

Social Networks, Health Behaviour, and Well-Being in Middle-Aged and Older Adults

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Chapter 1

Introduction

1.1. Background

The global population is ageing, with estimates suggesting that by 2030, the number of people aged over 60 will reach 1.4 billion, rising further to 2.1 billion by 2050 (World Health Organization, 2021). These demographic shifts highlight the increasing need for societies to promote overall quality of life in later life, ensuring that individuals can maintain their physical, mental and cognitive health. According to the World Health Organization (WHO), health is more than just the absence of disease; it is defined as ‘a state of complete physical, mental, and social well-being’ (World Health Organization, 2020). As a multifaceted concept, well-being encompasses three dimensions. Hedonic well-being relates to positive and negative emotions, while evaluative well-being reflects overall life satisfaction and eudaimonic well-being involves finding purpose and meaning in life (Martín-María et al., 2021; Steptoe et al., 2015). When studying the overall health of older adults, it is crucial to focus not only on physical and cognitive health but also on the concept of well-being. While physical and cognitive health typically decline with age, well-being is a part of health that does not necessarily have to deteriorate (Blanchflower, 2021; Carstensen & Mikels, 2005; Hansen & Blekesaune, 2022; Steptoe et al., 2015). Furthermore, well-being can be a protective factor for physical health (Steptoe et al., 2015) and is thus an important health indicator when attempting to promote older adults’ quality of life.

There is a wider paradox regarding the well-being of older adults, with research finding inconsistent results for the development of well-being over the life course (Hansen & Blekesaune, 2022). While some literature suggests that well-being is ‘U-shaped’ with age, with the lowest point of well-being occurring around 40 to 50 years of age in low-, middle- and high-income countries (Blanchflower, 2021; Blanchflower & Oswald, 2008), some authors note an increase in well-being from mid-life to the mid-70s, with a significant decline thereafter (Baird et al., 2010; Frijters & Beaton, 2012; Hansen & Blekesaune, 2022). One explanation for this may be that much well-being research does not consider the multidimensionality of well-being—particularly in older adults—with much research investigating only one dimension of well-being (Hansen & Blekesaune, 2022; Hansen &

Slagsvold, 2012). Therefore, when assessing the well-being of middle-aged and older adults, it is very important to look at the whole picture of well-being.

Social epidemiology has shown that social embeddedness is essential for physical and mental health and overall well-being, especially among older adults (Holt-Lunstad et al., 2010; Huxhold et al., 2013; Litwin & Shiovitz-Ezra, 2011; Rafnsson et al., 2015). Both social isolation and loneliness are linked to an increased risk of premature death, with this risk being comparable in magnitude to other well-established mortality risk factors such as obesity, substance abuse and insufficient physical activity (Holt-Lunstad et al., 2015). Research indicates a high prevalence of social isolation and loneliness worldwide, making it a public health challenge (Holt-Lunstad, 2017, 2022; Surkalim et al., 2022).

Although this issue is highly relevant, the study of social embeddedness and its relationships with health and well-being is challenging due to the complexity and overlap of related concepts (Valtorta et al., 2016). Terms such as social support, social networks and social integration represent different perspectives on the resources found within personal communities. Social support can be defined as those social resources that people either perceive to be available to them or that are actually provided to them. The social network is a component of social structure, which consists of the social relationships of individuals and the links between them. The extent to which a person participates in private and public social interactions is referred to as social integration (Gottlieb & Bergen, 2010). However, Gottlieb and Bergen (2010) note that these terms are often confused due to their interconnectedness and reciprocal influence. This conceptual ambiguity makes research in this area particularly challenging.

By adopting a social network perspective, this dissertation aims to address challenges in the field of social network research and fill important research gaps in the literature. This dissertation aims to explore the relationships between social relationships, health behaviour and well-being in middle-aged and older adults and is structured around two pillars. In the first pillar (*social support and health behaviour*), the dissertation specifically investigates the relationship between social support and physical activity. In the second pillar (*social networks and well-being*), the dissertation uses an empirical qualitative network approach to explore the relationship between social networks and well-being.

1.2. Research aim: Two pillars of the dissertation

Pillar 1 examines the relationship between social support and health behaviour in older adults, as described in Chapter 2. For Study 1, a scoping review was conducted using

self-collected data from 116 studies. The focus is narrow, concentrating only on functional social support, the older adult population and a specific health behaviour.

Pillar 2 (Chapters 3 and 4) broadens the scope to include a social network perspective that encompasses both middle-aged and older adults. Using self-collected data from 28 qualitative interviews and 25 unstructured egocentric network maps, a qualitative network analysis was conducted. Study 2 explored how well-being is perceived by middle-aged and older adults and how their personal networks contribute to their well-being. Study 3 examined how these personal networks are managed to maintain or improve well-being.

1.3 Research objectives

This dissertation addresses the following research objectives:

First, it provides a comprehensive and rigorous scoping review to exclusively examine how functional social support is associated with physical activity in older adults. A key challenge in research on social networks and health is the inconsistent use of terminology and lack of clarity about the various dimensions of social integration (Valtorta et al., 2016).

Functional support refers to providing specific functions through social relationships, such as emotional or informational support (Gottlieb & Bergen, 2010). By specifically examining the functional aspects of social support, this dissertation provides valuable insights into the relationship between functional social support and physical activity.

Second, this dissertation examines the well-being of middle-aged and older adults, with a particular focus on their well-being networks. Due to inconclusive research results about the development of well-being in middle-aged and older adults, it is important to study the well-being of this population group in depth. One way of achieving this would be to use a qualitative research design. This approach can provide detailed explanations of what well-being means to individuals and identify the factors and relationships contributing to it. By using a qualitative research design, my dissertation can uncover the underlying strategies used by middle-aged and older adults to promote well-being. By examining the factors contributing to their well-being, it explores the multidimensional nature of well-being in this population. It also provides insights into the so-called 'well-being paradox' by exploring how older adults define well-being, what actions they take to maintain or improve it, and how they maintain their well-being networks.

In the following section, I will present the theoretical background of my dissertation and further explain the importance of adopting a social network lens when studying health and well-being. Since the second pillar of my dissertation consists of data collected in a multi-method project, I will briefly outline the research approach I used, the background of the project and the data collection technique. I will then provide an overview of the three studies in the dissertation. Finally, I will summarise the main conclusions and discuss the limitations and contributions of this dissertation.

1.4 Theoretical framework: Social networks and health

The title of this dissertation is ‘Social Networks, Health Behaviour and Well-being in Middle-aged and Older Adults. But what is it that makes the social network perspective so important in the study of health and well-being? Social networks are ‘a web of social relationships that surround an individual and the characteristics of those ties’ (Berkman et al., 2000, p. 847). These relationships can influence both healthy and unhealthy behaviours and act as either facilitators or barriers. When individuals seek to change their health behaviour, these networks can either help or hinder their efforts. Thus, the impact of social networks on health is not necessarily positive or negative but depends on their specific characteristics and functions (de la Haye, 2024).

Social network characteristics include size (number of actors), transitivity (the tendency of ties to form clusters, i.e. whether indirect links exist between actors, creating a closed structure), density (the degree to which actors are connected in a network), homogeneity (the degree of similarity of actors within a network), centrality (the degree to which an actor is central in the network based on their direct and indirect ties), boundedness (the extent to which networks are defined based on group structures such as kinship) and distance (the path length between two actors within a network) (Berkman et al., 2000; Berkman & Krishna, 2014; de la Haye, 2024).

In this context, the characteristics of individual network ties provide a more specific understanding of the relationship between two actors within a network. Among others, these characteristics include contact frequency, multiplexity (the presence of multiple types of social ties or support exchanges between two actors in a network), reciprocity (the degree to which ties in a network are mutually shared), duration (the amount of time an actor has known another) and emotional closeness (Berkman et al., 2000; Berkman & Krishna, 2014; de la Haye, 2024).

The range of relationships associated with health concerns is broad, including kinship and friendship, help-seeking behaviour with neighbours and colleagues, sexual contact networks, organisational or governmental collaborations, and digital engagement through social media, such as liking or sharing posts (de la Haye, 2024; Valente, 2010). Health behaviours are rarely the result of personal characteristics alone (e.g. an individual's awareness of the health implications of a decision) and are shaped by personal factors, such as genetics, beliefs, emotions and finances, as well as broader influences such as social networks, community, organisations and the policy environment. Therefore, many health outcomes are partly shaped by social and structural factors (de la Haye, 2024).

Research on social networks differentiates between functional and structural characteristics. Functional aspects pertain to the quality of personal networks, including the availability of social support, feelings of loneliness, or perceptions of isolation. In contrast, structural characteristics focus on quantitative factors such as the size or density of networks, frequency of contact and the geographical proximity of social relationships (Ellwardt et al., 2015; Holt-Lunstad et al., 2017).

Berkman et al. (2000) developed a conceptual model of how social networks influence health, incorporating both the functional and structural perspectives of social networks. This dynamic model is a causal process, starting from the macro perspective of social-structural characteristics, through social networks at the meso level, to psychosocial mechanisms at the micro level, ultimately leading to health pathways. It explains the process by which social integration affects health. At the macro level, this model explains how social-structural conditions such as culture, socio-economic factors, politics and social change determine the extent, form and nature of social networks at the meso level. They divide social networks into two main categories: the network structure and the characteristics of ties within the network.

Social networks provide opportunities for the psychosocial mechanisms that operate at the micro level. These mechanisms consist of social support, social influence, social engagement, person-to-person contact, access to resources and material goods, and negative social interactions. These mechanisms ultimately affect health through different pathways: health behavioural pathways (e.g. *health-damaging* behaviour such as alcohol or tobacco consumption and *health-promoting* behaviour such as exercising or medical adherence); psychological pathways (e.g. coping mechanisms or sense of well-being); and physiological pathways (e.g. immune system function or infectious disease transmission) (Berkman et al., 2000; Berkman & Krishna, 2014).

In my dissertation, I focus on four components of this model. Chapters 2 and 3 focus on the micro level and emphasise the psychosocial mechanisms of how social networks affect health. Chapter 2 examines the link between *social support and health behaviour pathways*, while Chapter 3 examines the link between *social engagement and psychological pathways*. In Chapter 4, I take a meso perspective and examine the *social network structure and characteristics of the social network ties of socially engaged people*, thus incorporating psychosocial mechanisms at the micro level and exploring how these social networks influence *psychological pathways*.

To further demonstrate these concepts, the following sections examine how social support (Pillar 1), social engagement and social networks (Pillar 2) influence health.

1.5. Pillar 1: Social support and health behaviour

Social support is a multidimensional concept with varying definitions in the literature. For this dissertation, the definition proposed by Lin is used since it captures and synthesises various existing definitions. It states that social support can be defined as 'the perceived or actual instrumental and/or expressive provisions supplied by the community, the social network, and the confiding partners' (Lin, 1986, p. 19). Social support is inherently transactional, involving both giving and receiving. This exchange typically occurs within a normative framework of interdependence, solidarity and reciprocity (Gottlieb & Bergen, 2010; Taylor, 2012). Furthermore, it is important to distinguish between cognitive (perceived) social support and behavioural (received) social support. While received and perceived support are weakly linked (Thoits, 2011), both the availability of potential support and the actual receipt of support are very important (Berkman & Krishna, 2014; Cohen & Wills, 1985; Wills & Shinar, 2000).

Social support consists of two interrelated components: structural and functional support. Although distinct, these aspects influence each other (Gottlieb & Bergen, 2010). Structural social support refers to the extent to which an individual is embedded in a network of social relationships. It includes quantitative aspects such as the number of ties an individual has, their social roles, and the frequency of interactions within the network. The overall density and organisation of these ties influence how relationships are maintained and structured (Lin et al., 1999; Thoits, 2011).

These social ties form the basis of functional support, which refers to the qualitative aspects of relationships and the specific types of help they provide (Taylor, 2012). Functional social support can take different forms, depending on the nature of the

relationship (Taylor, 2012). However, access to these forms of support is inherently linked to structural relationships. The extent and type of support an individual receives is shaped by the size, cohesion and composition of their social network (Thoits, 2011).

This suggests that structural and functional social support are not independent concepts but rather interdependent (Gottlieb & Bergen, 2010). This dissertation specifically focuses on functional social support because I aim to explore which specific types of social support (i.e. emotional, informational, instrumental, companionship support or validation) are associated with health behaviours. The concept of functional social support suggests that social ties serve various supportive roles that can have different effects depending on the context and nature of a problem. Emotional support includes listening, caring and accepting, as well as providing encouragement, appreciation and reassurance. Instrumental support refers to tangible help such as transport, household or financial support. Informational support includes information about how to manage problems, resources and services, and advice and guidance. Companionship support includes the presence of people to share social and leisure activities with. The final dimension is based on the idea that social relationships can provide information about the appropriateness or conformity of behaviour and is often referred to as validation, feedback or social comparison (Wills & Shinar, 2000). This suggests that functional social support is of particular interest in health behaviour research since it is important to consider different dimensions of support separately, as well as how each type of support may help or hinder health behaviour.

1.6. Pillar 2: Social networks and well-being

Social networks serve crucial roles in health and well-being. The size of an individual's network is an important indicator of available resources. However, the diversity within this network is even more important since different types of relationships can fulfil many needs and functions (Agneessens et al., 2006; Wellman & Wortley, 1990). For example, declines in social network complexity are associated with declines in cognitive function in older adults (Ellwardt et al., 2015). Furthermore, older adults who are connected to less resourceful network types (e.g. family-centred or restricted networks) are more likely to experience alcohol abuse, physical inactivity and reduced complementary medicine use (Shiovitz-Ezra & Litwin, 2012). Importantly, the relationship between network types and health among older adults is reciprocal. For instance, diverse networks contribute to the best health outcomes, with friend-based networks showing more positive effects on physical health than family-based networks; however, this is not the case for mental health.

Moreover, a decline in health indicators often leads to a retreat from more supportive network types (e.g. diverse networks) to less advantageous networks (e.g. family-centred or restricted networks) (Li & Zhang, 2015).

The composition of social networks changes over one's lifetime (Bidart & Lavenu, 2005; Mollenhorst et al., 2014). In particular, age-related events and processes—e.g. declining health, retirement and bereavement—lead to changes in the size and composition of social networks (Ellwardt et al., 2015). Although the size of older adults' social networks decreases with age (Bidart & Lavenu, 2005; Wrzus et al., 2013), older adults are generally more satisfied with their social networks compared to younger adults. This is primarily because older adults have a higher proportion of emotionally close relationships (Huxhold et al., 2020). As individuals age, they tend to have a reduced number of peripheral relationships. However, research has demonstrated that close and emotionally significant relationships remain constant (English & Carstensen, 2014; Huxhold et al., 2020; Wrzus et al., 2013). Socioemotional selectivity theory (Carstensen, 1993) and social convoy theory (Kahn & Antonucci, 1980) address these changes. Both theories suggest that as people age, weaker social ties gradually decline, while stronger emotional ties—such as with family and close friends—tend to last. Nevertheless, these changes are attributed to different underlying factors (Wrzus et al., 2013).

The socioemotional selectivity theory is a motivational model. It posits that as people age, they become increasingly aware of the limited amount of time remaining in their lives. This impacts the way they choose to spend their time: Younger adults often concentrate on forming new relationships, while older adults focus on maintaining existing relationships with those they know and care about. Consequently, older adults are more likely to dissolve relationships with people to whom they feel less connected. This theory assumes that the process of 'cleaning out' one's network promotes well-being. This reduction in network size in old age is actively sought and not a passive consequence of the passing of network members (Carstensen, 1993; Carstensen & Mikels, 2005; Hollstein, 2023). Social convoy theory (Kahn & Antonucci, 1980) suggests that individuals have a network of social connections that accompany them throughout their lives. The importance and closeness of these relationships can vary according to social circumstances, and they can be affected in different ways by life transitions. The expectation is that relationships within the closest 'convoy', such as the nuclear family, are stable throughout life. Conversely, relationships on the periphery of the convoy (e.g. acquaintances, colleagues and neighbours) are considered less stable and may be ended due to changing external events (Hollstein,

2023; Kahn & Antonucci, 1980). It is crucial to acknowledge that older adults possess the capacity to proactively shape, adapt and maintain their personal networks to address their evolving social needs and thereby foster their well-being (Hollstein, 2023).

This ability to improve one's own well-being is addressed by the social production function (SPF) theory. This theory divides total well-being into physical well-being and social well-being, both of which are achieved through so-called instrumental goals. The maintenance of physical well-being is supported by two fundamental instrumental objectives: 'stimulation' (e.g. engagement in physical, mental and sensory activities) and 'comfort' (e.g. elimination of unmet physical needs and the fostering of a secure, comfortable living environment). Social well-being is achieved through three primary goals: 'status' (linked to one's profession, lifestyle and talents), 'behavioural confirmation' (participating in productive and meaningful actions, achieving personal and collective goals, and being a valued group member) and 'affection' (forming bonds of love, intimacy and emotional support with others) (Ormel et al., 1997, 1999; Steverink & Lindenberg, 2006). According to the SPF theory, individuals seek to maximise their overall well-being by selecting and switching between different goals whilst considering their constraints and the resources available to them (Ormel et al., 1997, 1999). SPF theory further developed into SPF successful ageing (SPF-SA) theory (Steverink et al., 1998; Steverink & Lindenberg, 2006), an important advance recognising that older adults experience changes in the resources needed to sustain their well-being. While basic human needs remain constant throughout life, this theory highlights that the physical and social resources and opportunities needed to fulfil those needs change over time. Moreover, the SPF-SA theory suggests that individuals adapt to such changes by compensating for a reduction in one need through increased efforts to meet other needs. For instance, losing status satisfaction may prompt a person to focus more on achieving behavioural confirmation and affection (Steverink et al., 1998; Steverink & Lindenberg, 2006).

Social engagement, also referred to as social participation, is often a key component of these efforts. Social participation involves 'a person's involvement in activities that promote interaction with others in the community or society' (Levasseur et al., 2010) and can be formal or informal in nature (Ang, 2019; Donnelly & Hinterlong, 2010). Examples of formal social participation include involvement in community groups or organisations, whilst informal participation includes maintaining contact and engaging in activities with family and friends. By facilitating engagement, social networks create and strengthen meaningful social roles that offer individuals a sense of worth, belonging and connection

(Berkman & Krishna, 2014). Research has found that social engagement and participation are closely associated with cognitive function in older adults, possibly through the direct stimulation of cognitive abilities. By activating physiological systems, social engagement may not only directly promote physical health but also indirectly promote a sense of coherence and identity, ultimately supporting overall well-being (Berkman & Krishna, 2014). As older adults transition away from formal employment and gain more free time, their social participation patterns tend to differ from those of younger adults (Levasseur et al., 2010). Formal social participation typically increases with age, particularly in older age, while informal participation tends to decrease (Ang, 2019). Thus, formal social participation can be seen as a strategy for maintaining social ties, sustaining social networks and combating loneliness (Donnelly & Hinterlong, 2010; Jongenelis et al., 2022).

1.6.1. Approach: Egocentric social network analysis

It is essential to adopt a social network perspective when studying health. Within social network analysis, researchers distinguish between studying whole social networks (sociometric) and individuals' personal networks (egocentric). Both types of network analysis have distinct advantages and disadvantages (Smith, 2021).

Sociometric network research aims to understand the structure of an entire network. Therefore, data must be collected in a bounded area (e.g. classrooms or workplaces), and all relationships within this bounded network are collected and analysed. Since all actors provide information about all other actors within this bounded network, information about the relationships (e.g. frequency and quality of contact, etc.) can be used to study network dynamics and their consequences (An, 2024). However, in sociometric network analysis, the researcher must assume that only relationships with individuals within the restricted network influence behaviour, and that relationships outside the network have no influence. For example, if one studies the entire network of a work department, one must assume that all relationships outside that department (e.g. romantic partners, family, friends, acquaintances, etc.) have little influence on the individual's behaviour (Perry et al., 2024). For some research questions, such as those related to mental health, this assumption can be inadequate, which is especially true for studying a latent construct such as well-being.

This problem can be addressed by egocentric network analysis since egocentric data collection is not tied to a specific limited context but collects data from a personal network of the ego (An, 2024). Egocentric network analysis focuses on the consequences of being socially embedded—often within multiple overlapping social circles (Kadushin, 2012).

Egocentric network analysis assumes that a person's personal network influences their

behaviour. This may involve analysing how a person uses, manages or activates their network, how a person deals with conflict, or how the composition and structure of the personal network affects the ego (Perry et al., 2024).

Nevertheless, egocentric data also has certain disadvantages. For example, all information obtained about a social network is collected from one person — ego. Thus, the information about the social relationships within the network is subject to the subjective interpretation and perception of the ego—and may thus be inaccurate (Perry et al., 2024; Smith, 2021). However, for the study of well-being, it can be argued that perceived embeddedness is more important than actual embeddedness. Furthermore, this dissertation uses a qualitative research design. Since qualitative research is always based on the subjective interpretation of the participants, this issue is not as problematic for the research objective. Therefore, it was appropriate to choose egocentric network analysis. By using a qualitative network study, a deeper and more nuanced perspective of the ego networks—and thus an understanding of the structure, stories, etc. behind the relationships—was gained.

The inclusion of qualitative methods in network research has many advantages. In addition to the possibility of developing new concepts, it offers the possibility of analysing social networks, as well as their structures and dynamics, in greater depth. Qualitative research methods are often the best way to investigate a particular area of research interest since they provide access to the field and can identify deeper interests and problems. As such, they offer the possibility of subsequently investigating these phenomena quantitatively (Hollstein, 2024). This initial access to the field is not only important if, for example, one aims to study hard-to-reach or vulnerable groups; it is also useful if one aims to gain a deeper understanding of more ambiguous or latent constructs such as well-being.

1.6.2 Multi-methods project ‘Social networks and wellbeing: A mixed methods study in an older community’ (*Jeckenstudie*)

This study is part of the multi-method project Social Networks and Wellbeing: A Mixed Methods Study in an Older Community, funded by the German Research Foundation (DFG) and also known as ‘*Jeckenstudie*’. The project investigates how social networks are associated with health and well-being in old age and consists of a cross-sectional qualitative egocentric network study and a longitudinal quantitative sociometric network study (Reiner et al., under review).

To explore the social networks of middle-aged and older adults and how these affect their well-being, I performed a qualitative social network study. I conducted qualitative

egocentric network interviews with 29 working and retired adults who are members of carnival clubs in North Rhine-Westphalia, Germany. These clubs act as local social organisations, organising annual carnival events and year-round community activities (e.g. summer festivals, informal gatherings and charity events). Members engage in significant volunteer work, with ordinary members meeting monthly and steering committee members meeting more frequently. Carnival clubs were chosen for their stability during the COVID-19 pandemic and their inclusive nature, allowing participation without specific prerequisites such as health, athletic or musical ability. Their demographic diversity, encompassing various educational, professional and social backgrounds, made them suitable for studying the social networks and well-being of middle-aged and older adults.

A qualitative social network approach allows researchers to explore not only the structural but also the functional dimensions of social networks (Bilecen, 2021; Sommer & Gamper, 2021). Therefore, this method facilitated an in-depth exploration of the well-being of middle-aged and older adults involved in formal social participation. Additionally, the approach shed light on the well-being networks of this group. Furthermore, this approach allowed us to uncover the mechanisms behind changes in these networks and how individuals adapt to these changes and manage their social networks for well-being.

1.6.3. Data collection method: Qualitative social network interviews

The interviews took place between November 2022 and April 2023 in Germany, and participants were interviewed individually, face to face. During the interviews, each participant created an unstructured egocentric network map (Hollstein et al., 2020). Analysing the social aspects of social networks requires a closer look at the importance of interpersonal relationships. For this purpose, it is useful not only to record how people talk about their social network and the social relationships they maintain but also to visualise these relationships. By visualising the network, additional and more detailed information about the network can be identified (Ryan et al., 2014). Visualising the social network provides participants with a more comprehensive view of their relationships and the social contexts in which they are embedded. This perspective may not be apparent from a simple interview that only describes their relationships. The network map visualises complex social structures and highlights unexpected aspects, encouraging reflection. Thus, it supports a deeper understanding of the social network. Additionally, it is possible to systematise information about social connections and explore the content and meaning of these connections (Tubaro et al., 2016).

In the present study, network maps were created using a sheet of blank paper only containing a circle with the word ‘ego’ in the centre, placed on the table in front of each participant. One advantage of using paper network maps—particularly over post-hoc software-based network maps—is that participants complete them during the interview, which increases the richness of the collected data. Paper network maps are also less prone to technical glitches and facilitate easy visualisation. Additionally, their simplicity makes them easy for older adults to use, which was important for our study (Ryan et al., 2014).

As a name generator exercise, participants were instructed to write down the names of individuals or organisations that are significant to their well-being on sticky notes (*‘I am interested in who or what is important for you to feel good. When you think about your personal well-being, who is particularly important to you?’*). To represent the importance of each person or organisation, participants were asked to use larger sticky notes for those who are very important and smaller ones for those who are less important. The frequency of contact with these individuals was indicated by the proximity or distance of the notes to the ‘ego’ in the centre. Participants were instructed to arrange the notes according to the frequency of their contact with people or organisations. Those with whom they had more contact were to be placed closer to the ego, while those with whom they had less contact were to be placed further away. Participants were then asked to draw lines between the people or organisations who know each other to represent the alter-alter relationships, which resulted in the creation of the individual well-being network map. Participants reflected on the network map and described changes that have occurred over time.

An unstructured network map approach was chosen for several reasons. First, it provides insights into contact frequency. Participants used the paper to indicate contact frequency, with some providing very thorough responses. For example, several participants replaced their sticky notes throughout the interview to ensure an accurate visual representation. Another advantage of using an unstructured network map was that it allowed a freer approach than, for example, a social convoy questionnaire. For example, participants could choose whether to include individual friends’ names or to use a single note to indicate ‘friends’ in general. No restrictions were imposed, which increased the openness of the interview.

The interview guide included the following main topics: a definition of well-being; positive, absent and negative social contacts for well-being; alter-alter relationships and their effects on participants’ well-being; reflection on one’s own network and the role of the carnival club for well-being.

