook usage undermines affective well-being: Experimental and longitudinal evidence. *Journal of Experimental Psychology: General*, *144*(2), 480-488. https://doi.org/10.1037/xge0000057

Verduyn, P., Schulte-Strathaus, J. C. C., Kross, E., & Hülsheger, U. R. (2021). When do smartphones displace face-to-face interactions and what to do about it? *Computers in Human Behavior*, *114*, 106550. https://doi.org/https://doi.org/10.1016/j.chb.2020.106550

Vernon, L., Modecki, K. L., & Barber, B. L. (2018). Mobile Phones in the Bedroom: Trajectories of Sleep Habits and Subsequent Adolescent Psychosocial Development. *Child Development*, *89*(1), 66-77. https://doi.org/https://doi.org/10.1111/cdev.12836

Viner, R., Russell, S., Saulle, R., Croker, H., Stansfield, C., Packer, J., Nicholls, D., Goddings, A.-L., Bonell, C., Hudson, L., Hope, S., Ward, J., Schwalbe, N., Morgan, A., & Minozzi, S. (2022). School Closures During Social Lockdown and Mental Health, Health Behaviors, and Well-being Among Children and Adolescents During the First COVID-19 Wave: A Systematic Review. *JAMA Pediatrics*, *176*(4), 400-409. https://doi.org/10.1001/jamapediatrics.2021.5840

Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., ..., & Bhutta, Z. A. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*, *396*(10258), 1204-1222. https://doi.org/10.1016/s0140-6736(20)30925-9

Vrijkotte, T. G. M., van Doornen, L. J. P., & de Geus, E. J. C. (2000). Effects of Work Stress on Ambulatory Blood Pressure, Heart Rate, and Heart Rate Variability. *Hypertension*, *35*(4), 880-886. https://doi.org/doi:10.1161/01.HYP.35.4.880

Walther, J. B. (1996). Computer-Mediated Communication:Impersonal, Interpersonal, and Hyperpersonal Interaction. *Communication Research*, *23*(1), 3-43. https://doi.org/10.1177/009365096023001001

Wang, J., Mann, F., Lloyd-Evans, B., Ma, R., & Johnson, S. (2018). Associations between loneliness and perceived social support and outcomes of mental health problems: a systematic review. *BMC Psychiatry*, *18*(1), 156. https://doi.org/10.1186/s12888-018-1736-5

Wanner, P., & Pecoraro, M. (2023). Self-reported health among migrants. Does contextual discrimination matter? *Journal of Migration and Health*, *8*, 100198. https://doi.org/https://doi.org/10.1016/j.jmh.2023.100198

Ware, J. E., Snow, K. K., Kosinski, M., & Gadek, B. (1993). *SF-36 Health Survey. manual and Interpretion Guide*. The Health Institute, New England Medical Center.

Ware, S., Yue, C., Morillo, R., Lu, J., Shang, C., Bi, J., Kamath, J., Russell, A., Bamis, A., & Wang, B. (2020). Predicting depressive symptoms using smartphone data. *Smart Health*, *15*, 100093. https://doi.org/https://doi.org/10.1016/j.smhl.2019.100093

Weiss, R. S. (1973). *Loneliness: The expierence of emotional and social isolation*. MIT Press.

Weiss, R. S. (1987). Reflections on the present state of loneliness research. *Journal of Social Behavior and Personality*, *2*(2), 1.

WHO. (1998). *Use of well-being measures in primary health care - the DepCare project health for all. Target 12. E60246.* WHO.

Wichstrøm, L. (1999). The emergence of gender difference in depressed mood during adolescence: the role of intensified gender socialization. *Developmental Psychology*, *35*(1), 232-245. https://doi.org/https://doi.org/10.1037/0012-1649.35.1.232

Williams, D. G. (1988). Gender, Marriage, and Psychosocial Well-Being. *Journal of Family Issues*, *9*(4), 452-468. https://doi.org/10.1177/019251388009004002

Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial Differences in Physical and Mental Health:Socio-economic Status, Stress and Discrimination. *Journal of Health Psychology*, *2*(3), 335-351. https://doi.org/10.1177/135910539700200305

Wills, T. A., & Shinar, O. (2000). Measuring perceived and received social support. In *Social support measurement and intervention: A guide for health and social scientists.* (pp. 86-135). Oxford University Press. https://doi.org/10.1093/med:psych/9780195126709.003.0004

Wittek, M., Kroneberg, C., & Lämmermann, K. (2020). Who is fighting with whom? How ethnic origin shapes friendship, dislike, and physical violence relations in German secondary schools. *Social Networks*, *60*, 34-47. https://doi.org/https://doi.org/10.1016/j.socnet.2019.04.004