Conducting qualitative interviews using sociograms offered many advantages due to the dynamic and interactive interview situation. Participants indicated that they found the creation of the network map interesting and enjoyable. Additionally, data on the importance and frequency of contacts and how participants structured their social networks was collected. For example, some participants developed clusters of people such as friends, colleagues, family members, etc. Others sorted their social contacts chronologically or geographically. Some participants said that only very important contacts (= large sticky notes) were relevant to their well-being, while others said that less important and more peripheral ties (= smaller sticky notes) were also important to them. The maps served as a cognitive aid, helping participants to better remember their social contacts (von der Lippe & Gamper, 2017). During the interviews, participants could add new sticky notes or adjust their size and location, resulting in a more accurate representation of their personal network map.

1.7. Summary of the three studies

This section introduces the three studies comprising this cumulative dissertation. Although the overall dissertation focuses on the influence of social networks on health behaviour and well-being of middle-aged and older adults, it is built on two pillars. The first pillar, presented in Chapter 2, adopts a narrow social network perspective by focusing on social support and targeting older adults (aged 60 and above). In contrast, the second pillar—comprising the studies in Chapters 3 and 4—offers a broader social network perspective. Drawing on data from the *Jeckenstudie*, these studies examine social participation and the management and maintenance of social relationships, including middle-aged and older adults aged 45–80. This broader scope facilitates a detailed exploration of the similarities and differences between these age groups. A summary of the three papers is provided in Table 1.

Table 1: Overview of the dissertation papers

	Study 1	Study 2	Study 3
Title	Physical activity and functional social support in community-dwelling older adults: A scoping review	Well-being in middle-aged and older adults who volunteer: A qualitative network analysis	How do working and retired adults maintain their social relationships? A qualitative network analysis
Research question	What is the relationship between functional social support and physical activity in community-dwelling older adults?	What factors contribute to the well-being of middle-aged and older adults who participate in formal volunteering activities?	What strategies do working and retired adults employ to navigate their social networks? How do they maintain their social relationships to promote well-being?
Study design	Scoping review	Qualitative network analysis	Qualitative network analysis
Data	Self-collected: 116 articles	Self-collected (' <i>Jeckenstudie</i> '): 28 qualitative interviews	Self-collected (' <i>Jeckenstudie</i> '): 28 qualitative interviews and 25 egocentric social network maps
Authorship	With Amelie Reiner	With Lea Ellwardt and Maya Wermeyer	With Başak Bilecen
Publication status	Published in <i>BMC Public Health</i> (2024, 10.1186/s12889-024-18863-6)	Published in <i>Aging & Mental Health</i> (2024, 10.1080/13607863.2024.2393250)	Submitted to <i>Advances in Life Course Research</i>

1.7.1 Study 1: Physical activity and functional social support in community-dwelling older adults: A scoping review

In this study (Chapter 2), Amelie Reiner and I conducted a scoping review to explore the association between functional social support (SOSU) and physical activity (PA) in community-dwelling older adults.

Regular PA serves a key role in maintaining the physical, cognitive and mental health of older adults. However, PA declines with age and many do not meet recommended activity levels (World Health Organization, 2022). Research suggests that older adults with more SOSU are more physically active (Lindsay Smith et al., 2017). However, terms such as social support, social integration and social networks are often used interchangeably, despite measuring different things. To address this issue, this study focuses exclusively on functional social support. Functional SOSU highlights the various types of support that social relationships provide, comprising five domains: emotional, instrumental,

informational, companionship support, and validation. Examining these functional aspects is crucial for understanding PA in older adults since each dimension provides distinct forms of support that may influence PA adherence.

The goal of this scoping review is to assess and map the full range of available evidence on the relationship between functional SOSU and PA in older people. Through the inclusion of quantitative, qualitative and mixed methods studies, this review aims to present a complete overview of functional SOSU and PA measures in older adults. Including qualitative studies highlights the barriers and facilitators to PA, helping explain why many older adults do not meet recommendations. This scoping review was conducted in line with the Joanna Briggs Institute guidelines (Peters et al., 2020).

We conducted the literature search up to 8 August 2023, across the databases PubMed, Web of Science, Scopus, APA PsycInfo, ProQuest, SocINDEX, PSYINDEX, and the Cochrane Library. We also reviewed reference lists from other literature reviews to uncover additional relevant sources. The inclusion criteria encompassed English-language, peer-reviewed empirical studies that explored the association between functional SOSU and PA in older adults, with no restrictions on time or geography. Eligible studies included participants aged 40 or older, with a minimum mean age of 60. Exclusion criteria included editorials, commentaries, study protocols, conference proceedings, grey literature, reviews, and studies only on specific patient groups or institutionalised individuals. The initial search yielded 35,777 articles. After removing duplicates, 20,907 abstracts were assessed for eligibility. After reviewing 255 full texts, 116 articles were included in the final analysis. The detailed data extraction table in Chapter 2 summarises the 116 articles' key characteristics, measures and results. The articles were published between 1989 and 2023, with more than 50% appearing after 2017. However, comparing their results was challenging due to significant differences in study design. While evidence of relationships between functional SOSU and PA is mixed, most studies show a positive association. Overall, 72% of the studies were quantitative and 28% were qualitative. Most quantitative studies used self-reported measures of PA, while only 23% used objective measures. Although most SOSU studies on PA and general SOSU and PA reported positive associations, the evidence is inconclusive when considering the source of support, with some studies favouring kin support and others non-kin support. Emotional, informational and companionship SOSU are all positively related to PA, while instrumental support occasionally shows a negative relationship. Companionship support is particularly effective in promoting PA by increasing social connectedness—especially in group settings.

Qualitative research also highlights the role of social comparison in motivating PA. Functional SOSU refers to the idea that interpersonal relationships offer distinct forms of support, each potentially more or less effective in addressing specific challenges. For older adults, all five dimensions of functional SOSU are relevant to PA adherence. In particular, SOSU from family, friends or an exercise group seems to encourage PA. As a result, participating in PA may also be an effective strategy for improving social interaction and integration.

1.7.2 Study 2: Well-being in middle-aged and older adults who volunteer: A qualitative network analysis

This paper (Chapter 3) is the first part of the second pillar of this dissertation. Lea Ellwardt, Maya Wermeyer and I explored the factors contributing to the well-being of people in middle and older adulthood who engage in formal volunteering. Older adults face difficulties in meeting their social and well-being needs due to ageing processes such as retirement or declining health. As a form of social participation, formal volunteering is associated with many positive health outcomes, reduces loneliness and can promote social integration among older adults. While much is known about the positive effects of formal volunteering on the health and well-being of older adults, limited research explores how social networks shape this association (Webster et al., 2021). As older adults' networks often shrink and lose diversity due to factors such as retirement, declining health or bereavement, social participation can become more challenging (Shi & Shi, 2023). Changes in network size and composition significantly affect the frequency and likelihood of volunteering (Ajrouch et al., 2016; Webster et al., 2021). Thus, qualitative studies should explore how social networks influence the motivations, facilitators and outcomes of volunteering among older adults (Jiang et al., 2019; Webster et al., 2021).

This study focuses on identifying the factors that impact the well-being of middle-aged and older adults engaged in formal volunteering. The choice of this group highlights the transition from work to retirement in order to better understand the resources that support well-being during this period. By focusing on socially active volunteers, the research explores their motivations for volunteering and their overall well-being. Using a network perspective, which recognises that well-being is shaped by interconnected social relationships, the study seeks to understand not only who contributes to well-being, but also the dynamics between these connections.

Overall, 28 semi-structured network interviews with members of carnival clubs in North Rhine-Westphalia, Germany were conducted. As local social organisations, these

clubs coordinate annual carnival activities and ongoing community events throughout the year (e.g. summer festivals, casual social gatherings and charity events). There is a high level of member involvement, with ordinary members meeting about once per month and steering committee members meeting more regularly. Among the participants, 68% (n=19) were steering committee members of their carnival clubs. The group included 29% women (n=8) and 71% men (n=20), with an average age of 62 years (+/- 7.5 years), ranging from 45 to 80. Nearly half (46%, n=13) of the participants were retirees. The data were analysed using reflexive thematic analysis (Braun & Clarke, 2006) and six themes were developed.

The six themes fall into two main groups: factors related to personal and social well-being (themes 1–3) and those related to engagement and fulfilment in well-being (themes 4–6). (1) Intrapersonal factors affecting well-being include internal aspects such as health, financial security and participation in leisure activities, which are fundamental to personal well-being. (2) Interpersonal factors affecting well-being include personal relationships, emphasising trust, belonging and the interconnectedness of one's well-being with that of others. (3) Social network characteristics that influence well-being focus on the structure of social networks, including their size, composition, diversity, harmony and balance. (4) Self-fulfilment reflects the role of meaningful activities, engaging projects, challenges, and a sense of accomplishment in personal goals. (5) Feeling indispensable underlines the value of feeling needed and offering support to others. (6) Unfulfilled expectations address the negative impacts of generational differences, changing family and friendship dynamics, and eroded trust on overall well-being.

This research highlights the importance of qualitative network interviews in providing a deeper, more detailed perspective on well-being, emphasising the significant influence of network interactions and relationships between network members. Engaging in formal volunteering, especially for retirees, can act as a substitute for previous roles, thereby promoting their well-being. Moreover, it represents an effective approach to mitigating social isolation and loneliness in later life.

1.7.3 Study 3: How do working and retired adults maintain their social relationships? A qualitative network analysis

The third paper of the dissertation (Chapter 4) was written in collaboration with Başak Bilecen. In this paper, the analysis encompasses both the qualitative network interviews and the unstructured network maps created during interviews.

Social connections are essential for physical and mental health and general well-being, especially for older adults (Holt-Lunstad et al., 2010). While the size of a social

network indicates available social resources, its composition is equally important since different relationships provide different resources (Agneessens et al., 2006). Social network composition evolves throughout life as older adults often experience a reduction in network size but report greater satisfaction due to a higher proportion of close emotional ties (Bidart & Lavenu, 2005; Huxhold et al., 2020). However, the processes by which older people adapt their networks—e.g. expanding ties, compensating for losses and maintaining relationships—are not fully understood (Hollstein, 2023). Recognising their ability to actively shape and nurture their networks is key to addressing their evolving social needs. This paper explores the strategies adopted by working and retired adults to manage their social networks and the underlying change processes. In this context, it seeks to understand how socially engaged individuals sustain their networks to enhance well-being. This study makes two important contributions. First, unlike research focusing only on middle-aged or older adults and age-related network changes (Cornwell et al., 2014; Wrzus et al., 2013), it examines both working and retired adults to compare personal network changes and maintenance strategies. Second, it uses qualitative social network analysis to provide detailed insights into the nature and quality of ties that influence well-being.

For this paper, the interview data and additionally the social network maps were analysed. To analyse the social dynamics and changes within networks, it is crucial to explore the meanings of interpersonal relationships. Visualising social networks alongside audio-recorded discussions provides richer, more detailed information (Ryan et al., 2014). Sociograms offer participants a broader perspective on their relationships and contexts, acting as cognitive aids that enhance reflection on ego-alter and alter-alter ties (Marsden & Hollstein, 2023; von der Lippe & Gamper, 2017), which supports a deeper understanding of the social network. Additionally, information about social connections can be systemised to explore the content and meaning of these connections (Tubaro et al., 2016).

The study identified two interrelated aspects of agency in personal network maintenance: (1) multiplexity of personal network ties and (2) personal network management.

(1) ‘Multiplexity of personal network ties’ encompasses the structure and stability of relationships within the network. Multiplex relationships are defined as connections involving interactions across various social settings, encompassing multiple roles within a single relationship. Although multiplex ties are clearly beneficial in terms of maintaining and exchanging support, challenges arise when they involve ambivalent relationships since terminating such ties is more complicated due to their multifaceted nature.

(2) 'Personal network management' refers to the proactive strategies individuals employ to navigate and sustain their personal networks. It became evident that many participants actively and rationally managed their social networks to enhance their well-being. For example, participants actively expand their networks and compensate for losses by employing strategies to remain connected after losing multiplex roles (e.g. through retirement). A key aspect of this management involves navigating difficult relationships.

Retirees have smaller general social networks but stable well-being networks, with fewer ambivalent ties compared to working participants. This study emphasises the crucial role of multiplex ties and proactive agency strategies (e.g. participating in social groups) in maintaining social integration, preventing isolation and supporting well-being among working and retired adults.

1.8. Conclusion: Main findings, limitations, strengths, and research and policy implications

1.8.1. Main findings

Consistent with Berkman et al.'s framework (2000; 2014), I found a predominantly positive association between social networks, health and well-being in middle-aged and older adults in this dissertation. At the micro level, I analysed the role of social support in health pathways (Chapter 2) and social engagement in psychological pathways (Chapter 3). Moving to a meso perspective in Chapter 4, I examined how social network structures and the characteristics of social ties among those engaged in social engagement contribute to psychological pathways. Based on these findings, my conclusions are as follows:

As part of this micro-level focus, the findings of Study 1 suggest that while most existing studies report a positive association between functional social support and physical activity, the results remain inconclusive when the source of support is considered. Emotional, informational and companionship support are typically associated with higher levels of physical activity, whereas instrumental support can sometimes have a negative effect. Companionship support serves a crucial role in promoting social connectedness, which encourages physical activity. Qualitative studies highlight the role of social comparison in promoting physical activity. In sum, while social support often facilitates health-promoting behaviours, there are instances where it may have unintended health-damaging effects, in line with Berkman et al.'s framework (2000; 2014).

Also at the micro level, Study 2 found a positive association between the social network mechanism of social engagement and psychological pathways, specifically well-being. The findings suggest that social engagement contributes to well-being and that

individuals actively improve their well-being through formal volunteering. Formal social participation, such as volunteering, appears to have a significant positive impact on well-being. Simultaneously, it is important to recognise that social networks can also harm well-being; for example, when expectations in relationships (e.g. exchange of social support) are not met. Especially after retirement, formal volunteering serves as an effective means of role substitution and compensation, helping to reduce loneliness and improve well-being in older adults.

Finally, from a meso perspective, Study 3 examined the structure of social networks and the characteristics of social ties among working and retired adults who employed the network mechanism of social engagement. It also explored how these networks influenced well-being. I found that participants actively maintained their well-being networks by managing their relationships and compensating for losses. Multiplex relationships emerged as particularly important for maintaining ties and were sometimes even deliberately cultivated (e.g. by joining a carnival club) to ensure that a relationship remained multiplex. However, multiplexity could also harm well-being since it makes disengaging from a relationship more difficult when it becomes ambivalent, especially if individuals must interact with these relationships in different contexts. The participants used proactive strategies to maintain and manage their social networks for well-being, with social group involvement—such as participation in carnival clubs—serving a crucial role in preventing social isolation.

In conclusion, this dissertation provides a better understanding of how social networks relate to health behaviour and well-being in middle-aged and older adults. Each of the three studies examined different aspects of social integration (social support, social engagement and social networks) and their relationship with health outcomes. Their findings highlight the importance of social integration for health and well-being. They also show how the different components of social integration are interrelated, which stresses the complexity of studying this area. A good example of this is the role of companionship support in promoting both social engagement and positive health behaviour. While the extensive evidence from all three studies generally points to a positive relationship between social networks, health and well-being, each study also revealed instances where relationships can harm health and well-being. Therefore, it is important to remain aware of the potential downsides of social relationships.

1.8.2. Limitations and strengths

This dissertation has several limitations that should be acknowledged. Since the first pillar of this dissertation (Chapter 2) is a scoping review, considerable heterogeneity exists between the included studies in terms of research design, sample size and study populations, which makes it difficult to compare the results. Another characteristic of scoping reviews is that they do not assess the quality of the studies analysed. Additionally, the inclusion of qualitative studies makes it difficult to directly compare and synthesise the results. However, this represents an advantage since qualitative studies provide deeper insights into the topic under review. The broad approach of a scoping review also meant that studies with different variables could be included (e.g. different types of physical activity). A distinct feature of this scoping review is the specific focus on functional social support. Particularly in the context of health behaviour, it is important to distinguish between structural and functional support. This clear distinction can help to better target future research and policy interventions.

In terms of the second pillar of this dissertation, certain limitations concerning the collected data must be acknowledged. Since the qualitative research approach was used, the results are not fully transferable to other contexts and should thus be interpreted with some caution and only in the context analysed. Another limitation of this study is that it is limited to carnival club members within a rather urban population in only one German federal state. This could imply that the findings are inapplicable to people in rural areas, who may face particular challenges in maintaining social networks. Additionally, since all participants were German citizens, the results do not necessarily reflect the perspectives of people without German citizenship, who may develop different strategies for maintaining social contacts. Furthermore, since only formal volunteering was considered, the extent to which informal volunteering can also promote well-being and reduce social isolation remains unknown. Another limiting factor of the data is the age distribution of the participants. The average age was 62 years, with a range from 45 to 80 years. It would be particularly interesting to analyse formal volunteering and social participation specifically among older adults over the age of 75. Our sample consisted mainly of younger retirees aged 60–69, with older age groups less represented—only one person was over 80 years old. This is significant since older age groups are more likely to face health limitations that can significantly affect their ability to maintain social networks (Broese van Groenou et al., 2013; Van Tilburg & Broese van Groenou, 2002). However, the inclusion of middle-aged to older adults also has advantages in making the results more comparable and allowing

them to follow the transition from work to retirement in more detail. Thus, valuable insights into the importance of social networks for well-being at this key stage in life were gained.

While acknowledging the limitations of the data, the *Jeckenstudie* data have important strengths. A key strength is the focus on ego networks. Rather than aiming to objectively map social structures, this approach allows us to explore how individuals perceive and define their own well-being and the role of their personal networks. This focus highlights the importance of subjective evaluations of social relationships as a central aspect of well-being. A major advantage is the qualitative research design, which provided deeper and more nuanced insights into the relationship between well-being and social networks in middle-aged and older adults—insights that would not have been captured by standardised quantitative surveys. Particularly valuable is the combined use of network maps and qualitative interviews, which enabled participants to visually map and analyse their social networks. This contributed to both reflections on personal relationships and the clarification and validation of interview data. This method provided deeper insights into network dynamics, such as changes in the importance of individuals or network composition. Overall, Studies 2 and 3 show how qualitative network interviews can contribute to a nuanced understanding of well-being and personal networks.

Although the selectivity of the sample—consisting of adults who actively engage in formal social participation through their social club membership—can be criticised, it is one of the key strengths of the studies. It provides specific insights into the well-being and social network maintenance and management strategies of individuals who consciously avoid social isolation and choose active social participation. The findings illustrate how purposeful strategies, such as joining social clubs, can strengthen social integration and thereby promote well-being among middle-aged and older adults.

1.8.3. Implications for future research and policy making

This dissertation has important implications for both future research and policy making.

Starting with the first pillar of the dissertation, Study 1 was able to explore how functional social support and physical activity are related in community-dwelling older adults. By identifying, mapping and providing a comprehensive overview of all the available evidence, the scoping review informs future research. However, since this was a scoping review, the research question was very broad and the evidence was not easily comparable. Thus, future research would benefit from a systematic review and meta-analysis to quantify the evidence. The combination of a scoping review with a systematic review and meta-analysis would be beneficial since these methods are complementary.

Systematic reviews have a narrower research question and assess only quantitative evidence, making the results slightly more comparable, while an additional meta-analysis could quantify the strength of the evidence by providing effect sizes, and the scoping review could provide a broader understanding of the underlying mechanisms. In this way, these studies would provide a sound and coherent basis for future research and evidence-based policy making.

Regarding the second pillar, future research would greatly benefit from both qualitative and quantitative longitudinal studies to observe changes over time. Additionally, it would be valuable to include more people aged 75 and over to explore their understanding of well-being, their well-being networks and how these evolve, which could provide deeper insights into the 'well-being paradox'.

This dissertation has additional important implications for social network research. One important contribution is to the growing field of qualitative social network analysis. By combining qualitative social network interviews with unstructured network maps, this approach provides a valuable methodological framework for future studies.

In the field of social network analysis, Studies 2 and 3 make significant contributions to the study of personal networks. Within social networks, personal networks refer to close personal ties, such as those with family, friends or confidants (Wrzus et al., 2013). When analysing the data, it became clear that there was no appropriate term for the social networks studied or for the name generator used to assess them. Traditional analyses of confidant networks and core discussion networks typically aim to identify those with whom important matters are discussed (Litwin & Stoeckel, 2013; Small, 2013). In contrast, I focused on individuals or organisations that contribute to an individual's well-being in some manner, regardless of whether they are typically involved in important conversations. This broader approach introduces the concept of 'social networks of well-being' or 'well-being networks'. Looking beyond the traditional emphasis on family and friends, the aim is a comprehensive understanding of the range of relationships that contribute to well-being. The findings suggest that additional ties—often overlooked by traditional name generators—serve a crucial role in personal well-being. Peripheral ties emerged as a critical factor in the well-being of some participants, highlighting the importance of a broader perspective on personal networks.

As previously noted, well-being is a critical component of health research, particularly among older adults. Consequently, future research would benefit from name generators that capture not only confidant, friendship or core discussion networks but also

well-being networks. This is particularly important when studying the health of older adults since well-being, unlike other aspects of health, can be promoted and does not necessarily decline with age (Steptoe et al., 2015).

My research further underscores the need to examine the multidimensional nature of well-being in older adults. Participants naturally described well-being in all three dimensions—hedonic, evaluative and eudaimonic—without being explicitly prompted to do so, highlighting the importance of these perspectives. This finding reinforces the need to incorporate all three dimensions when quantitatively assessing well-being across one's life, particularly among older adults (Hansen & Blekesaune, 2022; Steptoe et al., 2015).

In conclusion, while the importance of social integration for health and well-being is well established and a range of interventions exist to promote it, my research suggests that such interventions are most effective when they occur in informal, accessible and enjoyable settings. Encouraging positive health behaviours such as physical activity can be improved through group-based exercise programmes or even simple activities such as walking together. These not only promote physical activity but also social integration, which ultimately contributes to overall well-being.

Loneliness is becoming an increasingly pressing public health concern (Holt-Lunstad, 2017; Surkalim et al., 2022). One of the biggest challenges in tackling loneliness and social isolation is reaching those most affected. Local social clubs, such as carnival clubs, offer a promising setting for such interventions. First, unlike settings dealing with more solemn issues, such as hospice work or food banks—which are undoubtedly essential but may not promote well-being as readily—these clubs focus on fun and social engagement. Second, they are highly inclusive, welcoming people regardless of their physical abilities or specific skills. They are open to people of all religious (including none) and political backgrounds. Finally, because most carnival clubs are rooted in local communities, they offer opportunities for participation to those with limited mobility. If mobility becomes a barrier, other members can still offer support, such as visits or help with daily tasks such as shopping.

Both interviewees and respondents in the quantitative study emphasised the importance of contributing to their local community, which subsequently serves as a meaningful form of formal volunteering. This benefits the community by providing opportunities such as youth dance or sports programmes and fostering social cohesion through neighbourhood festivals and charity events. While carnival clubs are particularly prominent in certain regions of Germany, other local social clubs (e.g. citizen and

community associations, cultural and folklore societies or time banks) exist throughout Europe. Although these provide important opportunities for formal social participation, it is crucial to ensure that these opportunities are accessible—especially for those who are socially isolated. Information support from places that older adults frequently visit, such as GP practices, pharmacies or chiropodists, could serve a key role in informing older adults about these opportunities and encouraging their participation.

1.9. Status of the studies and contributions of co-authors

In the first study, 'Physical activity and functional social support in community-dwelling older adults: A scoping review', published in BMC Public Health (2024, 10.1186/s12889-024-18863-6), I designed the study, developed the research plan and collected the data. Both Amelie Reiner and I screened the articles as part of the data curation process. I led the analysis and interpretation of the data and drafted the manuscript. My co-author, Amelie Reiner, contributed to the study design and assisted in the analysis and interpretation of the data. Throughout the process, I benefited from the feedback of Lea Ellwardt and Karsten Hank. Maya Wermeyer assisted with the data extraction table.

The second study, titled 'Well-being in middle-aged and older adults who volunteer: A qualitative network analysis', was published in Aging & Mental Health (2024, 10.1080/13607863.2024.2393250). As the lead author, I conceptualised the study, developed the methodology, collected the data, conducted the empirical analysis and wrote the original draft. My co-author Lea Ellwardt contributed to the conceptual design and provided comprehensive feedback and editing. My other co-author Maya Wermeyer assisted with the data analysis and contributed to the manuscript's review and editing.

The third study, entitled 'How do working and retired adults maintain their social relationships? A qualitative network analysis' was submitted to Advances in Life Course Research. As lead author, I designed the study, developed the methodology, collected the data, conducted the data analysis and wrote the original draft. My co-author, Başak Bilecen of the University of Groningen, contributed to the data analysis and provided comprehensive feedback and editing.

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The DeepL Write AI, ChatGPT and Cambridge proofreading were used for the purposes of spell checking and language editing.

Chapter 2

Physical Activity and Functional Social Support in Community-dwelling Older Adults: A Scoping Review

Paula Steinhoff & Amelie Reiner

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Abstract

Background: Globally, the population of older people is increasing and is estimated to reach nearly 2.1 billion by 2050. Physical activity (PA) is one of the key components for successful ageing. However, PA decreases with age and many older adults do not meet PA guidelines. Previous research has shown that social support (SOSU) is related to PA in older people. The aim of this scoping review is to identify and map all of the available evidence and to explore the association between functional SOSU and PA in older adults. Functional SOSU consists of emotional, informational, instrumental and companionship SOSU and social comparison.

Methods: A scoping review was conducted using the Joanna Briggs manual. Quantitative and qualitative studies investigating associations between functional SOSU and PA levels in older adults (mean age ≥ 60 years) were identified through a systematic search in seven electronic databases up to August 2023. After removing duplicates, 20,907 articles were screened for titles and abstracts. The results were analysed separately for different types of SOSU.

Results: 116 articles met the inclusion criteria; 72% were quantitative studies and 28% were qualitative studies. Most studies used self-reported PA measures, only 23% of the studies used objective-reported PA measures. Most studies of SOSU for PA reported positive associations but the evidence is inconclusive when the source of support is considered. PA is positively associated with general, emotional, informational, and companionship SOSU, while instrumental support may occasionally be negatively associated. Companionship support is particularly influential on PA, especially in group

settings, as it promotes social connectedness. Qualitative studies show that social comparison also supports PA. Different forms of SOSU generally show positive associations with PA.

Conclusions: While the evidence on the association between functional SOSU and PA is mixed, most studies show that there is a positive association. PA may also be a strategy for improving social contact and social integration. This study offers a comprehensive overview of measures for SOSU and PA and thereby informs future research and policy-making.

2.1 Introduction

Regular physical activity (PA) is a key factor in preventing and managing non-communicable diseases and promoting mental health, cognitive functioning and quality of life (Cunningham et al., 2020; Posadzki et al., 2020). PA is defined as ‘any bodily movement produced by skeletal muscles that requires energy expenditure’ (World Health Organization, 2022). It encompasses exercise, sport and physical activities performed as part of daily living, occupation, leisure or active transportation. People who engage in recommended levels of PA have a 20–30% lower risk of dying prematurely (World Health Organization, 2022). Physical inactivity is nowadays considered a pandemic (Ding et al., 2016). It is the fourth leading cause of death worldwide (Kohl et al., 2012). It is estimated that physical inactivity accounts for 6–10% of the incidence of major non-communicable diseases such as cardiovascular diseases, diabetes mellitus type 2 and some types of cancers (Lee et al., 2012) and for 7–8% of depression and dementia (World Health Organization, 2022). This preventable burden not only affects mortality and morbidity (Lee et al., 2012) but also the economy (Ding et al., 2016) of nations worldwide. More than 80% of adolescents and more than one in four adults do not engage in the WHO’s recommended levels of PA (World Health Organization, 2022).

Regular PA is even more important for older adults. The global population of older people is increasing and is projected to reach 1.4 billion by 2030 (Fakoya et al., 2020). In most countries, however, PA decreases with age (World Health Organization, 2022), with around 67% of people aged 65–74 and 75% of people over 74 not meeting recommendations (Lindsay Smith et al., 2017). Nonetheless, older adults benefit particularly from regular PA to preserve their physical, social and mental health, delay dementia and prevent falls (World Health Organization, 2022). Older adults should perform a total of at least 150–300 minutes of moderate-intensity aerobic PA or 75–150 minutes of vigorous-intensity aerobic PA each

week or an equivalent combination of both (World Health Organization, 2020). Research has shown that older adults who receive more social support (SOSU) from family or friends are more physically active (Lindsay Smith et al., 2017). Furthermore, there is a negative association between social isolation and loneliness and PA in middle-aged (50–64) and older people (65 or older) (Schrempft et al., 2019). People of this age group are at higher risk of feeling lonely, having decreased SOSU and engaging in lower levels of PA due to declining physical capacities (Lindsay Smith et al., 2017; Vancampfort et al., 2019).

While much evidence exists of the interplay between PA and SOSU, there has been no systematic overview of studies addressing this topic in older adults that includes all study designs. One difficulty in the literature is that alternative terms such as social network, loneliness, social isolation and social integration are used interchangeably, even though these concepts all measure different phenomena. Functional SOSU is one dimension of SOSU and is a multidimensional concept.

It suggests that social relationships offer various types of supportive functions and these functions may be more or less effective in responding to specific problems or situations. Wills and Shinar (2000) identify five dimensions of functional SOSU. Emotional support relates to the availability of someone who listens, cares and accepts the individual and provides encouragement, esteem and reassurance. Instrumental support is more tangible and refers to the provision of practical assistance where needed, such as by helping with transportation, assisting in the home or lending money. Informational support entails providing valuable knowledge to address problems: this includes providing information about resources and services as well as offering advice and guidance. Companionship support encompasses the presence of individuals with whom one can partake in social and leisure activities. The final dimension, often referred to as validation, feedback or social comparison, is rooted in the idea that social relationships can offer insights into the appropriateness or conformity of behaviours. In line with this framework, this scoping review analyses the sub-dimensions of functional SOSU, namely emotional, instrumental, informational and companionship support and validation. Studying the functional aspects of SOSU is important for exploring PA among older adults. This is because each dimension offers different types of SOSU that can be important for PA adherence in older adults. For instance, emotional SOSU could provide encouragement to start exercising, while instrumental SOSU could involve driving someone to exercise classes. Informational SOSU could entail providing safe instructions for exercising, and companionship SOSU could involve going on a walk together. Validation could be gained from seeing peers engage in

PA and becoming motivated to do so as well. This approach has been used in a previous systematic review and meta-analysis concerning SOSU and PA in adolescent girls (Laird et al., 2016).

Lindsay Smith and colleagues (2017) conducted a comprehensive systematic review on the association between PA, loneliness and SOSU. However, their literature search ended in August 2014 and the intervening period, especially due to the COVID-19 pandemic, has seen important research around this topic. Importantly, as the authors conducted a systematic review, qualitative studies were not considered. The aim of this scoping review is to both update and deepen the systematic review (Lindsay Smith et al., 2017) by identifying and mapping all of the available evidence and to explore the association between functional SOSU and PA in older people.

By including quantitative, qualitative and mixed methods studies, this review aims to inform future research by offering a comprehensive overview of measures for functional aspects of SOSU and subjective and objective PA in older adults. Particularly through its overview of qualitative studies, it identifies facilitators and barriers for older adults to engage in PA and helps build a deeper understanding of why older adults do not exercise. In addition, it informs policy-makers by presenting the available evidence on why older adults do not participate sufficiently in PA.

2.2. Methods

A scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) Manual (Peters et al., 2020). This review was pre-registered. The review protocol can be accessed at <https://osf.io/9uhgb>. A scoping review differs from a standard systematic review in that it does not attempt to synthesise the evidence but rather serves to determine the extent and nature of the evidence. It identifies gaps and clarifies concepts in the literature and makes recommendations for future research and policy-making (Barton et al., 2015; Levac et al., 2010; Munn et al., 2018). Within this topic, a scoping review is particularly important as there are no clear concepts or definitions of the term ‘social support’. This paper focuses on the functional aspects of SOSU, namely emotional, instrumental, informational and companionship support and validation (Wills & Shinar, 2000). Hence, it gives a comprehensive overview of measurements of functional aspects of SOSU.

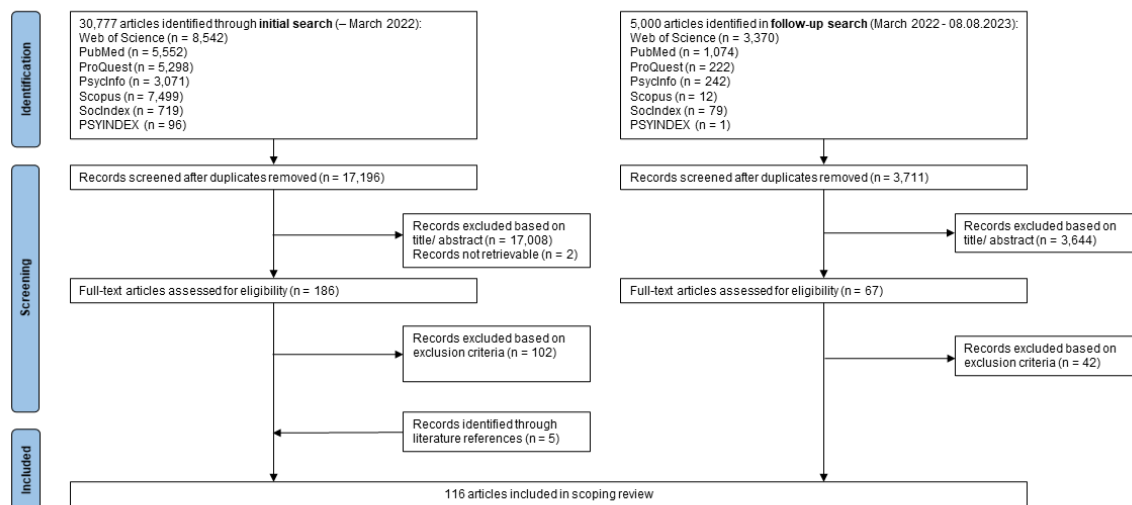
We followed the nine steps proposed by the JBI for conducting scoping reviews (Peters et al., 2020). The literature search was conducted up to the 8th of August 2023. Various search terms were developed (additional file 1) for each of the three dimensions of

the research aim ('older adults', 'social support' and 'physical activity'). The development of the search strategy followed a three-stream approach: first of all, we checked for search terms in prior published reviews; after this, we checked for MeSH terms in PubMed; subsequently, an interdisciplinary team of researchers met to discuss further search terms (PS, health scientist; AR, LE and KH, sociologists with a focus on health and ageing). We searched the databases PubMed, Web of Science, Scopus, APA PsycInfo, ProQuest, SocINDEX and PSYNDEX and in the Cochrane Library. In addition, we checked literature reference lists from other reviews to identify further relevant literature. English peer-reviewed empirical studies that addressed the association between functional SOSU and PA in an older population were included. We did not apply limits in terms of time or geographic location. We included studies in which the minimum age of participants was 40 years but the mean age of participants was at least 60 years; a minimum age of 40 years is in line with the common ageing surveys. We excluded editorials, comments, study protocols, conference proceedings, grey literature and literature reviews. Furthermore, we excluded studies which addressed only a specific patient group or concerned only institutionalised or hospitalised individuals (Lindsay Smith et al., 2017; Mohd et al., 2019). Since this is a scoping review, no critical appraisal or risk of bias assessment was conducted (Peters et al., 2020). We identified a total of 35,777 articles in our initial search. After the removal of duplicates, 20,907 abstracts were screened for eligibility. This screening process was carried out independently by two researchers (PS and AR), who remained blinded throughout. In cases where they could not reach a decision, a third reviewer (LE) was consulted and a final decision made after thorough discussion. To ensure reliability, PS and AR conducted two pilot screenings.

2.3. Results

Subsequently, 255 full texts were read, and 116 articles were included in the final analysis. These were published between 1989 and 2023, with over 50% published later than 2017. The entire process is visually represented in the adapted PRISMA-P flowchart (Figure 1).

Figure 1 adapted PRISMA-P flowchart



This paper provides a descriptive overview of the results of each of these studies, including the different measures for PA and SOSU in a data extraction table (additional file 2). This table was completed independently by two researchers (PS and MW). Approximately half of the studies included (48%) were conducted in North America, with 44 (38%) conducted in the USA. A further 26% were conducted in Asia and 16% in Europe. Results were broadly stable across geographic areas. Five articles focused on ethnic minority groups in the USA (Aguiñaga et al., 2021; Gothe, 2018; Gothe & Kendall, 2016; Levy-Storms & Lubben, 2006; Perrino et al., 2011), the UK (Horne et al., 2012) and Australia (Rowland, 2021) and four studies compared different ethnic populations which each other (Bopp et al., 2004; Harvey & Alexander, 2012; Mathews, 2010; Wilcox et al., 2003). In terms of gender, 22 articles (19%) concerned only women and two only men. Over 70% of the included studies were quantitative. Approximately 56% (n=65) were cross-sectional studies, 5% (n=6) were longitudinal studies and 11% (n=13) were intervention studies. Of the total, 6% (n=7) used a mixed methods design, while 22% (n=25) used a qualitative research design. Quantitative studies varied considerably in terms of sample size (from n=34 to n=78,002) and measurement quality (from one item per variable to validated scales). Of the quantitative studies analysed, 97% (n=83) controlled for age or gender, and 77% (n=66) controlled for both. Qualitative and some mixed methods studies lacked standardised quality criteria such as sample size or measurement instruments.

The included papers covered a wide range of research topics, but all explored aspects of functional SOSU in older adults. Among the quantitative studies, most analysed either

general SOSU (n=26) or SOSU specific for PA (SOSU for PA) (n=33). There was also considerable variation in the assessment of PA. Of the quantitative studies, 77% relied solely on subjective measures of PA. In 14%, only objective measures were used, while 9% used a combination of objective and subjective measures. Objective PA was mainly measured using device-based methods (accelerometer; n=15) or attendance records (n=4). Subjective PA was mostly measured using single items, although some studies used validated scales, such as versions of the International Physical Activity Questionnaire (IPAQ, n=12). In addition, 24% of the studies explicitly focused on PA in older adults, using either the Community Healthy Activities Model Program for Seniors (CHAMPS, n=7) or the Physical Activity Scale for the Elderly (PASE, n=14).

Overall, 65 of the 86 quantitative studies (76%) found at least partial evidence of a positive and significant association between SOSU and PA. Four studies reported both positive and negative associations (Gellert et al., 2011; Gomes et al., 2017; Marthammuthu et al., 2023; Zimmer & McDonough, 2022), while four studies found a negative association between SOSU and PA (Malek Rivan et al., 2022; Okoye et al., 2022; Perrino et al., 2011; Seguin-Fowler, 2021). In terms of sources of SOSU, the evidence is inconclusive. Seven quantitative studies (de Sousa et al., 2021; Harvey & Alexander, 2012; Levy-Storms & Lubben, 2006; Loprinzi & Joyner, 2016; Mudrak et al., 2017; Orsega-Smith et al., 2007; Warner et al., 2011) found that friends were more important, while four studies found that family SOSU was more important (Bakhtari et al., 2019; Corseuil Giehl et al., 2017; Kim & Kosma, 2013; Loprinzi & Crush, 2018). All qualitative studies described a positive relationship between SOSU and PA. The results are presented separately for the different types of functional SOSU.

2.3.1. General Social Support

Numerous studies have examined the association between general SOSU and PA in older adults, but the methods used to measure SOSU vary. Some studies have used instruments such as the DSSI (Blakoe et al., 2023; Y. Y. Chan et al., 2020; Marthammuthu et al., 2023), the MSPSS (Oh et al., 2020; Okoye et al., 2022; Qu et al., 2023) or the LSNS (Kumar et al., 2022; Levy-Storms & Lubben, 2006; Potts et al., 1992), while most measure general SOSU with very few items, both of which make it difficult to compare results. Nonetheless, despite these measurement differences, the majority of studies consistently show a significant positive relationship between general SOSU and PA in older adults. This is true not only

for studies that measure PA subjectively but also for those that use objective measures (E. Chan et al., 2020; Chen et al., 2021).

These positive associations have been found in various countries, including Malaysia (Y. Y. Chan et al., 2020; Marthammuthu et al., 2023), China (Chen et al., 2015; Jin, 2022; Yi et al., 2016), South Korea (Kang et al., 2018; Oh et al., 2020), Ghana (Gyasi, 2019), Jamaica (Morris et al., 2010), Canada (Kaplan et al., 2001; Zimmer & McDonough, 2022), the USA (E. Chan et al., 2020; Kwag, 2011; Levy-Storms & Lubben, 2006; Potts et al., 1992; Reed, 2011; Wilcox et al., 2000, 2008), Sweden (Chen et al., 2021), Spain (Blakoe et al., 2023) and Germany (Niedermeier et al., 2019). One study reported gender-specific effects, with SOSU showing a positive association with PA in Canadian women but not in men (Kaplan et al., 2001). In a study of older Samoan women in the USA, Levy-Storms and Lubben (2006) found a positive association between SOSU from a non-kin network and PA levels, but no significant association between kin-based SOSU and PA. Marthammuthu et al. (2023) found mixed results in Malaysian women: on the one hand, women with an increase in social interaction had significantly higher levels of PA; on the other hand, an increase in subjective SOSU was negatively associated with PA. A study that divided SOSU into objective support, subjective support and support use found that objective SOSU and support use were significantly associated with PA, whereas subjective SOSU and PA did not show a significant relationship in older Chinese (Jin, 2022). Kumar et al. (2022) found that a lack of exercise was significantly associated with a lack of general SOSU in India. An intervention study conducted in the USA found that higher SOSU from family and friends positively predicted increased PA levels in a telephone-based PA programme for older adults (Wilcox et al., 2008). However, there were exceptions to this general trend, with a few studies reporting no significant association between SOSU and PA in older adults (Riffle et al., 1989; Ryu et al., 2023; Umstattd, 2006).

2.3.2. Functional Social Support specific for Physical Activity (SOSU for PA)

SOSU for PA covers functional aspects of SOSU that are specifically relevant to PA. Most studies that have specifically examined SOSU for PA have found a positive correlation between SOSU for PA and actual levels of PA. Sixteen studies (Aguñaga et al., 2021; Bopp et al., 2004; Brassington et al., 2002; Carlson et al., 2012; Gellert et al., 2011; Gothe, 2018; Hall & McAuley, 2010; Kim & Kosma, 2013; Mudrak et al., 2017; Orsega-Smith, 2003; Orsega-Smith et al., 2007; Park et al., 2014; Seguin-Fowler, 2021; Van Luchene et al., 2021; Warner et al., 2011; Wilcox et al., 2003) used the Social Support for Exercise Scale (SSES)

from Sallis et al. (1987), which covers companionship, informational, emotional and instrumental support for exercise, to assess SOSU for PA. Not all studies using the SSES have produced consistent results. For example, Gothe (2018) found no effect of SOSU on objective or subjective PA in older African-Americans and Hall and McAuley (2010) found no association between SOSU and objective PA in older US-American women. A 12-week intervention study of a community-based programme to promote PA found that while the intervention group experienced greater improvements in exercise-related SOSU from friends, both the control and intervention groups experienced decreases in subjective and objective PA (Seguin-Fowler, 2021). Brassington et al. (2002) evaluated a 12-month exercise intervention study in the USA in which participants received regular telephone exercise advice from a trained health professional. Exercise-related SOSU showed no association with longer-term adherence. Gellert et al. (2011) conducted an intervention study in Germany comparing singles, participants who exercised with their partner, and partnered participants who did not. At baseline, there was no difference in PA levels between the three groups. At follow-up, couples who participated in the intervention showed a positive correlation between SOSU and PA, with SOSU increasing in this group. For singles and those whose partners chose not to participate, SOSU and PA were negatively associated.

Other studies used different scales to measure SOSU for PA. In a 6-month longitudinal study, Warner et al. (2011) found that friends' SOSU at baseline predicted PA at the 6-month follow-up. Family support was significantly positively associated with leisure walking in Brazil (Corseuil Giehl et al., 2017). In a longitudinal study, Smith et al. (2023) observed a positive relationship between SOSU for PA and PA over time in older Australians. Rhodes et al. (2001) examined adherence to a strength training programme in older Canadian women over the first 6 months. SOSU for PA was positively associated with participation after 3 months, but not after 6 months. Purath et al. (2009) investigated the relationship between SOSU and PA in 34 older adults in the USA: they found a significant positive association only between SOSU from healthcare providers and PA and no significant association for support from peers. One intervention study in the USA showed positive effects of SOSU interventions on PA levels (Ory, 2018), and general SOSU for PA was positively associated with PA (Oka & Shibata, 2012; Wendt Böhm et al., 2016). Emotional and informational support for PA was positively associated with exercise in older US-American adults (Newsom et al., 2018). Cousins (1995; 1996) and Wilcox et al. (2003) both found a positive association between SOSU for PA and PA in women. Focus groups

highlighted the importance of SOSU for PA as a facilitator for older adults to engage in group exercise (Zimmer et al., 2023) and for older women to engage in strength training (Bopp et al., 2004). In general, most studies support a significant positive association between SOSU for PA and actual levels of PA (Lee & Fan, 2023). However, evidence as to the most effective source of support is mixed, with some studies favouring support from friends (Bopp et al., 2004; de Sousa et al., 2021; Mudrak et al., 2017; Orsega-Smith et al., 2007) and others favouring family support (Bakhtari et al., 2019; Kim & Kosma, 2013).

2.3.3. Emotional Social Support

Numerous studies have focused on the relationship between emotional SOSU and PA in older adults. Four cross-sectional studies (Eronen et al., 2012; Krause et al., 1993; Loprinzi & Joyner, 2016; Watt et al., 2014) and one longitudinal study (Manz et al., 2018) found a positive association. However, the results are highly variable and may also depend on the type of PA studied. Malek Rivan et al. (2022) found no significant association between emotional SOSU and PA in older Malaysians. Perrino et al. (2011) found no significant association between emotional SOSU and walking in Hispanic-Americans, while Komazawa et al. (2021) found no significant association between emotional SOSU and exercise frequency in a longitudinal study in older Japanese adults. Yamakita et al. (2015) investigated the role of perceived and given emotional SOSU and participation in exercise groups in 78,002 older adults in Japan. Both perceived and given emotional SOSU were significantly associated with participation in sports groups. Loprinzi and Joyner (2016) assessed the source of emotional SOSU, asking older adult participants in the USA whether they received emotional SOSU from spouses, children, siblings, neighbours, church members or friends and assessing their subjective PA. Only emotional SOSU from friends was associated with meeting PA recommendations in older US-Americans. In 2018, Loprinzi and Crush examined the sources of emotional SOSU among the same range of social ties but with objective PA. They found a positive association only between spousal emotional SOSU and PA. While it is evident that emotional SOSU is associated with PA, the evidence around the source of SOSU is not consistent.

Qualitative studies (de Oliveira et al., 2019; Gothe & Kendall, 2016; Horne et al., 2012; Huffman & Amireault, 2021; Jones et al., 2020; Leung et al., 2021; Marthammuthu et al., 2021; Patterson et al., 2022; Wahlich et al., 2017; Zimmer et al., 2023) and a mixed methods study (Gagliardi et al., 2020) have also highlighted the importance of emotional SOSU. Huffman and Amireault (2021) highlighted its role in re-engagement and

maintenance of PA in the USA, while Wahlich et al. (2017) found that the presence of friends and family was crucial in motivating older adults to engage in PA by providing encouragement and support to try new exercises in the UK.

2.3.4. Informational Social Support

No quantitative studies have specifically examined the association between informational SOSU and general PA. Perrino et al. (2011) investigated the relationship between informational SOSU and walking in older Hispanic-Americans but found no significant association. Nevertheless, the qualitative components of three mixed methods studies (Arnautovska et al., 2018; de Oliveira et al., 2019; Gagliardi et al., 2020) and five qualitative studies (Gothe & Kendall, 2016; Huffman & Amireault, 2021; Leung et al., 2021; Marthammuthu et al., 2021; Mathews, 2010) highlight the importance of informational SOSU for PA and exercise.

Arnautovska et al. (2018) found that informational SOSU from healthcare professionals played an important role in facilitating PA in older Australians. Similarly, Gothe and Kendall (2016) found that informational support from physicians was important for PA in older African-American women. In line with this, Leung et al. (2021) found that professional guidance encouraged older adults to walk more in Hong Kong. De Oliveira et al. (2019) highlighted that informational SOSU from friends, family and trainers served as an important motivator for exercise and class attendance in older Australians. Gagliardi et al. (2020) evaluated a volunteer programme in Italy and found that ‘socialisation’ was an important reason for participation, with information exchange and peer support highly valued. Participants particularly valued learning from each other. Huffman and Amireault (2021) also emphasised the importance of sustained PA engagement through informational SOSU in older US-Americans. Marthammuthu et al. (2021) identified informational SOSU as a key factor in encouraging exercise among older rural Malaysian women. Mathews et al. (2010) identified a lack of knowledge about safe exercise as an important barrier, with informational SOSU specific to older people as an enabling factor for PA. Similarly, Beselt et al. (2023) found that older women living alone in Canada particularly valued group PA programmes, especially because the trainer’s instructions provided a sense of security.

2.3.5. Instrumental Social Support

Limited research has examined instrumental SOSU in relation to PA, and the evidence is mixed. For example, Zimmer and McDonough (2022) found a significant negative

association between instrumental SOSU and PA among Canadian older adults not living alone, but not among those living alone. Malek Rivan et al. (2022) also found a negative relationship between instrumental SOSU and PA. Perrino et al. (2011) observed that higher levels of instrumental SOSU were associated with lower levels of walking in older Hispanic-Americans. In a longitudinal analysis of older Japanese adults, Komazawa et al. (2021) reported that instrumental SOSU was negatively associated with PA in financially stressed women, but not in men. In contrast, Loprinzi and Joyner (2016) found a positive association between financial SOSU and PA levels. In line with this, Choi et al. (2023) found that financial SOSU was an important facilitator of exercise participation in South Korea. Lack of financial resources was an important barrier to PA. Yamakita et al. (2015) examined instrumental SOSU given and received and found that both were associated with sports group participation in older Japanese adults.

Qualitative studies offer a more positive perspective on the relationship between instrumental SOSU and PA. Janevic and Connell (2004) examined support and exercise in female US-American carers and found that instrumental SOSU, such as having someone to look after their care-receiver, facilitated exercise, whereas a lack of support hindered it. Marthammuthu et al. (2021) identified logistical problems in attending exercise programmes as a major barrier for older Malaysian women. Jones et al. (2020) highlighted the crucial role of instrumental SOSU in supporting exercise among older retired US-American women, and Arnautovska et al. (2018) also highlighted its importance in facilitating PA in older Australians.

2.3.6. Companionship Social Support

Companionship SOSU is an important determinant of PA in older adults. Ory et al. (2016) and Shores et al. (2009) found a positive association between companionship SOSU and PA. Salvador et al. (2009) investigated the association between PA and SOSU for exercising, walking or cycling with friends, neighbours or relatives in Brazil and found a significant positive association for men but not for women. However, Wagner et al. (2020) found no significant association between park-based PA and companionship SOSU in a study of older adults in China and Germany. McAuley et al. (2003) attempted to predict the long-term exercise behaviour of US-American older adults after a 6-month RCT with an 18-month follow-up. They found no direct effect of exercise frequency or companionship SOSU from the exercise group on long-term activity rates. Thomas et al. (2012) found a positive significant association between a buddy peer support intervention and subjective

PA in older Chinese. Cai et al. (2022) analysed the relationship between a similar intervention and objective PA in older Chinese and found a positive association. Crist et al. (2022) examined the relationship between a peer-led group PA intervention and objective PA in older US-Americans. They found a significant increase in PA in the intervention group at 12 months, and participants maintained the increase over 2 years. Chia et al. (2023) found a significant positive association between companionship SOSU and objective PA in Taiwanese men and women, but the association was stronger in women. Huang et al. (2022) found that walking together in a group significantly increased objective PA in older Taiwanese men.