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

Xu, Y., & Burleson, B. R. (2001). Effects of Sex, Culture, and Support Type on Perceptions of Spousal Social Support: An Assessment of the "Support Gap" Hypothesis in Early Marriage. *Human Communication Research*, *27*(4), 535-566. https://doi.org/https://doi.org/10.1111/j.1468-2958.2001.tb00792.x

Young, J. T. N., & Weerman, F. M. (2014). Delinquency as a Consequence of Misperception: Overestimation of Friends' Delinquent Behavior and Mechanisms of Social Influence. *Social Problems*, *60*(3), 334-356. https://doi.org/10.1525/sp.2013.60.3.334

Ysseldyk, R., McQuaid, R. J., McInnis, O. A., Anisman, H., & Matheson, K. (2018). The ties that bind: Ingroup ties are linked with diminished inflammatory immune responses and fewer mental health symptoms through less rumination. *PLOS ONE*, *13*(4), e0195237. https://doi.org/10.1371/journal.pone.0195237

Yu, Y.-F., Ting, T.-T., Liao, J. C., Tsai, M.-C., Lin, C.-Y., Hsieh, Y.-P., & Strong, C. (2023). The dynamics of adolescents' pubertal maturation, depressive symptoms and friendship networks: stochastic actor-oriented model. *Current Psychology*, *42*(19), 16573-16586. https://doi.org/10.1007/s12144-022-04078-8

Zimmer-Gembeck, M. J., Hunter, T. A., Waters, A. M., & Pronk, R. (2009). Depression as a longitudinal outcome and antecedent of preadolescents' peer relationships and peer-relevant cognition. *Development and Psychopathology*, *21*(2), 555-577. https://doi.org/10.1017/S0954579409000303

Declaration on Sources

Declaration on Sources

Eidesstattliche Erklärung

nach § 8 Abs. 3 der Promotionsordnung vom 17.02.2015

Hiermit versichere ich an Eides Statt, dass ich die vorgelegte Arbeit selbstständig und ohne die Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Die aus anderen Quellen direkt oder indirekt übernommenen Aussagen, Daten und Konzepte sind unter Angabe der Quelle gekennzeichnet. Bei der Auswahl und Auswertung folgenden Materials haben mir die nachstehend aufgeführten Personen in der jeweils beschriebenen Weise entgeltlich/unentgeltlich (zutreffendes unterstreichen) geholfen:

niemand

Weitere Personen, neben den ggf. in der Einleitung der Arbeit aufgeführten Koautorinnen und Koautoren, waren an der inhaltlich-materiellen Erstellung der vorliegenden Arbeit nicht beteiligt. Insbesondere habe ich hierfür nicht die entgeltliche Hilfe von Vermittlungs- bzw. Beratungsdiensten in Anspruch genommen. Niemand hat von mir unmittelbar oder mittelbar geldwerte Leistungen für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.

Die Arbeit wurde bisher weder im In- noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt.

Ich versichere, dass ich nach bestem Wissen die reine Wahrheit gesagt und nichts verschwiegen habe.

Ich versichere, dass die eingereichte elektronische Fassung der eingereichten Druckfassung vollständig entspricht.

Die Strafbarkeit einer falschen eidesstattlichen Versicherung ist mir bekannt, namentlich die Strafandrohung gemäß § 156 StGB bis zu drei Jahren Freiheitsstrafe oder Geldstrafe bei vorsätzlicher Begehung der Tat bzw. gemäß § 161 Abs. 1 StGB bis zu einem Jahr Freiheitsstrafe oder Geldstrafe bei fahrlässiger Begehung.

Ort, Datum Unterschrift

Curriculum Vitae

Curriculum Vitae

Birth: 12.03.1993, Bad Saarow (Germany)

Education

10/2019 – today	**Doctoral Studies Social Sciences** University of Cologne, Cologne
10/2016 – 09/2019	**Sociology & Social Research-Master of Science** University of Cologne, Cologne
04/2013 – 09/2016	**Social Sciences-Bachelor of Science** University of Cologne, Cologne
07/2012	**General qualification for university entrance** Nicolaus-Cusanus-Gymnasium, Bergisch Gladbach

---

Occupational career

10/2018 – today	**Research Associate** • Chair Sociology I Prof. Dr Clemens Kroneberg, University of Cologne
11/2022 – today	**Research Associate** • Chair of Methods of Empirical Social Research Prof. Dr Thomas Grund, RWTH Aachen University
07/2014 – 09/2018	**Student Assistent** • Chair Sociology I Prof. Dr Clemens Kroneberg, University of Cologne
06/2016 – 07/2016	**Internship** • Infas – Institute for Applied Social Science, Bonn
08/2012 – 10/2012	**Internship** • Max-Planck-Institute for the Study of Societies, Cologne

---