Numerous mixed methods (de Oliveira et al., 2019; Gagliardi et al., 2020; Orsega-Smith, 2003) and qualitative studies (Beselt et al., 2023; Bidonde, 2009; Choi & Bae, 2023; Choi et al., 2018; Du et al., 2023; Gayman et al., 2022; Janevic & Connell, 2004; Jones et al., 2020; Kosteli et al., 2016; Leung et al., 2021; Martín-Moya et al., 2022; Mobily, 2017; Victor et al., 2016; Wagner et al., 2020; Wahlich et al., 2017; Zimmer et al., 2023) have also highlighted the importance of companionship SOSU for PA. These studies underline the positive effects of group exercise, friendship formation, being part of a set group, and increased social interaction as facilitators of PA engagement.

Research suggests that companionship SOSU and PA have a close and bidirectional relationship. Specifically, engaging in PA in a group setting appears to be a critical factor in encouraging older adults to participate in regular exercise (Beselt et al., 2023; Bidonde, 2009; Choi & Bae, 2023; de Oliveira et al., 2019; Du et al., 2023; Floegel et al., 2015; Gagliardi et al., 2020; Gayman et al., 2022; Gothe & Kendall, 2016; Horne et al., 2012; Jones et al., 2020; Martín-Moya et al., 2022; Mobily, 2017; Zimmer et al., 2023). In addition to promoting PA, companionship SOSU also serves as an essential means of maintaining social connections for older adults, thereby improving their overall well-being. Furthermore, engaging in PA with others provides a sense of safety and security (Beselt et al., 2023; Leung et al., 2021; Marthammuthu et al., 2021; Zimmer et al., 2023).

2.3.7. Validation

There are no quantitative studies that focus on the aspect of validation, and only six qualitative studies have addressed this issue. Gagliardi et al. (2020) conducted a mixed methods study to evaluate an intervention programme for older adults in Italy. Participants reported that the opportunity to compare themselves with peers was an important reason for participating in the programme. Similarly, Huffman and Amireault (2021) found that

feedback, particularly from trainers, was an important facilitator of overall PA maintenance. Zhang et al. (2022) explored factors influencing PA participation among older adults in the UK. Participants highlighted the importance of social comparison with peers' health and PA behaviours as a motivating factor to engage in PA. The perspectives of older women living alone in Canada who participated in group exercise were explored by Beselt et al. (2023). Some participants emphasised the motivational value of comparing themselves with others in the group. Seeing other active women was particularly uplifting, and observing those who were less physically fit served to inspire participants to either maintain or increase their own levels of PA. When examining the relationship between SOSU and Canadian group PA programmes, Zimmer et al. (2023) found similar results. Giving and receiving feedback from others was an important motivator for participating in a group programme, while seeing others performing exercises motivated participants to try them themselves. Patterson et al. (2022) similarly found that social comparison with other participants increased motivation for attending a group PA programme in older Canadian women.

2.3.8. Other Social Support

Numerous studies have explored alternative aspects of SOSU and its association with PA in older adults. Mowen et al. (2007) examined SOSU network size and satisfaction in older US-Americans but found no association with PA. Oktaviani et al. (2022) conducted a longitudinal study in Indonesia measuring SOSU provision from living with a spouse and children and found no significant association between SOSU and PA. Okoye et al. (2022) found a negative association between perceived SOSU and PA in older Nigerians. Several studies have focused on the sources of SOSU but found inconclusive evidence. Van Cauwenberg et al. (2014) found a positive association between neighbourhood SOSU and walking in older Belgians. Thornton et al. (2017) observed positive associations between objective and subjective PA and SOSU from family, friends, acquaintances and co-workers in older US-Americans. In a longitudinal study of older US-American women, Harvey and Alexander (2012) found that SOSU from friends significantly predicted PA and had a positive effect on PA levels. However, SOSU from spouses or children did not show a significant effect. Lian et al. (1999) examined the relationship between PA and SOSU from family and friends in Singapore and found that family SOSU was positively associated with PA. Qu et al. (2023) found a significant positive association between group PA and SOSU from family and others but found no association with SOSU from friends in older Chinese. Lack of SOSU from friends and neighbours was found to be significantly associated with

lower levels of PA in older Japanese by Kanamori et al. (2023). Wang et al. (2022) analysed the relationship between SOSU from family and exercise in older Chinese and found a positive association.

Qualitative studies have also provided valuable insights. Rowland et al. (2021) identified family support and encouragement from friends as essential enablers of PA for Indigenous Australians. Kegler et al. (2012) highlighted church communities as important sources of support in the USA. Jones et al. (2020) highlighted emotional and instrumental SOSU from family, friends and fellow church members as essential enablers of PA in older US-American women. In an US-American intervention study, Floegel et al. (2015) found that sufficiently active participants reported more SOSU from friends and family than insufficiently active participants. Zhang et al. (2022) also identified family, partners and friends as important sources of SOSU to motivate exercise, although family responsibilities could be a barrier. Another study in the USA found SOSU from friends, family and peers an important facilitator of older women's participation in group classes (Du et al., 2023); elsewhere, SOSU from family and friends motivated older Spanish adults to engage in group exercise (Martín-Moya et al., 2022). The importance of trainers' SOSU for older Canadian adults to participate in group PA classes was highlighted by Morrison et al. (2023). Gomes et al. (2017) analysed factors encouraging or discouraging exercise among older adults in 16 European countries using the SHARE: the study showed that participants who received help had lower levels of PA, whereas participants who gave help had higher levels of PA. Sjöberg et al. (2022) examined the quality of SOSU and changes in PA during the COVID-19 pandemic in Sweden. They found that low levels of SOSU before the pandemic were associated with reductions in higher-intensity PA in older adults aged 80 and over. Kim et al. (2014) investigated the development of SOSU through PA in South Korea, finding that people who were members of a sports club created and maintained positive social interactions with other participants and developed close friendships. This finding relates to companionship SOSU and highlights the bidirectional relationship between PA and SOSU. Overall, these studies underscore the importance of different forms of SOSU in motivating and facilitating PA in older adults.

2.4. Discussion

This paper aimed to update a systematic review (Lindsay Smith et al., 2017) and deepen the existing understanding of our topic by encompassing both quantitative and qualitative research. The primary focus was to examine the relationship between functional SOSU and

PA in older adults. This scoping review included a significant amount of new evidence, highlighting the salience of the topic. Notably, 39% of the studies reviewed were published between 2020 and August 2023. In general, it can be concluded that functional SOSU is a key factor in PA and exercise in older adults. These findings are consistent with the systematic review by Lindsay Smith et al. (2017) but also with reviews analysing the situation in adolescents (Laird et al., 2016; Mendonça et al., 2014). By including qualitative evidence, we gained deeper insights into the barriers and facilitators for engaging in physical activity among older adults. For instance, Lindsay Smith et al. (2017) also emphasised the significance of peer programmes. The qualitative studies provided additional information on how these programmes contribute to PA adherence, such as increased feelings of safety and the opportunity to maintain social relationships with others. Comparing the quantitative results remains challenging due to the considerable variation in the measures used to assess both PA and SOSU across studies. However, when using comparable instruments, studies have shown a clearer association. For example, five studies used the PASE to assess PA and SSES to assess SOSU. Four studies reported a significant positive association (Bopp et al., 2004; Mudrak et al., 2017; Park et al., 2014; Wilcox et al., 2003), while one study found no significant association (Gothe, 2018). Similarly to the findings of Lindsay Smith et al., only SOSU for PA was often measured with the same instrument (SSES) whereas for the other types of SOSU the measurements varied so much that comparison is very difficult and therefore the results seem less reliable for other types of SOSU than for SOSU for PA. This furthermore shows that using instruments that measure specific the PA of older adults might produce different outcomes in the association between PA and functional SOSU than when using not age-specific instruments. For other types of SOSU, the varying measurements make comparison difficult, resulting in less reliable results. Furthermore, this demonstrates that using instruments that measure the PA of older adults specifically may yield different results in the relationship between PA and functional SOSU compared to using non-age-specific instruments. When PA has been measured objectively, there has been conflicting evidence regarding its association with SOSU. Some studies reported a positive association (Aguiñaga et al., 2021; Carlson et al., 2012; E. Chan et al., 2020; S. Chen et al., 2021; Ory, 2018; Thornton et al., 2017), whereas others (Brassington et al., 2002; Gothe, 2018; McAuley et al., 2003) found no such association. Seguin-Fowler et al. (2021) even found a negative association between both objective and subjective PA and SOSU. Furthermore, specific types of PA, such as park-based PA (Wagner et al., 2020) or walking (Corseuil

Giehl et al., 2017; Ory et al., 2016; Perrino et al., 2011; Van Cauwenberg et al., 2014), yielded different results from general PA.

For future research and public health interventions, it would be beneficial to use consistent measures for both PA and SOSU. Additionally, it would be helpful to use age-specific instruments for this study population, as older adults face different challenges in adhering to PA recommendations and their SOSU networks change due to ageing processes such as retirement or widowhood (Ayalon & Levkovich, 2019). This is particularly important given the inconclusive evidence on sources of SOSU. As sources of SOSU change with age, it would be useful to have a tool that specifically addresses this issue. This scoping review found that several studies used instruments designed for an older population, such as CHAMPS or PASE, to assess PA. However, for SOSU, none of the studies used age-specific instruments.

Regarding our study population, it is logical that both companionship and informational support from SOSU are important facilitators of PA. This is because they increase the feeling of safety when performing PA. Professional informational SOSU is particularly crucial for exercise and PA in older adults, possibly due to concerns about exercise safety in later life. Therefore, this aspect should be carefully considered when designing PA interventions for older adults.

Instrumental SOSU on the other hand stands out in the proportion of quantitative studies reporting significant negative associations. This may be because people who require instrumental SOSU face greater challenges in engaging in PA due to lower levels of fitness and health. One barrier to PA is the lack of financial resources and financial instrumental SOSU could help to overcome this problem. As older adults often face challenging financial situations, this is an area that requires further attention. Instrumental SOSU can address another barrier to PA, which is when older adults act as caregivers for their spouses. Barriers include family responsibilities and lack of support (Bopp et al., 2004; Gothe & Kendall, 2016; Janevic & Connell, 2004; Marthammuthu et al., 2021). Conversely, one motivation for exercising was to maintain good health and avoid becoming a burden on family members (Wahlich et al., 2017; Zhang et al., 2022).

Future studies and public health interventions should also focus on minority groups, such as ethnic minorities or migrants, to address the barriers and facilitators for engaging in PA. Older ethnic minorities, in particular, are an understudied group in this area. For instance, migrants may have smaller or different SOSU networks and may lack information

about low-cost community PA programmes. Additionally, cultural aspects of PA engagement should be considered when developing such programmes (Mathews, 2010). Overall, companionship SOSU contributes significantly to PA participation, especially in group-based programmes, and promotes social connections, ultimately benefiting the physical and social aspects of older adults' lives and, in turn, lead to increased PA. Safety is a critical issue to consider, and both companionship and informational SOSU can increase feelings of safety when engaging in PA. Difficulties related to safety, such as neighbourhood safety (Gothe & Kendall, 2016; Marthammuthu et al., 2021) and safe exercise practices, can be significant barriers to PA in older adults.

The concept of functional SOSU relates to the idea that interpersonal relationships provide multiple different types of SOSU and that these types of SOSU may be more or less important and effective in addressing specific problems or challenges (Wills & Shinar, 2000). Regarding adherence to PA recommendations in older adults, it is clear that all five dimensions of functional SOSU are associated with adherence. Although the evidence is mixed, companionship SOSU in particular appears to be a key enabler of PA in older adults.

2.5. Limitations and Strengths

This scoping review has several limitations, particularly in relation to our inclusion criteria. We excluded studies that focused on patient groups; as a result, we may have 'lost' many pertinent articles. However, we decided to do this as patients are likely to have different SOSU needs and may face different challenges in engaging in PA. In this review, we defined older adults broadly as those aged 60 or over and did not consider age groups of older adults in our analysis. However, there are significant variations between young-old, mid-old, and old-old individuals and the possibility of engaging in PA or exercise varies among different age groups. In addition, we only included articles that were written in English. Thus, there is limited information about cultural factors, such as race and ethnicity, related to SOSU and PA among older adults. Finally, this review focuses only on functional SOSU. Therefore, it excludes any form of structural SOSU. In addition, as we only included studies dealing with SOSU, papers analysing related concepts such as social networks, social integration and loneliness were not included. There is also a significant degree of heterogeneity between studies in terms of research design, sample size and specific study populations, which makes it difficult to compare results. A further limitation of scoping reviews is that they do not assess the quality of the studies; moreover, as they include qualitative studies, the results cannot be easily compared or synthesised. However, the

inclusion of qualitative studies is a major advantage of this paper as these provide a deeper insight into the research topic. The greater breadth of scoping reviews also allowed us to include more studies with different variables (e.g. not only general PA but also park-based PA). This scoping review is therefore an informative update to the 2017 systematic review. Though the results cannot be generalised, this review provides a comprehensive overview of all available evidence on the topic.

2.6. Conclusion and Implications

This review identifies which types of functional SOSU are associated with PA in older adults. There is considerable heterogeneity in the design of studies on this topic. While the evidence on the association between functional SOSU and PA is mixed, most studies show a positive association. In particular, SOSU from family, friends or an exercise group seems to increase PA. PA itself may also provide a strategy for improving social contact and social integration.

Further research is needed to not only assess but also improve PA in older adults. In particular, more longitudinal studies would be highly beneficial to this area of research to make conclusions about the direction of functional SOSU and PA. In addition, consistent use of validated scales could help in comparing results between studies. While some studies mentioned above used the CHAMPS or PASE, it would be helpful if future research used more age-specific measures; this also applies to SOSU instruments. It is clear that increasing SOSU in older people could have a positive effect on their PA levels. As PA is such an important aspect of healthy ageing, SOSU should be promoted in older adults. However, such public health interventions must be accessible to adults with lower SOSU from family and friends, for example, by involving general practitioners or other health professionals.

2.7. References

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Chapter 2

The DeepL Write AI, ChatGPT and Cambridge proofreading were used for the purposes of spell checking and language editing.

2.8. Appendix

2.8.1. Additional file 1: search terms

"aging" OR "ageing" OR "old* adult*" OR "late* life" OR "elder*" OR "geriatric*" OR "old* people" OR "old* male*" OR "old* female*" OR "late-life" OR "old* patient*" OR "old* age" OR "late adulthood" OR "life span" OR "life course" OR "second half of life" OR "life-span" OR "life-course" OR "aged" OR "old* person*" OR "lifespan" OR "old* population*" OR "HRS" OR "MHAS" OR "ELSA" OR "SHARE" OR "CRELES" OR "KLoSA" OR "JSTAR" OR "TILDA" OR "CHARLS" OR "LASI" OR "MARS" OR "IFLS" OR "SAGE" OR "HAALSI" OR "HAGIS" OR "NICOLA" OR "ELSI" OR "HART" OR "Health and Retirement Study" OR "Mexican Health and Aging Study" OR "English Longitudinal Study of Ageing" OR "Survey of Health, Ageing and Retirement in Europe" OR "Costa Rican Longevity and Healthy Aging Study" OR "Korean Longitudinal Study of Aging" OR "Japanese Study of Aging and Retirement" OR "The Irish Longitudinal Study on Ageing" OR "China Health and Retirement Longitudinal Study" OR "Longitudinal Aging Study in India" OR "Malaysia Ageing and Retirement Survey" OR "Indonesia Family Life Survey" OR "Study on Global Ageing and Adult Health" OR "Health and Aging Study in Africa" OR "Healthy Ageing in Scotland" OR "Northern Ireland Cohort for the Longitudinal Study of Ageing" OR "Brazilian Longitudinal Study of Aging" OR "Health, Aging, and Retirement in Thailand"

AND

"social support" OR "social network*" OR "social relation*" OR "social contact*" OR "social isolation" OR "social capital" OR "lonel*" OR "social engagement" OR "social integration" OR "social activit*" OR "social withdrawal" OR "social participation" OR "social disengagement" OR "personal network*" OR "social tie*" OR "social interaction" OR "social embeddedness" OR "family relation*" OR "kinship relation*" OR "friendship*" OR "social influence*" OR "social vulnerability" OR "peer support" OR "emotional support" OR "social connectedness" OR "belongingness" OR "socially isolated" OR "social environment" OR "tangible support" OR "emotional closeness" OR "informational support" OR "instrumental support" OR "appraisal support" OR "companionship support" OR "functional support" OR "structural support" OR "perceived support" OR "received support" OR "practical support" OR "esteem support" OR "confident support"

AND

"physical* activ*" OR "PA" OR "physical exercis*" OR "exercis*" OR "training" OR "fitness" OR "sport*" OR "physical* inactiv*" OR "aerobic exercis*" OR "run*" OR "swim*" OR "walk*" OR "cycl*" OR "bicycl*" OR "biking" OR "bike" OR "MVPA" OR "LTPA" OR "sedentary"

2.8.2. Additional file 2: Data extraction table for the included studies

Data extraction table for cross-sectional studies and the quantitative elements of mixed methods studies

Authors	Year	Country	Age (years) : m, [R] ^a	Gender	N ^b	Type of PA	PA Measure	Type of SOSU	SOSU measure	Results ^c
Bakhtari et al.	2019	Iran	[60+]	not stated	340	Subjective PA: MVPA	PASE-SF, last 7 days)	PA SOSU	20 items (5 items assess friends to support and 15 items measure family support.)	+
Blakoe et al.	2023	Spain	[65+]	60% female	7,023 (older age group)	Subjective PA: LTPA, MVPA	2 items: Doing PA in the leisure time at least several times a week; reported frequent PA during daily activity	General	DSSI	+
Bopp et al.	2004	USA	70.6	100% female	102	Subjective PA: MVPA Strength training	PASE Strength training exercise	PA SOSU	SSES	+
Carlson et al.	2012	USA	74.4	53.1% female	718	Objective PA Subjective PA: MVPA	Accelerometer (1 week) CHAMPS	PA SOSU	SSES (adapted, 4 items)	+
Chan et al.	2020	Malaysia	[60+]	51% female	3,969	Subjective PA: MVPA	GPAQ	General	DSSI	+
Chan et al.	2020	USA	74.1	52% female	400	Objective PA	Accelerometer (at least 7 consecutive days)	General	Lifestyle Questionnaire: 9 items regarding the availability of SOSU in various circumstances	+
Chen et al.	2021	Sweden	[60+]	Age group < 70: 60.2%	595	Objective PA	Accelerometer (at least 7 consecutive days)	General	9 items: Satisfaction with social contacts, instrumental SOSU, emotional SOSU, feeling of social embeddedness	+

				> 80: 69.9%						
Chen et al.	2015	China	76.5 [60–99]	66% female	521	Subjective PA: LTPA, HPA, MVPA	Self-reported items on frequency of walking, MVPA, LTPA, HPA	General	SSRS	+
Corseuil Giehl et al.	2017	Brazil	70.3	63.% female	1,705	Subjective PA: Walking	IPAQ (walking domain)	PA SOSU	Scale of Social Support for Physical Activity	+
Cousins	1995	Canada	77 [70–98]	100% female	327	Subjective PA: Exercising	OA-ESI	PA SOSU	4 items covering family athletism, encouragement, PA activity levels of close contacts	+
Cousins	1996	Canada	76.7 [70–98]	100% female	327	Subjective PA: Exercising	OA-ESI	PA SOSU	4 items covering family athletism, encouragement, PA activity levels of close contacts	+
Eronen et al.	2012	Finland	77.6 [75–81]	75% female	629	Subjective PA: Unmet PA need	2 items: ‘Do you feel that you would have the opportunity to increase your level of physical activity if someone recommended you to do so?’; ‘Would you like to increase your level of physical activity?’	Emotional	1 item: Someone to talk to	+
Gomes et al.	2017	Europe (SHARE)	67.8	59.2% female	19,29 8	Subjective PA: MVPA	2 items: PA frequency	Given and received help	2 items: Received help from others, given help last 12 months	*
Gothé	2018	USA	64.8 [55–75]	87.2% female	110	Objective PA:	Accelerometer (7 consecutive days) PASE GLTEQ	PA SOSU	SSES	0

						Subjective PA: MVPA				
Gyasi	2019	Ghana	66	63% female	1,200	Subjective PA: MVPA	GPAQ: 1 item	General	2 items: Contact frequency; social participation	+
Hall & McAuley	2010	USA	69.6	100% female	128	Objective PA: Daily steps	Accelerometer (7 days)	PA SOSU	SSES	0
Jin et al.	2022	China	69	69.5% female	778	Subjective PA: MVPA	IPAQ-SF	General	SSRS	+
Kanamori et al.	2023	Japan	75	59% female	1,494	Subjective PA: Exercise habits	1 item: Do you walk or do household chores (cleaning, gardening, etc.) that constitute exercise at least once per week?’	SOSU source	1 item: Who do you consults with about your problems?	+
Kang et al.	2018	South Korea	[65+]	61% female	332	Subjective PA: LTPA	GLTEQ	General	SSQ	+
Kaplan et al.	2001	Canada	[65+]	50.4% female	12,611	Subjective PA: LTPA	1 item: Monthly LTPA more than 15 minutes	General	4 items: Someone they could confine in; someone they could count on; someone who could give them advice; someone who made them feel loved	+
Kim & Kosma	2012	South Korea	68.56 [65–89]	70% female	290	Subjective PA: LTPA	GLTEQ	PA SOSU	SSES (adapted)	+
Krause et al.	1993	Japan	68.7	51% female	2,200	Subjective PA: MVPA	3 items on exercise, walking and gardening frequency	Emotional	2 items: Someone to talk to; feeling loved and cared	+
Kumar et al.	2022	India	67.2 [60–95]	58% female	400	Subjective PA: Exercising	Items via Katz ADL	General	LSNS	+
Kwag et al.	2011	USA	81.84 [66–106]	72.8% female	163	Subjective PA: MVPA	PASE	Perceived	SPS-SF	+
Lee & Fan	2023	Taiwan	71.41 (older)	68.36% female	183 (older)	Subjective PA: MVPA	PASE	PA SOSU	5 items: Assessing SOSU from family and friends	+

			age group)		age group)				for PA, such as engaging in PA with the participant or encouraging them to take PA	
Levy-Storms & Lubben	2006	USA	61 [50–97]	100% women	290	Subjective PA: Exercising	1 item: Exercises at all	General	LSNS	+
Lian et al.	1999	Singapur	[60–80+]	58% female	2,494	Subjective PA: MVPA	Weekly frequency of MVPA	SOSU source	Rewards and SOSU from family members + friends	+
Loprinzi & Crush	2017	USA	71.4, 60-85	50.7% male	2,519	Objective PA	Accelerometer (at least 4 consecutive days)	Emotional Instrumental	2 items: Provision of emotional support in the last 12 months 1 item: Having someone to help financially if needed	+
Loprinzi & Joyner	2016	USA	71.4	50.1% female	5,616	Subjective PA: LTPA	Question about 48 different activities in the last 30 days (16 sport, 14 exercise and 18 recreational activities)	Emotional Instrumental	2 items: Provision of emotional support in the last 12 months 1 item: Having someone to help financially if needed	+
Malek Rivan et al.	2022	Malaysia	71.18	55% female	535	Subjective PA: MVPA	IPAQ-SF	Emotional Instrumental	Items based on the Brief COPE inventory	-
Marthammuthu et al.	2023	Malaysia	70.83	100% female	1,221	Subjective PA: MVPA	PASE	General	DSSI	*
Morris et al.	2010	Jamaica	[55–64] [65–74] [75+]	100% male	2,000	Subjective PA: Exercising	2 items	General	1 item: Having SOSU (yes/ no)	+
Mowen et al.	2007	USA	67.4 [55-99]	66% female	1,515	Subjective PA: Daily PA levels	1 item: Daily PA levels	General	SSQ	0
Mudrak et al.	2017	Czech Republic	68	79.2% female	546	Subjective PA: LTPA MVPA	GLTEQ PASE	PA SOSU	SSSES	+

Newsom et al.	2018	USA	72.55	58.5% female	217	Subjective PA: MVPA	CHAMPS	PA SOSU	16 items	+
Niedermeier et al.	2019	Germany	70 [60–80]	50% female	100	Subjective PA: MVPA	PAQ-50+	General	SSQ	+
Oh et al.	2020	South Korea	[50–65]	44.3% female	778	Subjective PA: MVPA	IPAQ	General	MSPSS	+
Oka & Shibata	2012	Japan	74.5 [70–89]	53% female	137	Objective PA:	Accelerometer: Daily number of steps. Recorded over 1 year and data downloaded every month	PA SOSU	5 items: functional, emotional + informational PA SOSU	0
Okoye et al.	2022	Nigeria	74.25	65% female	100	Subjective PA: MVPA	PASE	SOSU source	MSPSS	-
Orsega-Smith et al.	2003	USA	69 [60–88]	80% female	265	Objective PA: Participation level in an exercise programme	Attendance	PA SOSU	SSES	+
Orsega-Smith et al.	2007	USA	67.7	61.5% female	1,900	Subjective PA: LTPA	2 items: Type of LTPA; frequency over the last week	PA SOSU	SSES	+
Ory et al.	2016	USA	69 [60–92]	50.37% female	272	Subjective PA: Walking	Walking (1 item)	Companionship	SOSU for walking (2 items)	+
Park et al.	2014	South Korea	71.62	70.1% female	187	Subjective PA: MVPA	PASE	PA SOSU	SSES	+
Perrino et al.	2011	USA	79.95 [72–102]	62% female	217	Subjective PA: Walking	Walking route in the last 7 days, transformed into ‘total blocks walked’	General Emotional Informational Instrumental	Emotional (4 items) Informational (4 items) Instrumental (2 items)	-
Potts et al.	1992	USA	72.57	59.6% female	936	Subjective PA: MVPA	Exercising adherence (frequency) in the last week	General	LSNS	+
Purath et al.	2009	USA	67.4 [60–87]	62% female	34	Subjective PA: MVPA	PASE	PA SOSU	Social Support for Physical Activity Scale	+

Qu et al.	2023	China	60.62	95.2% female	2,721	Subjective PA: Group exercising	PARS-3	General	MSPSS	+
Reed et al.	2011	USA	[60+]	not stated	601	Subjective PA: LTPA	Frequency of LTPA in the last months	General	4 items on social contacts in a typical week	+
Riffle et al.	1989	USA	74 [56–94]	78% female	113	Subjective PA: Exercising	1 item: Exercises at all	General	PRQ 2	0
Ryu et al.	2023	USA	78.1 [63–99]	100% female	4,168	Objective PA	Accelerometer (7 days)	General	MOS	0
Salvador et al.	2009	Brazil	[60–74]	60.5% female	385	Subjective PA: MVPA	IPAQ	Companionship	NEWS	+
Shores et al.	2009	USA	[65–74] [75–84] [85+]	46.8% female	454	Subjective PA: Exercising	Exercise frequency (last 7 days)	Companionship	1 item: ‘I don’t know anyone who would participate with me.’	+
Sjöberg et al.	2022	Sweden	[65–99] Age group ≤70: 66.1 Age group ≥80: 84	Age group ≤70: 64.8% female Age group ≥80: 67.9% female	624	Subjective PA: Change of MVPA levels during the pandemic as compared to pre-pandemic levels	Self-reported changes of LVPA + MVPA	Quality of SOSU	4 items: Reported satisfaction with the social contacts; perceived material and psychological support; sense of affinity with association members, relatives, and living area; being part of a group of friends	+
Thornton et al.	2017	USA	74.4	53% female	726	Objective PA: Subjective PA: MVPA	Accelerometer (7 consecutive days) CHAMPS	PA SOSU	4 items: How often during the past 6 months their family, friends, acquaintances or co-workers (1) walked or exercised with them, (2) gave them encouragement to do physical activity, (3) made positive comments about the participant’s	+

									physical appearance, and (4) criticized or made fun of them for walking or exercising	
Umstattd et al.	2006	USA	70.4	78% women	296	Subjective PA: MVPA	CHAMPS-SF	PA SOSU	PASS	0
Van Cauwenberg et al.	2014	Belgium	74.3	55.6% female	50,986	Subjective PA: Walking	1 item: Walking for transportation	Neighbours SOSU	1 item: Counting on help from neighbours	+
Van Luchene et al.	2021	Belgium	67.59 sub-group retirees	74.36% female (sub-group)	39 (sub-group)	Subjective PA: MVPA	SOC, IPAQ-SF	PA SOSU	SSES	+
Wagner et al.	2020	Germany & China	71.03	52.7% female	617	Subjective PA: Park-based PA	3 items: Type, amount and intensity levels of PA in parks during a typical week	Companionship	3 items	0
Wang et al.	2022	China	[60+]	41% female	7,901	Subjective PA: Exercising	1 item: Exercise activities: went to a sport, social, or other kind of club in the past months (based on CHARLS)	SOSU source	5 items: Marital status; number of children; frequency of meeting with their children, whether their children provide financial support; whether they are satisfied with their relationship with their children	+
Watt et al.	2014	USA	71.7	55.6 % female	4,014	Subjective PA: MVPA	1 item: PA in the last 30 days	Emotional	2 items: Provision of emotional support in the last 12 months	+
Wendt Böhm et al.	2016	Brazil	69.5	63.4% female	1,285	Subjective PA: LTPA	IPAQ (leisure domain)	PA SOSU	PASSS	+
Wilcox et al.	2003	USA	70.6	100% female	102	Subjective PA: MVPA	PASE	PA SOSU	SSES	+
Wilcox et al.	2000	USA	67.43	100% female	2,912	Subjective PA: Exercising	Items adapted from the NHIS + the BRFSS about	PA SOSU	4 items	+

							frequency and intensity of exercising in the last 14 days			
Yamakita et al.	2015	Japan	73.5	51.6% female	78,002	Subjective PA: Participation in sports groups	1 item: Frequency of participation in sports groups	Emotional Instrumental	4 items: Emotional + instrumental SOSU received + given (yes/no)	+
Yi et al.	2016	China	67.11 [60–85]	63.3% female	1,580	Subjective PA: Exercising	3 items: Exercise frequency + duration	General	5 items assessing emotional and informational SOSU	+
Zimmer & McDonough	2021	Canada	72.78 [65–89]	53.4% female	21,491	Subjective PA: MVPA	PASE	General Instrumental	Items on instrumental support, affectionate support, emotional/informational support + positive social interaction (items based on the MOS)	*

^a m = mean, [R] = range

^b N = sample size

^c Results: 0 indicates no sig. relationship ($p \geq 0.05$), + indicates sig. pos. relationship ($p < 0.05$), - indicates sig. neg. relationship, * indicates sig. mixed relationship

Abbreviations: PA = physical activity; SOSU = social support; MVPA = moderate-vigorous PA; LTPA = leisure-time PA; HPA = household PA

Physical activity measures: CHAMPS - Community Healthy Activities Model Program for Seniors; GLTEQ – Godin’s Leisure Time Exercise Questionnaire; GPAQ - Global Physical Activity Questionnaire; IPAQ – International Physical Activity Questionnaire; PASE - Physical Activity Scale for the Elderly; PAQ+50+ - German Physical Activity Questionnaire 50+; SOC - Stage of Change to Exercise Behaviour Scale; OA-ESI - Older Adult Exercise Status Inventory; Katz ADL - Activities of Daily Living Index; PARS-3 - Physical Activity Rating Scale-3; SBQ - Sedentary Behavior Questionnaire

Social support measures: SSPAS - Social Support for Physical Activity Scale; SSES – Social Support for Exercise Scale; DSSI - Duke Social Support Index; SSRS - Social Support Rate Scale; SSQ - Perceived Social Support Questionnaire; SPS - Social Provision Scale; LSNS - Lubben Social Network Scale; PRQ 2 - Personal Resource Questionnaire; NEWS - Neighborhood Environment Walkability Scale; PASSS - Physical Activity Social Support Scale; PASS – PA Social Support; MSPSS - Multidimensional Scale of Perceived Social Support; OSSS-3 - Oslo-3 Social Support Scale; MOS – Medical Outcomes Study

Data extraction table for observational longitudinal studies

Authors	Year	Country	Age (years): m, [R] ^a	Gender	N ^b	Type of PA	PA Measure	Type of SOSU	SOSU measure	Results ^c
Harvey & Alexander	2012	USA	69	100% female	671	Subjective PA: MVPA	3 items: 'How often they engaged in the following activities: working in the garden or yard, participating in active sports or exercise, and taking walks'	SOSU source	3 items: SOSU from spouse; friends; children	+
Komazawa et al.	2021	Japan	68.9	56.6% female	3,911	Subjective PA: Exercising	1 item: Exercise frequency in general	Emotional Instrumental	2 items: 'How often does someone listen to you?' and 'How often does someone show you love and understanding?' 2 items: 'How often does someone care for you when you are sick?' and 'How often does someone provide financial assistance?'	0
Manz et al.	2018	Germany	60 [50–78]	52.5% female	1,184	Subjective PA: LTPA	1 item: Frequency of LTPA	Emotional	1 item from OSSS-3	+
Oktaviani et al.	2022	Indonesia	[60–70+]	52% female	1,289	Subjective PA: MVPA	IPAQ	Having SOSU	1 item: Living with spouse and children (yes/ no)	0
Smith et al.	2023	Australia	61.7 [60–65]	61.4% female	1,984	Subjective PA: LTPA/ MVPA	Items assessing the frequency + duration of LTPA + MVPA in the last week (using items from the Active Australia Survey)	PA SOSU	5 items: Rate how often family or friends provided each of different types of SSPA (emotional, instrumental, informational and companionship) over the last three months	+

Warner et al.	2011	Germany	65+ [65–89]	42% female	309	Subjective PA: Exercising	1 item: Exercise frequency in the last 7 days	SOSU for PA	SSES-SF	+
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^a m = mean, [R] = range at baseline

^b N = sample size at baseline

^c Results: 0 indicates no sig. relationship ($p \geq 0.05$), + indicates sig. pos. relationship ($p < 0.05$), - indicates sig. neg. relationship, * indicates sig. mixed relationship

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Data extraction table for experimental studies

Authors	Year	Country	Age (years): m, [R] ^a	Gender	N ^b	Type of PA	PA Measure	Type of SOSU	SOSU measure	Results ^c
Aguiñaga et al.	2021	USA	67	75% female	20	Objective PA Subjective PA: LTPA, MVPA	Accelerometer CHAMPS SBQ	PA SOSU	SSES	+
Brassington et al.	2002	USA	70.18	65% female	103	Objective PA: Exercising	Attendance	PA SOSU	SSES	0
Cai et al.	2022	China	66.9	64% female	72	Objective PA: Daily walking steps	Accelerometer for 3 consecutive days	Companionship	Peer support intervention arm	+
Chia et al.	2023	Taiwan	71.6 (male) 72.3 (female)	50% female	120	Objective PA: Steps	Accelerometer	Companionship	6 items from the Health-Promoting-Lifestyle-Scale: ‘Discuss exercise patterns with friends’; ‘I would compliment a friend’s athleticism’; ‘Exercise with friends’; ‘I will	+

									show concern to my friends’; ‘Playing sports with friends makes me happy’; ‘get support from friends while exercising’	
Crist et al.	2022	USA	71	76% female	476	Objective PA	Accelerometer	Companionship	Peer-led intervention, group walks	+
Gellert et al.	2011	Germany	66.5	48% female	302	Subjective PA: HPA, LTPA/ sport/ TPA	PAQ-50	PA SOSU	SSES (adapted, 2 items)	*
Huang et al.	2022	Taiwan	70.8 (arm 1) 71 (arm 2) 71.5 (arm 3)	100% male	60	Objective PA: Steps + walked distance Subjective PA: MVPA, LTPA	Accelerometer 6 items: VPA for at least 3 times for 30 minutes a week; MPA for at least 5 times a week for 30-40 minutes; stretching; LTPA; HPA; pulse checking	Companionship	Arm 1: Walking together in the park for at 30 minutes from Monday to Friday	+
McAuley et al.	2003	USA	66 [60–75]	not stated	153	Objective PA: Exercising Subjective PA: LTPA	Attendance PASE	General Companionship	SPS Group exercise	0
Ory et al.	2018	USA	74.8 (arm 1) 74.3 (arm 2)	79.1% (arm 1) 76.4% (arm 2)	430	Objective PA: Exercising Subjective PA: MVPA	Attendance IPAQ	PA SOSU	4 items: How frequently receiving SOSU for planning PA goals; keeping PA goals; reducing barriers to PA; engaging in PA	+
Rhodes et al.	2001	Canada	76.4 [75–80]	100% female	30	Objective PA: Exercising	Attendance	PA SOSU	1 item: ‘The people I spend most of my time with now encourage me in physical fitness activities.’	+

Seguin-Fowler et al.	2021	USA	64.8 (arm 1) 65.1 (arm 2)	80.7% female (arm 1) 75% female (arm 2)	167	Objective PA: All Subjective PA: LTPA, MVPA	Accelerometer (7 consecutive days) CHAMPS IPAQ	PA SOSU	SSES	-
Thomas et al.	2012	China	72.4 (arm 1) 71.7 (arm 2)	67% female (arm 1) 65.3% female (arm 2)	399	Subjective PA: MVPA	IPAQ	Companionship	Peer buddy support arm	+
Wilcox et al.	2008	USA	[50+]	79.1% female (arm 1) 82.5% female (arm 2)	1335	Subjective PA: LTPA	CHAMPS	General	5 items (developed from the US Women's Determinants Study)	+

^a m = mean, [R] = range

^b N = sample size

^c Results: 0 indicates no sig. relationship ($p \geq 0.05$), + indicates sig. pos. relationship ($p < 0.05$), - indicates sig. neg. relationship, * indicates sig. mixed relationship

Abbreviations: PA = physical activity; SOSU = social support; MVPA = moderate-vigorous PA; LTPA = leisure-time PA; HPA = household PA; arm = study arm

Physical activity measures: CHAMPS - Community Healthy Activities Model Program for Seniors; GLTEQ – Godin's Leisure Time Exercise Questionnaire; GPAQ - Global Physical Activity Questionnaire; IPAQ – International Physical Activity Questionnaire; PASE - Physical Activity Scale for the Elderly; PAQ+50+ - German Physical Activity Questionnaire 50+; SOC - Stage of Change to Exercise Behaviour Scale; OA-ESI - Older Adult Exercise Status Inventory; Katz ADL - Activities of Daily Living Index; PARS-3 - Physical Activity Rating Scale-3; SBQ - Sedentary Behavior Questionnaire

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Data extraction table for qualitative studies and the qualitative elements of mixed methods studies

Authors	Year	Country	Age (years): m, [R] ^a	Gender	N ^b	Type of PA	Type of SOSU	Results
Arnautovska et al.	2017	Australia	73.3	64.6% female	48	Motivation to engage in PA	Informational General Instrumental	Informational SOSU from health care professionals, general SOSU and instrumental SOSU were important facilitators for PA.
Beselt et al.	2023	Canada	66.9 [57–79]	100% female	16	Group PA classes	Companionship Informational Validation	(1) Exercising together was seen as safer than exercising alone, particularly because of health concerns and fears of falling, and informational SOSU from the instructor was very important for safe training. (2) The positive obligation to attend stemmed from the opportunity to socialise with other participants, and participants valued the mutual accountability that led them to check on each other if someone had missed a class. (3) Some participants found it motivating to compare themselves with other participants and were inspired by seeing other women engaged in PA; observing women with lower fitness levels also motivated participants to maintain or increase their own levels of PA.
Bidonde et al.	2009	Canada	75 [67–83]	100% female	9	Group exercise programme	Companionship	Through the programme, participants formed relationships and bonded with other women in similar positions. Friendships emerged outside the programme.
Bopp et al.	2004	USA	67.5	100% female	39	Strength training	General	Lack of social support and family obligations were barriers to training.
Choi et al.	2018	USA	69 [55–79]	100% female	64	Team sport	Companionship	(1) Friendship and social connections were important motivators for players to join the team and continue playing. (2) Participation strengthened social connections with others; through the sport, participants developed a social network.
Choi et al.	2022	South Korea	77 [66–88]	66.6% female	15	Exercising	Instrumental (financial) Companionship	(1) Financial support was an important facilitator of exercise, given the importance of limited resources as a barrier to PA. (2) Participants preferred group exercise because of the opportunity for social interaction and increased motivation.
de Oliveira et al.	2019	Australia	67 [54–84]	87% female	93	Exercise programme	Emotional Information Companionship	(1) Emotional and informational SOSU from family, friends and trainers were important facilitators.

								(2) Participants valued the programme as a group-based activity with people of the same age, and they valued the interaction with peers and the opportunity to socialise outside the exercise context.
Du et al.	2023	USA	69.2	100% female	13	Group exercise programme	Companionship SOSU source	(1) Peer support within the class played an important role in maintaining PA engagement. (2) Support from friends, family and peers was key to participation in group exercise.
Floegel et al.	2015	USA	65	87.5% female	24	Peer-led advice and support PA group	Companionship SOSU source	(1) SOSU within the peer group and from mentors was a facilitator of PA engagement for both active and insufficiently active participants. (2) More active participants reported greater SOSU from family and friends, even outside the intervention context, than less active participants.
Gagliardi et al.	2020	Italy	75.7	42% female	13	Group exercise programme	Emotional Informational Companionship Validation	Emotional, informational and companionship SOSU and validation were important motivators and facilitators for PA.
Gayman et al.	2022	Canada	64 [55–73]	17.6% female	17	Team sport	Companionship	Exercising in a team sport was perceived as very positive as the team was seen as an important source of SOSU and increased participants' social network.
Gothé & Kendall	2016	USA	63 [55–75]	100% female	20	LTPA	General Emotional Companionship Informational	(1) SOSU, specifically emotional and companionship SOSU, was considered one of the most important motivators for LTPA. (2) Most participants preferred group exercise programmes; giving SOSU was also important. (3) Participants valued informational support from physicians. (4) Peer pressure, family responsibilities and poor neighbourhood conditions were considered barriers to exercising.
Horne et al.	2012	UK	[60–70]	50% female	46	Taking up and maintaining PA	Emotional Companionship	(1) In taking up PA, encouragement and motivation from family, friends and peers but also statutory and voluntary workers was crucial. SOSU made participants more confident in starting PA and was the most important factor in PA adherence. (2) Exercising in a group was important because of the socialising opportunities.
Huffman & Amireault	2021	USA	76	68.4% female	38	PA maintenance	Emotional Informational Validation	(1) For sustained PA engagement, informational and companionship SOSU were important facilitators. (2) For re-engagement in PA, emotional SOSU from family and friends was especially important.

								(3) For the general maintenance of PA, validation (feedback) and informational and emotional SOSU were particularly important.
Janevic & Connell	2008	USA	66.1	100% female	30	Exercising	Instrumental Companionship	Enablers for PA were having an exercise partner and instrumental SOSU, in particular having someone to watch the participant's care-receiver.
Jones et al.	2020	USA	68	100% female	15	Exercising	Emotional Instrumental Companionship	(1) Emotional and instrumental SOSU provided by family, friends and fellow church members and companionship SOSU were important facilitators for PA. (2) Group exercise provided opportunities to meet people and form new friendships, which was also an important facilitator.
Kegler et al.	2010	USA	63 [50–70]	47% female	60	Exercising	SOSU source	SOSU from church friends constituted important support for exercising.
Kim et al.	2014	South Korea	71 [66–83]	70% female	10	LTPA in a sports club	Development of SOSU	Participants emphasised the development of SOSU: most stated that by participating in various sports club activities, they created and maintained positive social interactions with other participants and established close friendships.
Kosteli et al.	2016	UK	64 [54–79]	54% female	37	Exercising	Companionship	(1) Older adults specifically engaged in PA for social reasons: PA was considered crucial to social connections. (2) Participants reported that having an exercise companion made them more motivated to engage in PA, while the lack of an exercise partner was a barrier.
Leung et al.	2021	Hong Kong	72.8	50% female	38	Walking	Emotional Informational Companionship	(1) Being encouraged to walk by family, having friends to accompany them and having professional guidance encouraged participants to walk more. (2) The majority of participants valued the increased sense of security and enjoyment of social interaction provided by walking in a group and preferred this to solo walking.
Marthammuthu et al.	2021	Malaysia	74 [60–90]	100% female	17	Exercising	Emotional Instrumental Informational Companionship	(1) Informational, companionship and emotional SOSU were key factors encouraging exercise, while a lack of SOSU was a demotivator. (2) The main barriers to PA were loss of companionship support, lack of instrumental support, logistical problems in attending exercise programmes and neighbourhood safety issues.
Martín-Moya et al.	2022	Spain	68	77% female	39	Group exercise programme	Companionship SOSU source	(1) Group exercise provided opportunities to socialise and develop new friendships. (2) SOSU from family and friends motivated participants to engage in group exercise.

Mathews et al.	2010	USA	71	75% female	396	Exercising	Informational Instrumental	(1) Important barriers were lack of knowledge in terms of safety instructions and financial costs. (2) General and senior-specific SOSU were important enablers.
Mobiliy et al.	2017	USA	67 [54–81]	100% female	7	Group exercise programme	Companionship	SOSU and social interaction with other participants were very important and motivated participants to continue to exercise.
Morrison et al.	2022	Canada	Phase 2: 69.49 [55–80]	Phase 2: 76.3% female	Phase 2: 38	Group exercise programme	SOSU source	Trainers supported autonomous PA engagement by encouraging and validating participants' perspectives and experiences, while trainers' knowledge and safe guidance increased participants' confidence and enabled them to complete the course.
Orsega-Smith et al.	2003	USA	69 [60–88]	80% female	50	Community-based exercise programme	Companionship	The exercise programme developed and promoted social support through interaction with peers and instructors who were in a similar age group.
Patterson et al.	2022	Canada	71.6 [65–84]	100% female	14	Group exercise programme	Validation Companionship	(1) Social comparison with other participants increased participants' motivation to engage in a group PA programme. (2) Encouragement from other participants was an important factor in engagement.
Rowland et al.	2021	Australia	[55–70]	100% female	7	PA	SOSU source	Family support and encouragement from friends were identified as important facilitators of PA, while family breakdown or separation and lack of support from friends and family were important barriers.
Victor et al.	2016	UK	68 [61–75]	60% female	30	Walking	Companionship	The majority of participants who increased their walking level either participated in the trial as a couple or had someone else to walk with. Participants who did not improve their walking reported that they lacked SOSU and that this was a barrier.
Wahlich et al.	2017	UK	[60–75]	62% female	60	PA maintenance	Emotional Companionship	(1) Having friends and family to motivate participants to engage in PA was important; this support could be given either by exercising together or by giving participants the encouragement to exercise and try new exercise activities. Some participants mentioned that they exercised to stay healthy for their families. (2) PA allowed participants to meet new people. (3) Having no one with whom to engage in activity was perceived as an obstacle, with participants saying that a lack of SOSU caused them to walk less.
Zhang et al.	2022	UK	78 [74–83]	47% female	92	Exercising	Companionship Validation SOSU source	(1) Companionship SOSU was important for exercising. Validation by social comparison was a further motivator. (2) Family, partners and friends were considered important sources of SOSU and motivated participants to exercise. Participants also

								mentioned that they were motivated to exercise in order to stay healthy so as not to become a burden for their families. For people living alone, SOSU from friends was particularly important for encouraging exercise. (3) Family responsibilities as a carer could be a barrier to exercising.
Zimmer et al.	2023	Canada	Phase 2: 69.49 [55–80]	76.3% female	Phase 2: 38 (FGs)	Group exercise programme	Emotional Companionship Validation	(1) Participants valued the opportunity to make new social connections through group activities. (2) The involvement of family or friends served as an important motivation to engage in PA. SOSU for PA from family, friends and others was very important as they provided instrumental, informational and emotional SOSU. (3) Participants maintained a sense of security by checking on each other when someone missed a class. (4) Sharing feedback was an important motivator for group participation. Observing others performing exercises encouraged participants to try them themselves.

^a m = mean, [R] = range

^b N = sample size

Abbreviations: PA = physical activity; SOSU = social support; MVPA = moderate-vigorous PA; LTPA = leisure-time PA

Chapter 3

Well-being in Middle-aged and Older Adults Who Volunteer: A Qualitative Network Analysis

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Abstract

Objective: Social participation is essential for the health of older adults. Formal volunteering can reduce loneliness and is associated with numerous positive health outcomes. Older adults have limited resources to meet their social and well-being needs. We explore factors contributing to the well-being of middle-aged and older adults who engage in formal volunteering using a qualitative social network approach.

Methods: Between 2022 and 2023, qualitative semi-structured interviews were conducted with 28 members of social clubs in Germany, aged 45–80 (mean age 62 years). Thirteen participants were retired. Eight interviewees were female and twenty were male. Participants created unstructured egocentric network maps of individuals or organisations important to their well-being. Participants reflected on their social networks using these maps, which allowed for deeper insights into changing network dynamics. The data were analysed using thematic analysis.

Results: We developed six themes: intrapersonal, interpersonal and social network characteristics affecting well-being, self-fulfilment, feeling indispensable and unfulfilled expectations. Formal social participation, particularly through volunteering, contributed significantly to the well-being.

Conclusion: Formal volunteering can aid successful role substitution and compensation, especially after retirement. This may prevent loneliness and increase well-being in older age.

3.1 Introduction

The world's population is ageing, with projections indicating that by 2030, there will be 1.4 billion people aged over 60. This number is expected to increase to 2.1 billion by 2050 (World Health Organization, 2020a). This shift in the global population demands modifications to the structure of communities in multiple respects, including health and social care, transport, housing and urban development. By adapting to changing demographics and prioritising the promotion of healthy ageing, societies can enable individuals to lead longer and healthier lives, with benefits for all. The WHO defines healthy ageing as 'the process of developing and maintaining the functional ability that enables well-being in older age' (World Health Organization, 2020a); it further defines health as not merely the absence of disease but a 'state of complete physical, mental and social well-being' (World Health Organization, 2020b). Well-being is a multidimensional concept consisting of positive and negative emotions (hedonic well-being), general life satisfaction (evaluative well-being) and having a purpose and meaning in life (eudaimonic well-being) (Greenfield & Marks, 2004; Martín-María et al., 2021). Evidence-based health interventions will benefit from research exploring how older adults can actively achieve and maintain high levels of well-being.

3.1.2. Social needs and changing resources

Social production function (SPF) theory suggests that individuals make choices and move between different goals to maximise their overall well-being, taking into account constraints and available resources (Ormel et al., 1999). Physical well-being is achieved through the two instrumental goals of stimulation (physical, mental, sensory) and comfort (absence of physiological needs, a comfortable and secure environment). Social well-being is achieved through three instrumental goals, namely status (related to occupation, lifestyle, talents), behavioural confirmation (engaging in positive or effective actions, embodying value as an individual or in a functional group, contributing to shared goals) and affection (love, intimacy, support from family and friends) (Ormel et al., 1999; Steverink & Lindenberg, 2006). Steverink et al. (1998) extended the SPF framework specifically for older adults, developing the SPF successful ageing (SPF-SA) theory (Steverink et al., 1998; Steverink & Lindenberg, 2006).

The core idea of this theory is that while basic human needs remain the same throughout life, the opportunities and resources available to meet them change. These include both physical and social resources and opportunities. For example, the satisfaction

of status needs often depends on employment or being recognised for certain skills. In older age, this becomes more difficult, not only because of retirement but also because of age-related impairments that hinder status-enhancing abilities (e.g. cognitive decline). The same principle applies, although to a lesser extent, to behavioural confirmation (achieved by e.g. volunteering or helping others), which requires potentially declining physical and social resources. Affection is the most resistant of the three social needs to the effects of ageing because it is the least dependent on individual capabilities: even when a person's physical and social resources decline significantly, that person can, in theory, still satisfy their need for affection.

SPF-SA theory further suggests that people will seek to compensate for losses in relation to one need by increasing efforts to fulfil the other two: loss of status satisfaction will be compensated (at least in part) by increased efforts to secure behavioural confirmation and affection, while loss of behavioural confirmation will be compensated (at least in part) by increased efforts to achieve affection (Steverink et al., 1998; Steverink & Lindenberg, 2006).

3.1.2. Volunteering as a strategy for social participation

These efforts often include social participation, also referred to as social engagement, social integration or social networking. Social participation refers to 'a person's involvement in activities that provide interaction with others in society or the community' (Levasseur et al., 2010). This can be formal or informal (Ang, 2019; Donnelly & Hinterlong, 2010). Formal social participation entails, for example, attendance and engagement in community groups or organisations, whereas informal participation entails contact and activities with family and friends. While formal social participation typically increases throughout the lifespan, especially during later life, informal social participation decreases over time (Ang, 2019). As older adults participate less in formal employment and gain more leisure time, they may have different social participation patterns from younger adults (Levasseur et al., 2010). Furthermore, as network size and overall social participation often decrease with age, older adults constitute a particularly vulnerable group (Forsman et al., 2013).

Formal social participation in general, and formal volunteering in particular, is considered an agency strategy to maintain a social network and alleviate loneliness (Donnelly & Hinterlong, 2010; Jongenelis et al., 2022). Volunteering refers to non-mandatory, unpaid work for an organisation or the community (Donnelly & Hinterlong, 2010). Research has shown that formal volunteering promotes healthy ageing, as it is

associated with many positive health outcomes (Jongenelis et al., 2020; Webster et al., 2021) including better self-rated health, increased life satisfaction and contentment, decreased mortality, lower levels of depressive symptoms and lower functional dependence (Greenfield & Marks, 2004).

A theoretical explanation for such positive outcomes is offered by interactional role theory (Stryker & Statham, 1985). Individuals occupy different social positions within society, each of which is associated with different behavioural expectations. These expectations, which exist independently of individual personality, are transformed into roles through social interactions. As individuals internalise the positional labels acquired through role relations, they develop role identities that shape their self-image. Formal volunteering might be particularly meaningful for older adults since they may lack other important role identities, such as employment-based and marital roles (Greenfield & Marks, 2004). The underlying motivations for formal volunteering may differ, however. Working older adults may seek to enhance their careers or knowledge, while retirees may aim to compensate for loss of identity or social functions. Since volunteering can be especially beneficial for retirees, who may have lost social roles and networks, it is crucial to understand the factors influencing volunteering among such individuals (Jongenelis et al., 2020).

Although significant literature exists on the effects of formal volunteering on the health and well-being of older adults, there is a lack of research on how social networks affect the connection between volunteering, health and well-being (Webster et al., 2021). Social networks are, however, a crucial factor in volunteering. Social relationships are multidimensional and include both bridging (connections facilitated by the diversity of social relationships, as indicated by the size and composition of the network) and bonding (connections facilitated by frequent contact and geographical proximity) capital (Webster et al., 2021). A key element of networks is change: networks can grow or shrink, become more or less diverse in composition and facilitate or inhibit personal contacts. Social networks of older adults often become smaller and less diverse due to ageing processes such as retirement, declining health, or widowhood, making it more difficult for them to participate socially (Shi & Shi, 2023). Heterogeneity and change in social networks influence the likelihood and frequency of volunteering (Ajrouch et al., 2016; Webster et al., 2021). Qualitative research through a network lens is needed to unravel the diversity of volunteering experiences and identify intersections with motivators, facilitators and outcomes, elucidating the role of the social network in the relationship between volunteering and well-being (Jiang et al., 2019; Webster et al., 2021).

3.1.3. Aim of the current research

In summary, it is evident that older adults have different and sometimes limited resources to meet their social and thus their well-being needs. Therefore, we aim to explore the factors contributing to the well-being of people in middle and older adulthood who engage in formal volunteering. We specifically chose this sample to understand the resources supporting the well-being of middle-aged and older adults, as the transition from work to retirement is a sensitive period. We chose participants who were active in formal volunteering and might therefore have higher levels of social participation to deepen our understanding of the well-being of people who are already socially active and explore the underlying reasons for volunteering. A network approach to research on well-being is particularly suitable because all individuals are embedded in social networks and their well-being depends on network dynamics and alter-alter relationships. It is, therefore, important to ask people not only who contributes to their well-being but also how they relate to these social contacts and whether and how these social contacts relate to one another.

3.2. Methods

3.2.1. Design and participants

We conducted semi-structured network interviews with members of carnival clubs in North Rhine-Westphalia, Germany. Carnival clubs can be seen as local social clubs: in addition to organising carnival events in the community during the annual carnival season from November to February/March, they contribute socially to their local communities throughout the year. For example, they organise summer festivals, informal gatherings and charity events. Carnival clubs require considerable volunteer work. While ordinary members meet approximately monthly, steering committee members meet closer to weekly, depending on the season. We chose carnival clubs for several reasons. Firstly, they remained relatively stable throughout the Covid-19 pandemic and ‘survived’ social distancing policies. Secondly, anyone can join a carnival club, as there are no prerequisites such as religion, health, musical or athletic skill. This allowed us to consider the well-being of middle-aged and older adults in the wider population. Furthermore, carnival clubs are relatively heterogeneous in terms of educational backgrounds, professions and social classes.

Ethical approval was granted by the ethics committee of the University of Cologne (reference: 220036LE). We recruited participants by contacting several carnival clubs and via snowballing. A remuneration of €15 was offered. In total, we conducted 28 interviews.

Of those interviewed, 68% (n=19) were members of the steering committee of their carnival club; 29% were female (n=8) and 71% were male (n=20). The mean age was 62 years (± 7.5 years) with a range from 45 to 80 years. Thirteen participants (46%) were retirees. The average interview duration was 40.16 minutes. The characteristics of the participants are shown in Table 1.

Table 1: Characteristics of the study participants.

Participant	Age	Gender	Retired	Parent	Grand-parent	Member of steering committee
Interviewee 1	61	M	No	Yes	No	No
Interviewee 2	58	F	No	Yes	No	Yes
Interviewee 3	67	M	Yes	Yes	Yes	No
Interviewee 4	69	M	Yes	Yes	No	No
Interviewee 5	66	M	Yes	Yes	Yes	No
Interviewee 6	58	M	No	Yes	Yes	Yes
Interviewee 7	68	M	Yes	Yes	Yes	Yes
Interviewee 8	45	F	No	Yes	No	Yes
Interviewee 9	70	F	Yes	Yes	Yes	Yes
Interviewee 10	50	M	No	Yes	No	Yes
Interviewee 11	60	M	No	Yes	No	No (former)
Interviewee 12	54	F	No	Yes	No	Yes
Interviewee 13	58	F	No	Yes	No	Yes
Interviewee 14	49	F	No	Yes	No	Yes
Interviewee 15	51	M	No	Yes	Yes	Yes
Interviewee 16	63	M	Yes	Yes	Yes	Yes
Interviewee 17	56	M	No	Yes	No	No
Interviewee 18	64	M	No	No	No	No
Interviewee 19	74	M	Yes	Yes	Yes	Yes
Interviewee 20	61	F	No	Yes	No	Yes
Interviewee 21	75	M	Yes	Yes	Yes	Yes
Interviewee 22	70	M	Yes	Yes	Yes	Yes
Interviewee 23	56	M	No	Yes	No	Yes
Interviewee 24	67	M	Yes	Yes	No	Yes
Interviewee 25	67	M	Yes	No	No	Yes
Interviewee 26	76	F	Yes	Yes	Yes	Yes
Interviewee 27	80	M	Yes	Yes	No	No (former)
Interviewee 28	50	M	No	Yes	No	No

3.2.2. Procedure

Participants were interviewed individually, face-to-face, by the first author (PS), who was not a member of a carnival club or involved in formal volunteering. Interviews took place between November 2022 and April 2023. Written informed consent was obtained beforehand. During interviews, each participant created an unstructured egocentric network map (Hollstein et al., 2020), which served the sole purpose of guiding the conversation and generating richer interview data and was not analysed. The network map was created using

a sheet of paper, blank except for a circle with the word 'ego' in the centre, placed on the table in front of each participant. Participants were asked to write down on sticky notes the names of people or organisations that were important to their well-being (either positively or negatively). For a very important individual or organisation, they used a larger sticky note; for a less important one, they used a smaller sticky note. Participants were then asked to sort the notes, placing people or organisations they had a lot of contact with closer to the 'ego' and those they had less contact with further away. Finally, participants were asked about alter-alter relationships and asked to draw a line between the individuals and organisations that knew each other. The participants were then asked to reflect on the network maps they had created.

The interview guide covered the following main topics: A subjective definition of what well-being is; positive, absent and negative ties for well-being; alter-alter relationships; network reflection; and the role of the social club in well-being. The interview guide can be found in the appendix. Conducting qualitative egocentric network interviews presented many advantages. First, the interview situation was highly interactive and dynamic, and participants reported that they enjoyed it and found it interesting to develop the network map. In addition to the interview material, we learned about the importance and frequency of contacts and how the participants sorted their social networks. The maps also made it harder for participants to forget social contacts (von der Lippe & Gamper, 2017).

3.2.3. Analysis

The interviews were digitally recorded and orthographically transcribed. MW listened to the audio of all interviews to ensure the quality of the transcripts. The interviews were analysed using reflexive thematic analysis as described by Braun and Clarke which consists of six phases (Braun & Clarke, 2006, 2021b). Reflexive thematic analysis was appropriate as our goal was to identify, describe and analyse patterns and themes from across the data (Braun & Clarke, 2021a, 2021b).

First, all authors immersed themselves by reading the interview transcripts and noting their initial impressions. PS and MW then coded the interviews systematically and independently through an inductive and deductive approach using the MAXQDA software. Our individual academic and personal backgrounds are likely to have influenced our insights into the data, resulting in a somewhat inevitable deductive aspect. By engaging in collaborative coding, we were able to improve our comprehension, interpretation and reflexivity. We identified both semantic codes on the surface of the data and latent codes at

a deeper level. These codes were subsequently organised to identify initial themes, which were then explored, named and defined using thematic maps, facilitating the organisation of themes to effectively capture the essential narratives within the data. In Phases 4–5, LE re-joined the research team and gave her input with a fresh set of eyes. The analysis of participants' accounts in this context involved reflexive practices, requiring constant reflection on our own positions in relation to our subjective understandings and different approaches to interpreting others' accounts (Braun & Clarke, 2006, 2021b). Initial findings were presented at three conferences. The research team then engaged in further discussions to refine and define the final themes.

3.3. Results

We developed six themes for well-being which can be distinguished into personal and social well-being factors and engagement and fulfilment factors for well-being. This is illustrated in Table 2.

Table 2. Six themes on well-being factors

Factors contributing to well-being		
Aspect	Theme	Description
Personal and Social Well-Being Factors	(1) Intrapersonal factors affecting well-being	• Internal important factors for personal well-being, including health, financial security, and leisure activities
	(2) Interpersonal factors affecting well-being	• Personal human resources for well-being • Feelings of trust and belonging • Importance of other people's well-being for own well-being
	(3) Social network characteristics affecting well-being	• Composition, size and diversity of the social network for well-being • Social network harmony and balance
Engagement and Fulfilment Factors	(4) Self-fulfilment	• Engaging in meaningful activities • Participating in interesting projects • Facing challenges • Experiencing a sense of accomplishment
	(5) Feeling indispensable	• Feeling needed by others • Giving social support to others • Making others happy
	(6) Unfulfilled expectations	• Generational differences • Changing family and friendship dynamics • Lack of trust

3.3.1. Theme 1: Intrapersonal factors affecting well-being

Intrapersonal factors affecting well-being include everything that is internally important to the individual's well-being or lack of it. This includes general and mental health, as well as more tangible factors such as hobbies, financial security and having a place to retreat to. Interviewee 28 defined well-being in hedonic terms.

'Yes, just doing what's fun. To have no little ailments. Not having to worry about one's own health. To not worry, Who do I still have to call? To have peace and quiet.' Interviewee 28 (50, working, male)

Interviewee 19 also stressed the importance of evaluative well-being:

'Well-being has something to do with health. Well-being has something to do with life satisfaction. A good level of where you enjoy spending your free time. [...] It's to wake up healthy and have a good day ahead of you.' Interviewee 19 (74, retired, male)

Participants primarily linked well-being to health, with this being the most frequently mentioned factor affecting intrapersonal well-being. They often distinguished between physical and mental health: while physical health was prioritised, mental health also played a crucial role in achieving overall well-being. In addition to these aspects, more tangible factors were also important, most notably financial security and doing something for oneself, such as hobbies or other solitary leisure activities.

Having a place to retreat to for relaxation and winding down such as a holiday house or a garden was also an important contributor to intrapersonal well-being.

'We have an allotment in an association about 900 metres from our home. We have been members for 46 years. Due to my health, I can only do light work, so having a garden where we can relax is essential.' Interviewee 27 (80, retired, male)

3.3.2. Theme 2: Interpersonal factors affecting well-being

Interpersonal factors refer to human sources of well-being such as family, friends, neighbours, social clubs or other trusted individuals. They also refer to the feeling of belonging and the idea that the well-being of others influences one's own. Interviewee 2 emphasised the importance of a sense of acceptance and inclusion for well-being:

'What else is important for well-being [...] is the feeling of acceptance or the feeling of belonging.' Interviewee 2 (58, working, female)

In terms of social connections, family relationships were unanimously identified by participants as the most crucial factor affecting well-being. However, it is noteworthy that the family could also be a source of conflict, creating a certain ambivalence in its impact. Grandparenthood was considered a crucial aspect of well-being. Eleven participants (39%) were already grandparents. For the majority of these participants, their relationship with

their grandchildren was highly important, sometimes even more significant than that with their children.

An essential element of interpersonal well-being is the well-being of others. Many participants emphasised this link in their own lives, particularly within family relationships.

'Well, I believe that I only feel good when my surroundings are right. [...] So only when my husband is doing well, my daughter is doing well, then it feels good for me to be able to tackle all the other things.' Interviewee 13 (58, working, female)

Friendships also contributed significantly to well-being, especially if they were long-term friendships. However, participants emphasised that while friendships were significant, they were not as crucial as family relationships.

Only two participants did not have children. However, it was evident that friendships held greater significance for them than for the other participants. Interestingly, both had godchildren with whom they had a very active relationship.

The carnival club was an important source of interpersonal well-being. Interestingly, the primary reason given for joining was not the carnival itself but rather the sense of community it provided. Club membership offers the opportunity to expand one's social circle and meet regularly with others, making it an easy way to maintain a social network.

'Because I basically had these two centres of life, it was simply difficult to build a normal, let's say, social organisation around myself, i.e. a circle of friends, etc. [...] And basically that was one of the main arguments at the time, to look at it, to do it and say, yes, I have a circle of friends that is organised in a secondary way, so to speak.' Interviewee 4 (69, retired, male)

Many participants expressed that they had little interest in the carnival but enjoyed the sense of community and collaboration.

'I don't have that much interest in carnival. I have a great interest in the club. And that I walk through the streets and know people. [...] It's also nice to have an extended circle of acquaintances. And socialising is something I enjoy.' Interviewee 6 (58, working, male)

This phenomenon applied to membership not only in carnival clubs but also in other organisations, such as churches or bowling clubs.

3.3.3. Theme 3: Social network characteristics affecting well-being

Social network characteristics refer to the composition, size and diversity of the social network and the harmony within it. It also includes the roles that are integrated into this network, which are not necessarily always filled by the same people.

In general, participants were content with their social networks. However, network size and composition varied. While for all participants, family played a major role in their well-being, for some, other social contacts such as friends, neighbours, acquaintances, work colleagues or fellow club members also occupied important roles. Some participants had large social networks with more numerous but therefore also less important contacts.

'I'm a person who actually needs a large crowd for my personal well-being. I function better in a large group. I'm not at the point where I would say I can't be alone. [...] but I like to share and I'm more embedded in a big group or a larger group.' Interviewee 2 (58, working, female)

Other interviewees had fewer but more important social contacts. Participants frequently stated that quality was more significant than quantity.

'That it's not a big network. [...] I know that there aren't many, but the ones that are there are of high quality. For me, it's not the quantity that matters, but [...]. Quality.' Interviewee 18 (64, working, male)

Some participants reflected that they had very intertwined social networks, whereas others had much more isolated alters. Having a harmonious and balanced network also contributed to participants' well-being.

'Yes, in my eyes it is a small network [...]. But it occurs to me that the relationship within this network is actually quite harmonious.' Interviewee 20 (61, working, female)

Certain roles, such as 'neighbour' or 'work colleague', contributed to well-being within some social networks. However, the individuals occupying these roles could be subject to change.

'Yes, it's actually quite dynamic. [...] So the roles would probably be similar, but the people behind them are always different, who sometimes become more important and sometimes less important. So over the course of time.' Interviewee 13 (58, working, female)

An interesting factor resulting from the Covid-19 pandemic was the growth in importance of geographically close social contacts. While most social relationships and contacts have now returned to their pre-pandemic state, this effect persists.

3.3.4. Theme 4: Self-fulfilment

Self-fulfilment refers to the significance of engaging in meaningful activities, whether in the workplace or elsewhere. This encompasses participating in interesting projects, facing challenges and experiencing a sense of accomplishment.

Meaningful activities were considered crucial in achieving well-being. For instance, Interviewee 26 achieved this through volunteering, while Interviewee 19 did so by working on a part-time basis:

'Yes, that I am busy. Well, I can't sit here. And if you hadn't come now, I'd probably be somewhere. That means I've already been somewhere today. I've already been to church because I do volunteer work in the Protestant church.' Interviewee 26 (76, retired, female)

'Yes, it has to have a good mix of tension and relaxation. Well, tension means both, I still have a small professional counselling practice since I retired [...]. But that's also good in relation to my age, so between that and still having something meaningful to do. But that can also be a corresponding reading.' Interviewee 19 (74, retired, male)

A sense of achievement upon completing challenges was also valued.

'You make yourself smart. I'm always doing research for things. Yes, and then of course you're happy when you can help someone or when you do something for yourself.' Interviewee 16 (63, retired, male)

Thirteen participants (46%) were retired, although seven of them still held marginal occupations. This was due not to financial need but rather a general interest in continuing to work in some capacity, which also contributed to well-being.

Several female participants stated that they engaged in the carnival club as an opportunity for fulfilment they could not achieve in their jobs.

'I couldn't do it at the professional level or I didn't dare, let's put it that way. Because professionally I was on the way to becoming [profession]. A pregnancy

came in between and unplanned. [...] And it was hop or skip. Job or child. Because back then I just didn't have the courage to say I could do it. [...] So now I don't really do anything else. I'm editor by buying the product, negotiating and putting it on stage. I'm production manager by making sure it works back there. And I'm recording manager by running the live broadcast. That's nothing other than what I learnt on the job.' Interviewee 2 (58, working, female)

3.3.5. Theme 5: Feeling indispensable

Feeling needed by others is an important aspect of well-being. It can be fulfilled by providing social support or seeking to make others happy.

Although participants described themselves as devoted and selfless, it appears that they also derived personal benefits from their roles. Many volunteered not only in one carnival club but in several or were also active in other volunteer organisations. Examples of helping others included providing practical social support, such as by assisting with construction projects and cars, collecting money for charities or volunteering in leadership positions in church.

'But the wishes are getting more and more. [...] The disadvantage is, of course, if you can do so much, then you also have a circle of acquaintances who come and say, 'Listen, can you help me'. [...] Yes, and of course, word gets round and you always have a lot to do. But I think that's fine. I've met a lot of people who didn't do anything after they retired.' Interviewee 16 (63, retired, male)

'So apart from the carnival club, I basically only do a bit with the band now. [...] But we don't play for money or anything like that any more, but when we play somewhere, a hat goes around. And we then donate the proceeds to refugee aid or to Africa or children in need or something like that. So, we no longer see it as, yes, as earning money, we just want to donate it. We want to bring joy.' Interviewee 7 (68, retired, male)

One participant had already planned to join an additional volunteer organisation on retirement in order to feel useful in retirement.

'Because when I retire, I want to be active in two clubs, here the carnival club and then another. [...] So if I do more for the world, it ultimately makes me feel good, it's something like a food bank or Red Cross or hospice and things like that.' Interviewee 6 (58, working, male)

Assisting others through advice or guidance also helped interviewees feel valued.

'So then we have a very close circle of friends. And also with their children. They don't necessarily always have to be godchildren. We do careers counselling with them, they can... we help them with all sorts of things.' Interviewee 25 (67, retired, male)

In this area, supporting one's own family was particularly important. Helping with grandchildren was a significant contributor to feeling needed.

3.3.6. Theme 6: Unfulfilled expectations

Unfulfilled expectations have an important negative impact on well-being and are a major source of conflict. They can result from generational differences or new family or friendship dynamics. A lack of trust and social support are also significant causes.

Generational differences were a frequent source of conflict. However, two participants operated a family business with other family members, granting these differences even greater potential importance.

'Family is difficult. My son is now taking over my business. There are also things that are simply different across the generations, that I see differently. And then you discuss them with your young son.' Interviewee 1 (61, working, male)

Another important aspect of unfulfilled expectations is the impact of changing dynamics, which can be due to the expansion of the family or changes within groups of friends.

'It was very positive at the beginning, even during the coronavirus pandemic, but has changed massively this year with the wedding. Like this. You have to realise that there are also, let's say, psychological factors at play. And who's really in charge now and all that. Family structures also have to come together somehow, we'll have to wait and see.' Interviewee 4 (69, retired, male)

Changes resulting from ageing also contribute to these dynamics.

'I can immediately think of someone with whom I have a close, friendly relationship. [...] We all used to go skiing together with the children when they were little. We did an awful lot together and [...]. And now he's sold up and retired. I've stopped working. However... Everything is done a bit differently [...] Yes, it's drifting apart a bit now. [...] So, and some of them can't do it physically anymore. And then things drift apart.' Interviewee 24 (67, retired, male)

A lack of social support had a significant impact on unfulfilled expectations, which, in turn, had a strongly negative impact on well-being. This was especially true in close relationships, such as those with intimate friends or family members.

Deficient social support can have a negative impact on not only individuals but also social connections. This can occur when there is a lack of support between two important social contacts.

'Yes, here with my sons, for example, it's a bit like that, the two of them... They don't help each other as much as I would have liked. [...] and I would have liked a bit more help from the family.' Interviewee 16 (63, retired, male)

Most participants reported that they did not have only difficult relationships, but described them as ambivalent, consisting of both positive and negative interactions. These ambivalent relationships usually stem from difficult to escape situations where contact cannot be easily terminated. The ambivalent relationships of retired participants were mostly with family members, whereas working participants reported ambivalent relationships with co-workers in addition to ambivalent family relationships. While ambivalent relationships had a negative impact on participants' overall well-being, these contacts were still important to them as they sometimes had a positive impact on well-being. Interviewee 20 illustrates well the complexity of ambivalent relationships:

'I can't say that I don't like her, but she is very complicated and doesn't have a lot of empathy.' Interviewee 20 (61, working, female)

3.4. Discussion

This study aimed to gain a deeper and more nuanced understanding of the well-being of middle-aged and older adults who are socially active and participate in formal volunteering, using a qualitative network approach. As well-being is a crucial component of healthy ageing, it is important to gain a deeper understanding of the well-being of adults in the working to retired age group to develop adequate interventions. Without specific prompting, participants mentioned several dimensions of well-being, establishing three in particular: hedonic, evaluative and eudaimonic. This highlights the importance of the combination of these three dimensions when studying well-being in this age group (Martín-María et al., 2021).

3.4.1. Well-being as a multidimensional concept

Hedonic and evaluative well-being are included under the theme of ‘intrapersonal factors affecting well-being’. It appears that eudaimonic well-being was the most significant to participants. Eudaimonic well-being, also known as ‘psychological flourishing’, goes beyond reflective evaluations (Diener et al., 2010; Rafnsson et al., 2015): it refers to individuals’ functioning in life and realisation of their potential. Flourishing involves having a purposeful and meaningful life, being engaged and interested in one’s activities and feeling competent in performing them, aspects captured within the theme ‘self-fulfilment’. It also includes having meaningful social relationships that are perceived as supportive and rewarding, contribute to the happiness of others, and make individuals feel respected by others. It is important not only to receive support from others but also to be able to support them (Diener et al., 2010). This is captured in the themes ‘interpersonal factors affecting well-being’ and ‘feeling indispensable’.

3.4.2. Opportunities in social networks

The role of the carnival club stands out in terms of ‘interpersonal factors affecting well-being’ for its ability to provide a community and social contacts without requiring significant effort. This is in line with the literature that suggests that formal social participation may become more important or easier to achieve with increasing age than informal social participation (Ang, 2019). It also serves as an active platform for maintaining a social network and, consequently, personal well-being. As older adults’ social networks tend to become smaller and less diverse, that might be a strategy to improve well-being. The carnival club is a place where members have access to a variety of valuable resources through both strong and weak ties. The theme ‘social network characteristics affecting well-being’ demonstrates that while social networks can vary in size and composition, these differences do not necessarily affect satisfaction with the network. Furthermore, the structure of the network (size, frequency of contact, geographical proximity and composition) did not seem to be a relevant factor for engagement in volunteering.

‘Self-fulfilment’ and ‘feeling indispensable’ are particularly interesting themes when we consider SPF-SA theory: participants approaching or already in retirement and those who had not found the fulfilment they sought in their careers compensated by engaging in voluntary work or helping others. Notably, seven interviewees chose to continue working in marginal occupations even after retirement, despite having no financial

need to do so. Grandparenthood is also particularly important in this context. For participants without children, supporting and helping their godchildren became a crucial aspect. This highlights an increased emphasis on behavioural confirmation and affection to compensate for reduced status satisfaction. One participant had already planned to join a second voluntary organisation on retirement as an active strategy to gain purpose and perhaps also behavioural confirmation, compensating for the role and status loss involved in retirement. ‘Feeling indispensable’ also refers to unique talents that one may no longer be able to utilise in the same way as before, as in the case of a car mechanic who now assists family, friends or acquaintances with their vehicles or someone who previously worked with calculations and now serves as a carnival club’s treasurer. Participants transitioning to or already in retirement or finding themselves in unsatisfying job situations used their skills and talents to compensate for unfulfilled status needs through increased behavioural confirmation. The importance of the role of grandchildren, as well as other family members, reflects the need for affection, which may become increasingly important in retirement. In addition to affection, behavioural confirmation also appears to be significant in this relationship, with participants emphasising the degree to which they helped with their grandchildren.

Interactional role theory provides a valuable perspective for analysing the data. The interviews revealed that feeling fulfilled and being interested in something were important contributors to well-being. Feeling useful and needed also contributed significantly. This could be achieved through involvement in voluntary organisations such as the carnival club or church or by providing social support to others. This can be interpreted as role substitution. Consistent with prior research (Greenfield & Marks, 2004; Jongenelis et al., 2022), new activities such as formal volunteering may hold particular significance for older adults, who may lack other important role identities, offering them a substitute for lost roles. For some female participants who were unable to find fulfilment in their jobs, role compensation was a significant motivation for volunteering in the carnival club. In conclusion, the themes of ‘self-fulfilment’ and ‘feeling indispensable’ were of particular significance for both male and female retirees. However, it is notable that among working participants, these themes were only highlighted by female participants.

3.4.3. Unfulfilled expectations in social networks

This study shows the value of qualitative network interviews in gaining a more nuanced understanding of well-being, in which network dynamics and alter–alter relationships play

a substantial role. This role becomes evident within the theme ‘unfulfilled expectations’. During interviews, participants often revealed difficult or ambivalent ties despite initially claiming not to have any when asked to write down names. Contacts that involved conflicts they could not resolve and which they did not consider particularly important usually ended. However, important individuals such as family members often remained part of their social network despite their potential negative impact. Changes in network dynamics resulting from family expansion, relocation or ageing processes could also have a negative effect on well-being. Moreover, if the relationship between two significant social contacts was strained, this negatively impacted the well-being of the participant. Well-being was, furthermore, influenced by the well-being of others, as described in the theme ‘interpersonal well-being’, emphasising again the importance of social network dynamics. We are all embedded in social networks: therefore, our social contacts influence our well-being, for better or worse. Through the application of a qualitative social network approach, participants were able to reflect on their social networks with the visual aid of a network map. This allowed for deeper insights into changing network dynamics, such as shifts in individuals’ importance, alter-alter relationships and the composition and size of the network. This also helped to understand the role of social networks in volunteering.

3.4.4. Limitations and future research

As this was a qualitative study, the results cannot be generalised and should be treated with caution. Another limitation is imposed by the use of a selective sample of adults who are socially engaged and therefore already embedded in a social network, which will likely have affected their well-being. Alternatively, those with higher degrees of well-being might be more likely to volunteer. However, this selectivity provides specific insights into the well-being of those who participate in formal social contexts. The mean age of participants was 62 years. It would be interesting to study formal volunteering and social participation in older adults, for instance focusing exclusively on adults over 75. Furthermore, we only investigated formal volunteering and did not study whether informal volunteering might similarly support well-being and protect from social isolation. Nevertheless, our study empirically supports the idea that a social network perspective is crucial when studying formal social participation, formal volunteering and well-being. Formal volunteering contributes to well-being, but without putting this into a social network context, results can be skewed. The study’s strength lies in its ability to identify deeper motives for volunteering. For example, the interviews revealed self-serving reasons for volunteering that might be

more challenging to uncover using standardised surveys. Longitudinal egocentric network studies are needed to investigate more comprehensively the causal associations between role shifts, social network dynamics, volunteering and well-being.

3.5. Conclusion

In this paper, we studied the well-being of socially active adults and found that formal volunteering had a positive impact on their overall well-being. Our findings suggest that public health interventions and future research should address the multifaceted aspects of well-being. Formal volunteering can be seen as role substitution, particularly for retired individuals, which can enhance their well-being. It also offers a strategy to prevent social isolation and loneliness in older age. This can serve as a foundation for public health interventions. Formal volunteering benefits not only older adults but also their communities. Interventions could include low-threshold proposals for retired adults to volunteer in the community; focus should be placed on having fun, and the voluntary work should not be particularly burdensome. Volunteering with others in a social context should be encouraged. Carnival clubs are especially prevalent in North Rhine-Westphalia, Germany, but other local social clubs, such as community centres, could also present suitable opportunities for this low-cost intervention worldwide, which is feasible for both urban and rural areas.

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The DeepL Write AI, ChatGPT and Cambridge proofreading were used for the purposes of spell checking and language editing.

3.7. Appendix

I: Interview guide

All participants were asked the initial questions. If their responses were incomplete or unclear, follow-up or supplementary questions were introduced to elicit further information. These follow-up questions were also employed to ensure all relevant aspects of the topic were covered. Network questions were specifically asked if participants did not spontaneously address these points while placing and describing the persons/ organisations on the sticky notes, focusing on how each person contributed to their well-being. As is usual in qualitative interviews, the guide was applied flexibly and adaptively, depending on the flow of the conversation and the participants' responses.

Initial questions	Follow-up/ supplementary questions	Network questions/ specific enquiries
Personal definition of well-being		
Well-being means something different to everyone. Tell me, what does well-being mean to you?	• There are good days and not so good days. When you think about it in the evening, what makes a good day for you?	
Positive ties		
So, as I said at the beginning, the interview is primarily about well-being. I am interested in who or what is important for you to feel good. When you think about your personal well-being, who is particularly important to you? Take some time to think about it and simply write down all the people and organisations or institutions. If something is particularly important to you, write the name on a large post-it note. If someone is not quite so important, use a small post-it. Take your time to do this. You can also write down other people or organisations at any time during the conversation if you think of anything else. You can now organise these notes on this sheet. Place people or organisations with whom you have a lot of contact a little closer to the centre. Sort people with whom you don't have as much contact a little further away. While you are doing this, feel free to explain why you are doing it this way.	• Well-being is important in every phase of life. If you think back to the last few days, who is particularly important to you? • Who does you good in everyday life? What do they contribute? • Think about everything that contributes to your well-being. What brings you joy in life? • When you think back over the last four weeks, who has been particularly good for you?	• How do these persons (p.)/ organisations (o.) contribute to your well-being/feeling good? • Why is this p./ o. important to you? What makes the p./ o. important to you? • I see that you have grouped some p./ o. together. Why have you placed them so close together? • I see that you have drawn these p./ o. further away/closer. How did that come about? Has it always been like this? • How did the contact with the p./ o. come about? • Why did you write the p./ o. on a smaller/larger piece of paper?
Absent ties		
Now we have talked about who is there or who is important to you when you are well. There are sometimes people who are missing to make you feel good. Who do you miss in everyday life? Who would you like to have more contact with?	• Were there situations in which you needed more support but didn't get any?	• What would you have wished for from the p./ o.? Can you give me an example? • Why would you like to have more contact with this person?

Take some time to think about this and write down the names of people or organisations on the post-it note. If you would like to add more names of people or organisations, feel free to write them down and sort them on your network map.

- What kind of support do you still need? Who is that? What should it be?
- How did you deal with it/ the situations when you didn't have the support?
- Has the relationship between you always been like this or has it changed over time?
- Have you spoken to the p./ o. about wanting more support?
- How did the contact with the p./ o. come about?
- I see that you have grouped some p./ o. together. Why did you put these people so close together?
- I see that you have drawn these p./ o. further away/closer. How did that come about? Has it always been like this?

Difficult ties

We have already talked a lot about important people in your life. In interpersonal contact, there are sometimes situations in which you find exchanges with people or organisations somewhat difficult or stressful. How is that for you? Which people or organisations can be a little more difficult to deal with?

**Take some time to think about this and write the names down on the post-it note.
Feel free to write the names on a post-it again and organise them in your network.**

- The people with whom we have a lot of contact or who are important to us are often the people with whom things can be a little more difficult. What is it like for you? Are there people or organisations that are very important to you, but with whom it can still be a little stressful?
- Why is this p./ o. not so good for you? Is there an example you can tell me about?
- What makes the relationship with the p./ o. difficult?
- If things are a little more difficult in everyday life, how do you deal with this?
- Life can be exhausting sometimes. Who is there with whom it is sometimes a bit stressful? What characterises these people?
- Has the relationship between you always been like this or has it changed over time?
- How did the contact with the p./ o. come about?

-
- We find some people more sociable, others less so - for example, they are demanding or sometimes even annoying
 - How much influence would you say this person has on your personal well-being and why?
 - I see that you have grouped some p./ o. together. Tell me, why did you put these pieces of paper so close together?
 - I can see that you have drawn these p./ o. further away/closer. How did that come about? Has it always been like this?
 - Why did you write the p./ o. on a smaller/larger piece of paper?
-

Alter-alter relationships

If you now look at your network map, which people are also in contact with each other? Please draw a line between the contacts who know each other.

- To what extent are these relationships important to you?
 - What influence does the relationship between X and Y have on your well-being? Can you give an example of this?
 - What do you notice and how does it make you feel?
 - How has the relationship between X and Y affected you?
 - What was it like for you? How did you perceive it?
-

Network conclusion

You have now drawn your personal network. Now take another look at it at your leisure. Is the network complete for you or would you like to change something? Would you like to add or remove someone or an institution/organisation, make it bigger/smaller, closer/farther away, etc.?

- Why are so many p./ o. grouped together here?
 - Why is this p./ o. so central for you?
 - Why is this p./ o. so isolated?
-

When you look at your network map now, what goes through your mind?

- If you look at your network map now, what has changed in the last years?
- Why has it changed so much?
- To what extent has the coronavirus pandemic had an impact on your social relationships?
- In how far has the coronavirus pandemic affected your well-being?

Significance of carnival

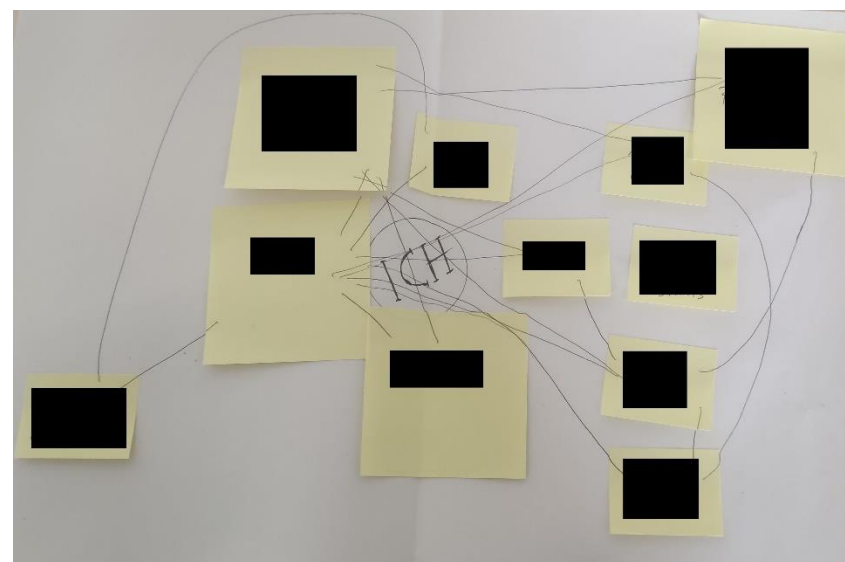
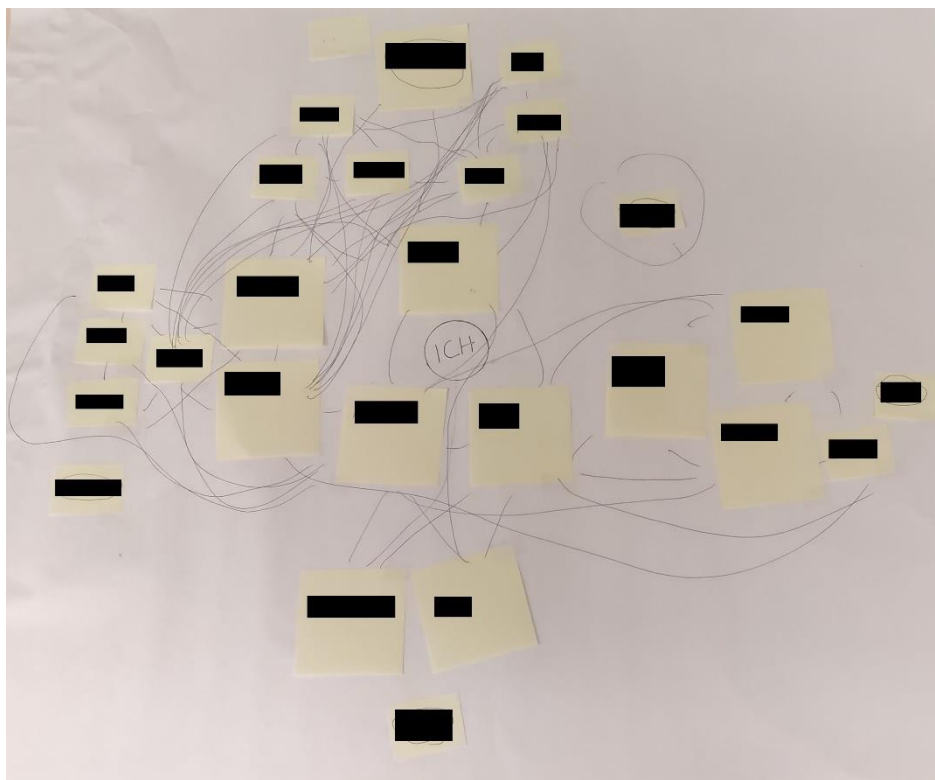
You are very committed in carnival. Tell me how did you get involved in the organised carnival in the first place?

- How important is carnival in your everyday life?
- To what extent does carnival contribute to your well-being?
- Who of the people in your network are also active in carnival?
- Can you describe the network within your carnival club?
- How often are you in contact?

Now I have two more questions for you:

- Are you currently employed?
- In which year were you born?

II: Example social network maps



Note. Participants created the network map using a blank sheet of paper with only a circle marked 'ego' (German: ICH) in the centre, placed in front of each participant. They wrote the names of people or organisations that were important to their well-being (positively or negatively) on sticky notes. Larger sticky notes were used for more important people or organisations, while smaller notes were used for less important ones. Participants then sorted the notes themselves, placing those with more contact closer to the ego and those with less contact further away. Finally, participants identified alter-alter relationships by drawing lines between individuals and organisations that knew each other.

Chapter 4

How Do Working and Retired Adults Maintain Their Social Relationships?

A Qualitative Network Analysis

Paula Steinhoff & Başak Bilecen

Abstract

Background: The size and composition of older adults' personal networks undergo change over the life course, but these changes are little understood due to their complexity. This study aimed to examine the strategies employed by working and retired adults to maintain their networks.

Methods: Qualitative semi-structured interviews were conducted between November 2022 and April 2023 with 28 members of carnival clubs in Germany, aged 45–80 (mean age 62). During these interviews, participants constructed egocentric network maps, offering insights into network dynamics. The data were analysed using reflexive thematic analysis.

Results: Two key themes were discussed: multiplexity of personal network ties and management of personal networks. Multiplex ties facilitated tie maintenance and the exchanging of support, but they could also pose challenges when they involved difficult social interactions. Managing these ambivalent ties is an integral aspect of network management. Participants actively employed strategies to expand their networks and compensate for losses. When a multiplex role was lost, such as through retirement, participants used contact maintenance strategies to remain connected.

Discussion: Retired participants had smaller social networks than working participants but maintained stable well-being networks. They also had fewer ambivalent ties and fewer ambivalent connections among their contacts. Multiplex ties can be beneficial or detrimental. They are easier to maintain and require less effort than non-multiplex ties, but they can become burdensome if the relationships involved are ambivalent.

Conclusion: This study highlights the importance of multiplex ties in maintaining social networks among both working and retired adults. Our participants employed proactive strategies to maintain and manage their social networks for their well-being: these strategies, along with involvement in social groups such as carnival clubs, are crucial in preventing social isolation.

4.1. Introduction

Being socially embedded is essential for both physical and mental health and overall well-being (Holt-Lunstad et al., 2010). This is particularly true for older adults. The size of one's social network is an important indicator of available social resources; however, the composition is equally crucial, as different relationships fulfil distinct functions (Agneessens et al., 2006). Social network composition changes over the life course (Bidart & Lavenu, 2005; Mollenhorst et al., 2014): while older adults often experience a reduction in network size with age (Bidart & Lavenu, 2005; Wrzus et al., 2013), they frequently report higher satisfaction with their networks, primarily due to an increased proportion of emotionally close ties (Huxhold et al., 2020). This suggests that while peripheral connections may diminish over the life course, emotionally significant ties endure (English & Carstensen, 2014; Huxhold et al., 2020). Nonetheless, our understanding of the processes involved in these changes, such as how older individuals expand their social networks, compensate for losses and maintain their network relationships, remains limited (Hollstein, 2023). It is important to recognise that older adults have the capacity to actively shape, adapt and nurture their personal networks to meet their evolving social needs. Therefore, this paper investigates in depth the strategies used by working and retired adults in navigating their social networks and underlying mechanisms of change.

Against the background described above, this study aims to examine closely how individuals already engaged in social participation maintain their social networks to promote well-being. While conventional analyses of confidant networks and core discussion networks typically involve identifying individuals with whom important matters are discussed (Litwin & Stoeckel, 2013; Small, 2013), our approach focuses on identifying individuals or organisations that contribute to personal well-being in some capacity – not necessarily those with whom one would traditionally discuss important matters. In this way, we explore the concept of 'social networks of well-being'. By thus broadening our focus beyond family and friends, we aim to gain a comprehensive understanding of who plays a significant role in promoting well-being among working and retired adults. In this paper, we use the terms 'personal networks' and 'well-being networks' interchangeably to refer to these social networks.

This study focuses on working and retired adults who are members of carnival clubs in North Rhine-Westphalia, Germany. These local social organisations arrange carnival events during the annual season and host various other social activities throughout the year, including summer parties, informal gatherings and charity events. Membership is open to everyone, with no specific requirements regarding such aspects as health or musical or sporting ability.

Notably, carnival clubs are diverse organisations, encompassing members from various occupations, educational backgrounds and social classes (Steinhoff et al., 2024).

The study offers two main contributions. First, while many studies focus on either middle-aged or older adults and emphasise age-related network changes (Cornwell et al., 2014; Wrzus et al., 2013), we examine both working and retired adults to explore personal network changes and compare approaches to network maintenance. Second, by conducting a qualitative social network analysis, we provide in-depth insights into personal networks related to well-being, focusing on the type and quality of ties.

4.1.1. Conceptual framework

Due to ageing-related events and processes such as retirement, bereavement and declining health, not only the size but particularly the composition of social networks change over the life course (Ellwardt et al., 2015). Research has shown that peripheral relationships, in particular, decline, while close and familial relationships are less affected (Huxhold et al., 2020; Wrzus et al., 2013). The socioemotional selectivity theory (Carstensen, 1993) and the social convoy model (Kahn & Antonucci, 1980) address these changes. Both predict that weak relationships will decrease continuously during adulthood, while relationships with family and close friends persist throughout the life course. However, they suggest different causes for these changes (Wrzus et al., 2013). The socioemotional selectivity theory proposes a motivational model, suggesting that as people age, they become more aware of the limited time available to them. This awareness influences time management, with younger adults focusing on making new connections and older adults prioritising relationships with people they already know and value. As a result, older adults are more likely to end relationships with individuals they feel less connected to, a process believed to enhance well-being. The reduction in network size during old age is thus actively sought rather than being merely a passive result of network members' passing away (Carstensen, 1993; Hollstein, 2023). The social convoy model proposes that individuals maintain a network of social relationships that accompany them throughout their lives (Kahn & Antonucci, 1980): the closeness and importance of these relationships vary with social circumstances, and they are differently affected by life changes. Relationships within the closest circle of the 'convoy', such as those with spouses and nuclear family, are expected to remain stable throughout one's lifespan. Peripheral relationships, such as those with acquaintances, colleagues and neighbours, are less stable and may be terminated due to changes in external circumstances (Hollstein, 2023; Kahn & Antonucci, 1980).

It is important to note that some difficult or ambivalent ties may be difficult to resolve, especially when they are deeply rooted in hard-to-escape contexts. While retired individuals can find relief from difficult work relationships, other ties, particularly those with close family, can remain persistently challenging. Studies indicate that family ties are often perceived as more complex in later life, making conflict resolution within these relationships particularly difficult (Offer & Fischer, 2018). Alongside difficult relationships, which are characterised mainly by negative interactions, ambivalent relationships encompass a mixture of positive and negative interactions (Offer, 2021; Rook & Charles, 2017). Research highlights that difficult and ambivalent relationships can significantly harm mental health and overall well-being, as they can be sources of stress and emotional strain (Offer, 2021).

Changes in personal relationships often stem from shifts in the social environments individuals inhabit. Previous studies emphasise that various everyday social contexts – such as workplaces, community organisations or neighbourhoods – are pivotal in facilitating social interactions and shaping the composition and structure of personal networks (Feld, 1981; Mollenhorst et al., 2014). As a result, retirement, for instance, may lead to a reduction in an individual's social network associated with work-related ties. Ties where interactions occur across multiple social contexts are termed 'multiplex' relationships. These involve the coexistence of multiple roles within a single relationship, such as a relationship where the participants are both neighbours and friends. Relationships characterised by a single role, such as that between two individuals who are solely neighbours, are termed 'uniplex'. Multiplexity thus refers to the breadth of roles and interactions existing within a personal relationship, encompassing the diverse exchanges and connections shared between individuals (Mollenhorst, 2008).

The transition from working life to retirement brings about changes in social networks due to altered opportunities for encounters. Contact with colleagues typically decreases significantly. However, retirement affords individuals more time to spend with family, friends and acquaintances and engage in non-work activities. This can strengthen existing social ties and even foster the creation of new ones. Thus, retirees can allocate their time to relationships that hold greater emotional significance (Kauppi et al., 2021). One longitudinal study found that while social network size decreased during the transition to retirement, it increased again after 6–18 months of retirement. This suggests both that the decrease in network size can be attributed to retirement rather than ageing and that it may be temporary (Kauppi et al., 2021). The existing literature indicates, moreover, that older adults have the capacity to expand their

social networks and employ specific strategies to do so (Broese van Groenou et al., 2013; Cornwell et al., 2014; Van Tilburg & Broese van Groenou, 2002).

Regarding the structure of social networks, it is essential to recognise that different types of relationships serve distinct needs. Friendships, for instance, play a significant role in alleviating loneliness and offering emotional support, while family ties often provide instrumental assistance for older adults (Blieszner et al., 2019; Miche et al., 2013). Non-kin relationships formed through community ties, voluntary organisations or religious affiliations also play a crucial role in well-being, particularly during significant life transitions such as retirement. Research by Pinquart and Sorensen (2001), for instance, highlights that increased interaction with neighbours correlates more strongly with reduced loneliness in older adults than increased contact with family members. In essence, maintaining a diverse personal network is vital for older adults, as it mitigates the risk of social isolation and ensures access to essential support for autonomy and well-being. Given this context, retired older adults typically experience a reduction in work-related connections and place greater emphasis on familial and leisure-oriented relationships. Conversely, working older adults frequently remain actively engaged with colleagues and professional networks in addition to maintaining personal and family ties. It is, nonetheless, crucial to examine how both groups strategically manage their networks to adapt to their evolving needs and circumstances. This paper thus aims to explore how both working and retired adults strategically navigate their networks to maintain their well-being as they age.

4.2. Research design, methods and sample

By using a qualitative social network approach, researchers can gain a deeper understanding of not only the structural but also the functional characteristics of personal networks (Bilecen, 2021; Sommer & Gamper, 2021). This method allows for a comprehensive exploration of the underlying mechanisms driving changes in personal networks, as well as how individuals navigate and sustain these changes. In this study, semi-structured network interviews were conducted with members of carnival clubs in North Rhine-Westphalia, Germany. These interviews, facilitated by the first author, who had no affiliation with carnival clubs or formal volunteering, took place individually and in person between November 2022 and April 2023 in Germany. Prior to the interviews, participants provided written informed consent. Ethical approval (reference: 220036LE) was granted by the Ethics Committee of the University of Cologne.

Participants were recruited through convenience sampling by contacting various carnival clubs, followed by snowball sampling. They were offered an incentive of €15 for their time. A total of 28 interviews were conducted, with 68 per cent ($n = 19$) of interviewees being members of the steering committees of their respective carnival clubs. Table 1 shows the key characteristics of the participants. Participants were 29% female ($n = 8$) and 71% male ($n = 20$). The average age of participants was 62 years ($SD = 7.5$, range = 45–80). Of the total, 13 participants (46%) were retired, of which seven opted to continue in marginal employment despite not needing to financially. Only two participants did not have children, and 11 were grandparents (39%). The interviews lasted a mean of 40.16 minutes (range = 20–117).

Table 1. Characteristics of the participants.

Participant (pseudonym)	Age	Gender	Retired	Marginal employment
Mrs Fischer	45	F	No	-
Mrs Weiss	49	F	No	-
Mr Sommer	50	M	No	-
Mr Schmidt	50	M	No	-
Mr Neumann	51	M	No	-
Mrs Wolf	54	F	No	-
Mr Bauer	56	M	No	-
Mr Stein	56	M	No	-
Mrs Beck	58	F	No	-
Mr Becker	58	M	No	-
Mrs Klein	58	F	No	-
Mr Walter	60	M	No	-
Mr Hoffmann	61	M	No	-
Mrs Richter	61	F	No	-
Mr Keller	63	M	Yes	No
Mr Berger	64	M	No	-
Mr Lehmann	66	M	Yes	No
Mr Brandt	67	M	Yes	Yes
Mr Hartmann	67	M	Yes	Yes
Mr Winkler	67	M	Yes	Yes
Mr Wagner	68	M	Yes	Yes
Mr Schneider	69	M	Yes	Yes
Mrs Meyer	70	F	Yes	No
Mr Schafer	70	M	Yes	No
Mr Friedrichs	74	M	Yes	Yes
Mr Schwartz	75	M	Yes	No
Mrs Schreiber	76	F	Yes	Yes
Mr Vogt	80	M	Yes	No

During each interview, the participant created an unstructured egocentric network map (Hollstein et al., 2020), allowing for a detailed analysis of interpersonal relationships. By

visualising these networks, participants gain a comprehensive view of their relationships and social contexts, which aids reflection on ego–alter and alter–alter relationships (Marsden & Hollstein, 2023; von der Lippe & Gamper, 2017). Such sociograms serve as cognitive aids, revealing complex social structures and facilitating a deeper understanding (Ryan et al., 2014). This visual approach facilitates the exploration of social connections and their meanings (Tubaro et al., 2016), offering insights not accessible through verbal descriptions alone.

In our study, participants created their network maps using paper and sticky notes. This method offers several advantages over software-based mapping, including enhanced data richness, fewer technical challenges and greater ease of use, particularly for older adults (Ryan et al., 2014). Three older participants, however, did not create maps: one due to eyesight challenges, and two because they preferred solely verbal interviews. Participants listed important individuals and organisations on sticky notes, varying their size to reflect importance and arranging them relative to the central ‘ego’ point based on how frequently they interacted. Lines were drawn between individuals who knew each other to indicate alter–alter relationships. This flexible, unstructured approach captured participants’ cognitive representations (Marsden & Hollstein, 2023), revealing detailed insights into contact frequency. Participants reflected on their network maps and described any changes in their networks over time. The overall approach offered interactive advantages, with participants finding map creation enjoyable and employing diverse approaches, such as clustering by relationship type or chronological order. Participants noted that the maps helped them recall contacts and that they could modify them during interviews. The interview guide covered topics such as the importance of well-being, various social contacts, alter–alter relationships and the role of social clubs (Steinhoff et al., 2024).

4.3. Analysis protocol

The interviews were recorded and transcribed verbatim. The paper network maps were digitised after the interviews using VennMaker software, with the interview data integrated to supply vital information for analysis. Reflexive thematic analysis, consisting of six phases, was employed for data analysis, as our aim was to identify and analyse patterns and themes across the data (Braun & Clarke, 2021).

The authors first reviewed the interview transcripts and network maps to form initial impressions. The first author then coded the transcripts using MAXQDA, employing both inductive and deductive approaches, while the second author provided independent coding for further input. Our personal and academic backgrounds influenced our insights, resulting in

some unavoidable deductive reasoning. Coding together enhanced our understanding of the data and enhanced our reflexivity. Semantic and latent codes were identified and organised into themes using thematic maps. Initial themes were refined through discussion and presented at colloquia and a conference for further refinement. Quotations were translated from German to English by the first author.

4.4. Results

In total, we identified four themes, namely (1) satisfaction with social relationships, (2) changes in personal networks, (3) multiplexity of personal network ties and (4) personal network management. This paper explores two interconnected themes regarding agency strategies for personal network maintenance: multiplexity of personal network ties and personal network management.

4.4.1. Multiplexity of personal network ties

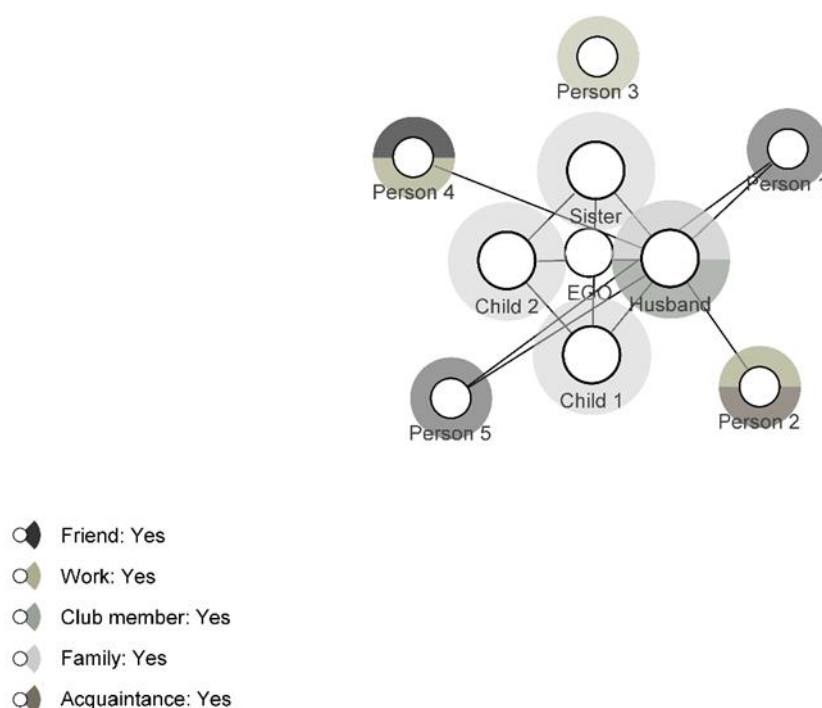
Multiplexity of personal network ties encompasses the structure and stability of relationships within the network. Our findings revealed that many non-kin relationships that support well-being exhibit multiplex characteristics, with some participants also reporting multiplex ties within their families.

Mrs Richter (61 years, working) described such a multiplex relationship with her boss (person 2):

‘And the [person 2], for example, is... yes, actually, he’s my boss, so he’s a man I’ve worked with for many, many years and... But over time we’ve become closer and closer. So we also talk about a lot of books and... give each other book recommendations. I talk to him a lot – and I see him almost every day. So he’s simply a permanent fixture in my everyday life.’

Mrs Richter’s personal network exhibited multiplex ties, further illustrating their importance in various aspects of her life. This is clear from her personal network map (Figure 1).

Figure 1. Mrs Richter's network map



Mrs Richter was married and had two grown-up children with chronic diseases who required significant attention. Her husband occupied a stepfather role for her children, who no longer lived with her. She maintained a close relationship with her sister. Her work brought her considerable satisfaction and inspiration, with colleagues forming a crucial part of her well-being network. In addition to the close bond with her boss described above, she shared quality time with another colleague, whom she considered a friend (person 4). Despite an ambivalent relationship with another colleague (person 3), this individual appeared prominently on her personal network map. In Mrs Richter's own words,

'Um, this is the person who [...] is a key contact person when it comes to [the job] [...] and a very educated woman. I can't say that I don't like her, but she is very complicated and doesn't have a lot of empathy.'

Mrs Richter and her husband cultivated close friendships with other couples, with whom they were emotionally connected. Her husband was actively involved in the carnival club, where both he and Mrs Richter served on the steering committee, which involved a substantial time commitment.

Multiplex relationships offer distinct advantages. They facilitate easier contact maintenance, as individuals in such relationships interact in multiple contexts and therefore have more meeting opportunities (Mollenhorst et al., 2014). Moreover, multiplex ties can provide support across various dimensions. For instance, a colleague who is also a friend may

offer both emotional and informational support. This was the case, for example, for Mr Berger (64 years, working), who spent time with a colleague who was also his friend:

'[Friend 1], [...] whom I met ten years ago, through my business partner [...]. And that's how a friendship developed, not just in business, but also in private life. And we talk about things that you wouldn't normally tell everyone, because we spent many hours in the car driving to [city 1] or [city 2], where we always had a lot of free time.'

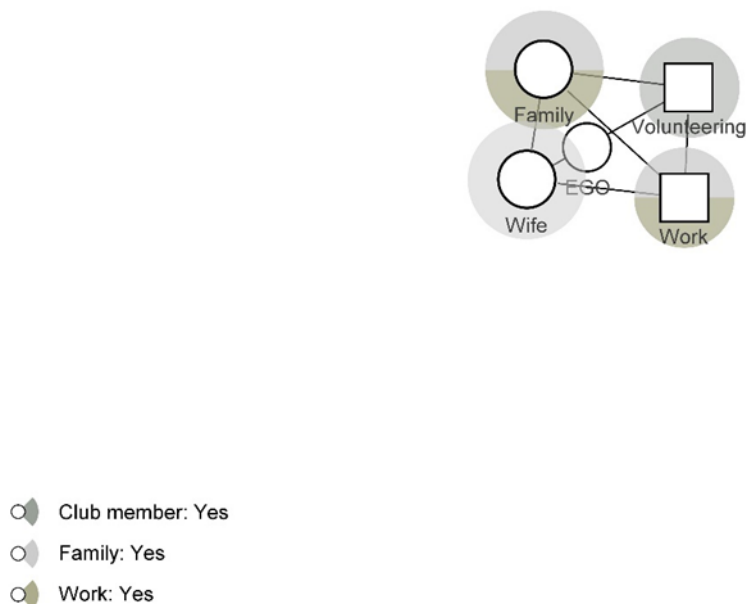
However, multiplex relationships can also present challenges, especially when they are ambivalent. Moreover, terminating such ties is more complicated due to their multifaceted nature. Individuals who occupy two distinct roles, such as being both a fellow carnival club member and a colleague, or both a parent and a colleague, may encounter difficulties in managing ambivalent relationships. Participants indicated that they had developed effective strategies for handling family conflicts, but dealing with ambivalent ties that spanned multiple roles proved notably more challenging.

Mr Hoffman (61 years, working) exemplifies ambivalent multiplex relationships. Divorced and remarried, he operated his own company, where conflicts occasionally arose with his son, who was taking over. In his own words,

'Family is difficult. My son is now taking over my business. There are things that are simply different across generations, that I see differently. And then you discuss things with your little son.'

His company held significant importance for his well-being. Mr Hoffman was actively involved in various community roles: he volunteered at the carnival club, participated actively in church activities and served on the church's steering committee, which involved a substantial commitment. Despite having a broad personal network due to his business and volunteer roles, however, he included only his wife, family, company and volunteering on his personal network map (Figure 2).

Figure 2. Mr Hoffmann's network map



In terms of network maintenance, the stability of relationships can be affected when a multiplex relationship becomes a uniplex relationship. For instance, friendships often develop from shared experiences such as attending the same school or residing in the same neighbourhood: as emphasised by Mollenhorst et al. (2014), the availability of meeting opportunities is crucial for sustaining these relationships. When the original shared roles cease to exist, therefore, maintaining such relationships becomes more challenging, necessitating increased effort.

After relocating to another city, for example, Mr Keller (63 years, retired) joined the carnival club in his former hometown to stay in touch with his friends:

'And that was mainly to keep in touch with friends from childhood, with friends we had back then [...]. You didn't have to... you used to see them every day. And to maintain contact there. That's why. That's how it all came about. That was always a reason to say, now we're going back to [hometown] or to this or that, we'll meet the old people there.'

This challenge in maintaining ties also applies to kin relationships, especially when children move away, requiring alternative strategies to maintain contact.

For example, Mr Schafer (70 years, retired) used weekly phone calls to stay in touch with his grandchildren:

'One family lives in [federal state], but we talk to each other every Sunday at 5 p.m. via FaceTime, and we make sure that we see each other every four to six weeks. So that is very important to us, so we drive the 400 kilometres there and back because it is very,

very important to us. [...] Just having contact once a week via FaceTime, and that is a regular meeting, nothing can beat that.'

The multiplexity of many ties within the well-being network is evident in several key dimensions, underscoring the complexity and importance of such relationships. This theme encompasses not only the density of connections but also the geographical closeness of significant individuals and the frequency of contact maintained across various roles and contexts, as demonstrated through the examples of Mr Keller and Mr Schafer. These factors collectively emphasise the complex interplay of relationships that contribute to older individuals' overall well-being.

4.4.2. Personal network management

Personal network management refers to the proactive strategies individuals employ to navigate and sustain their personal networks, thereby fostering social relationships and enhancing their well-being. This entails managing ambivalent ties and engaging in active behaviours and strategies to maintain connections with significant individuals. This theme highlights, that participants are not passive members of their networks but actively reflect on and strategize ways to maintain or expand them. For example, Mr Sommer (50 years, working) expressed a preference for numerous superficial acquaintances over close friendships, perceiving the former as less demanding to manage:

'There are no friends here, either. I prefer to use the term 'people' or 'folks' or 'acquaintances'. With friends, it starts again, with expectations, with constraints, with quirks, with foibles that you have to put up with each other, with, with the same stories that people tell over and over again. [...] Yes, and, and that's something I can't deal with. So then I meet up with people, I prefer to have a certain non-commitment in my life. [...] No, no. I don't need friends to be happy. I need different people to, to be happy.'

Mr Becker (58 years, working) described a methodical approach to handling social relationships, highlighting the significance of maintaining a limited number of friendships to ensure each received sufficient attention:

'I have a theory: you can't have more than five or six friends. [...] If it gets too much, nothing will happen. The other relationships suffer, then it's not good for anyone. And that's why I think there are different types of relationships for everyone with their own abilities. There's a kind of... everyone has a capacity. If you try to manage too many friends, then you'll be in trouble.'

Some participants, such as Mr Lehmann (66 years, retired), intentionally joined local carnival clubs to establish a stable group of friends:

'But then, about 30 years ago, I went into the sales force and was travelling from Monday to Friday and sometimes over the weekend in some German city or Austria, somewhere where I had work to do, so I wasn't there within the family either. Of course, I kept in regular contact with my wife by phone, and also with my son, of course. But you quickly lost friends [...]. Some stayed, but I would say that the extended circle became smaller as a result. That's quite clear, because you're no longer as present. The fact that I joined the carnival club again, I think eight years ago, meant that I got to know new people again. That was also very good for me personally in terms of the future. [...] So, and I think now that you have time, everything is expanding again. So, you make more friends again.'

This strategy resulted in an increase in the size of his personal network following his retirement, consistent with the findings of previous research on retired adults (Broese van Groenou et al., 2013; Cornwell et al., 2014; Kauppi et al., 2021).

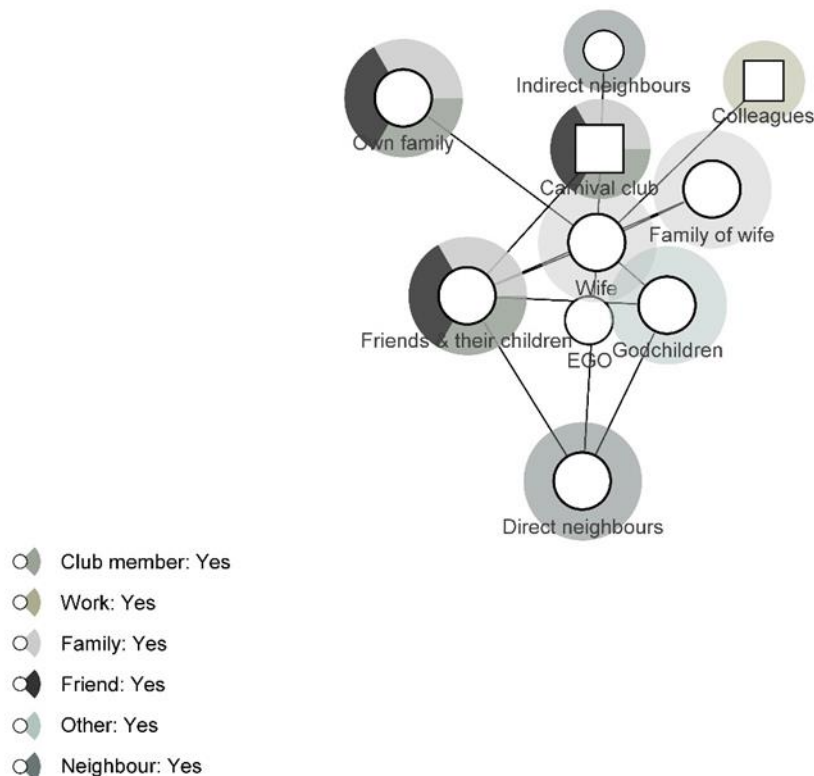
Another participant who employed strategies to expand his personal network was Mr Brandt (67 years, retired), who considered his wife the most significant person in his life. They were involuntarily childless, which he described as strengthening their bond. Mr Brandt prioritised his wife's family over his own siblings and maintained close ties with their seven godchildren, with whom they holidayed annually. He valued his childless friends highly and attributed significant changes in his network to his previous role in a large multinational corporation, where frequent international travel limited his social life. This resulted in his missing out on numerous opportunities. After leaving to start his own business, Mr Brandt gained more flexibility and time to nurture social connections. Now mostly retired and a shareholder in his firm, he credited these career transitions with expanding his social network significantly:

'My network has intensified somewhat in the last few years, because the professional colleagues have decreased. In other words, the... I used to be in the company, and I was always away. [...] My wife always went to birthdays alone because I wasn't there. In other words, that has shifted over the years. [...] In this respect, well-being has increased in the same space, because I hadn't defined well-being in terms of my job, my profession, but actually in terms of my private life. [...] I left the corporate environment 15 years ago to become self-employed. I then became a partner in the [current company] and have now only been a shareholder in the company for a little over a year,

but operationally out of it. So you could say that my, my, the, the intensity of meeting up more with friends, helping them, taking them somewhere by car if they need it, which I was never able to do before, that's been the case for about 1¼ years.'

Mr Brandt's network map (Figure 3) clearly illustrates this development of an intensified personal network.

Figure 3. Mr Brandt's network map



Mr Brandt's case exemplifies both the social convoy model and the socioemotional selectivity theory. By actively changing his circumstances and personal network through a job change and subsequent retirement, Mr Brandt reduced contact with peripheral ties such as colleagues and increased his interaction with emotionally close, significant ties, thus enhancing his well-being. Joining the carnival club was an important move that enriched his well-being network, providing meaningful friendships and involvement in the steering committee. During a natural disaster that affected his home, members of the carnival club offered invaluable support, while his personal network, including family, godchildren and neighbours, also rallied to assist him. His neighbours played a crucial role in his network, contributing significantly to his overall well-being. In terms of multiplexity, Mr Brandt's cousin served as a close friend, father to a godchild and fellow member of the carnival club.

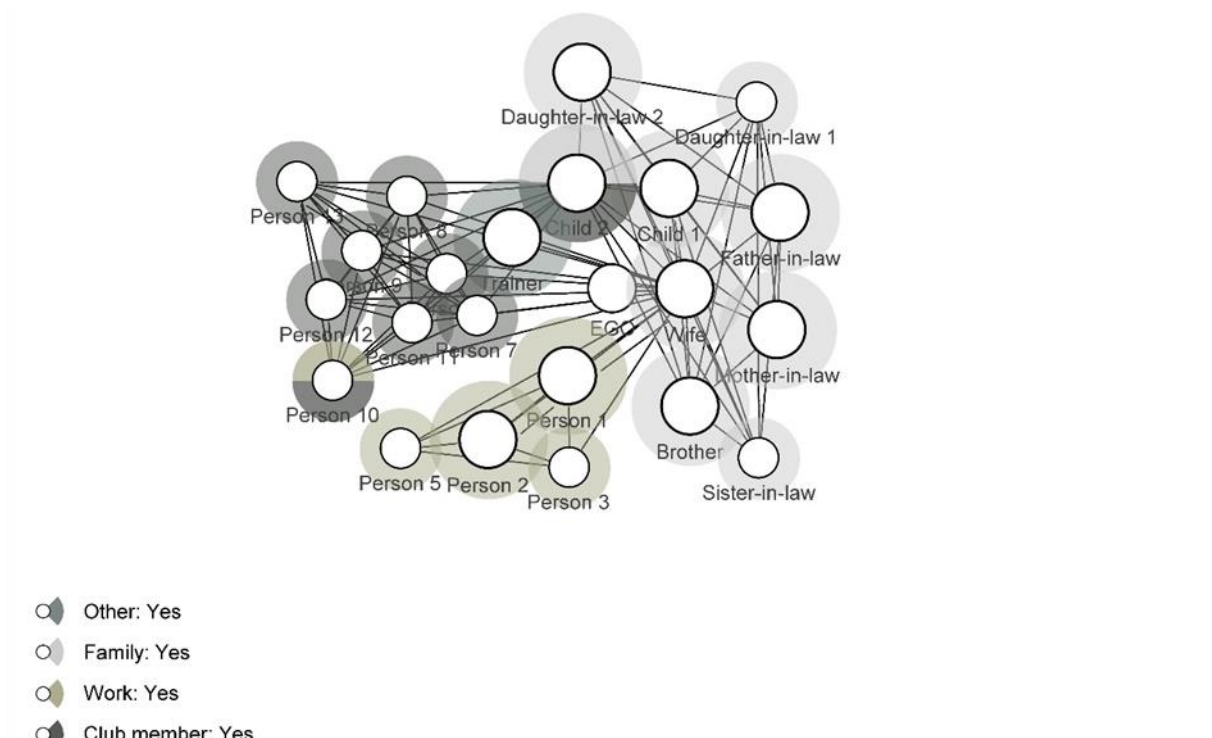
Managing challenging relationships, particularly within families, emerged as a critical aspect of participants' network maintenance. Participants employed various strategies, such as establishing agreements or compromises, to navigate ambivalent family ties. Ambivalent non-kin relationships were managed through open discussions and compromise, with termination considered only as a last resort if stress levels became overwhelming.

Mr Schneider (69 years, retired) provides a compelling example of managing ambivalent relationships within both kin and non-kin contexts. Married with two adult children, he was retired but continued to work minimally in his previous job, which he found fulfilling and essential for his well-being. Throughout his professional life, having two residences posed challenges in maintaining friendships and connections. Joining the carnival club provided Mr Schneider with a stable group of friends locally, requiring less effort to maintain because the club already offered an established social circle:

'Because I basically had these two focal points in my life, it was difficult to build a normal, let's say, social organisation around myself, a circle of friends, etc. Simply because you weren't there and because you couldn't... And basically, that was one of the main arguments back then, to just look at it, to do it and say, yes, I have a circle of friends that is organised secondarily, so to speak. Where you don't have to do everything yourself.'

The carnival club and its members played a crucial role in enhancing Mr Schneider's well-being, featuring prominently on his well-being network map (Figure 4).

Figure 4. Mr Schneider's network map



While some relationships within this context might be ambivalent, their lesser importance meant that they did not significantly impact Mr Schneider's overall well-being. Additionally, Mr Schneider occasionally collaborated with a carnival club member (person 10) in a work capacity, creating a multiplex relationship that could be characterised as ambivalent, particularly within the work context:

'The most interesting case, from my point of view, would be [person 10], [...] in the environment between here, between the carnival club and the professional one, because on the one hand, we do a lot together. But in terms of perception, he falls into the category of the cunning rascal. So you never know exactly what is really on his mind. Especially when it comes to professional projects, etc. [...] So he is someone who, on the one hand, it is certainly interesting to do things, but with whom I exercise extreme caution, especially when it comes to professional, business matters, because you cannot predict what will actually happen in the end.'

Maintaining contact with this individual, however, was important to Mr Schneider, and he wished to preserve their relationship. Additionally, his work relationships contributed significantly to his well-being. His closest colleague (person 1), with whom he had frequent interactions during his career, had also relocated to North Rhine-Westphalia, where Mr Schneider resided, facilitating easier communication.

For Mr Schneider, the most pivotal person in his life was his wife. His sons also held great importance for him; however, he faced challenges in his relationship with one son (child 1), resulting in minimal contact. This strain was exacerbated by conflicts with his daughter-in-law (daughter-in-law 1), with whom he and his wife shared an ambivalent relationship:

'The relationship with the daughter-in-law is just still relatively new. So, let's say, they only got married this year, have been together for about two years now. It was very positive at the beginning, even during the Corona period, but it changed massively this year with the wedding. So. We have to see, let's say, psychological factors also play a role. And who is actually in charge and so on. Family structures have to come together somehow, we will have to wait and see.'

These difficulties adversely affected Mr Schneider's well-being, as well as that of his wife:

'Well, it just dampens the mood. [...] Especially because it puts more strain on my wife's well-being than it does on me. [...] That is more difficult, especially when it comes to my daughter-in-law.'

Regarding family dynamics, Mr Schneider also referred to challenges in his relationship with his sister-in-law, mentioning that they had found a way to manage the situation. His personal network serves as a notable example of navigating difficult and ambivalent ties within a family. While his relationships with his daughter-in-law and sister-in-law were characterised by ambivalence, they remained significant to him, meriting inclusion in his well-being network map.

As Figure 4 shows, Mr Schneider's network consisted of several distinct clusters, varying in connectivity. These clusters encompassed 'members of the carnival club', 'work' and 'family', with only his wife being acquainted with all individuals featured. An important isolated connection was Mr Schneider's sports trainer, who played a vital role in both his and his wife's well-being.

Participants demonstrated a proactive approach to maintaining their social connections, actively employing strategies to stay in touch, especially with those who lived far away. Many had adopted consistent practices such as biannual vacations, weekly phone calls or daily voice messages to sustain their social ties. For Mrs Fischer (45 years, working), these regular exchanges significantly enhanced her well-being:

'So I talk to [friend 1] for 25 minutes every morning. When I'm in the hula hoop, she talks to me, always in three-minute intervals, like my day before, and vice versa. We both have children, roughly the same age. What a mess you had with your son and what

worries and troubles. And that's how the day starts in the morning, once you've got all the baggage off your chest.'

The examples above demonstrate the interconnections between the two themes of multiplexity of network ties and personal network management. While multiplex ties facilitate connection maintenance and the exchanging of support, they also present challenges in navigating ambivalent relationships. Managing these ambivalent ties is crucial for effective network management. Participants also employed proactive strategies to expand their networks and mitigate losses. For instance, when losing a multiplex role through an event such as retirement, participants implemented contact maintenance strategies, such as organising fixed yearly vacations with former colleagues, to sustain connections.

4.5. Discussion

4.5.1. Comparing personal networks of working and retired participants

Retired participants reported two main characteristics of their personal networks. First, they had fewer ambivalent relationships and fewer ambivalent alter-alter relationships than working participants. Second, retirement often led to changes in the size of their networks. However, while many reported a general decline in their overall social network size, their well-being networks typically remained stable or even expanded as they prioritised emotionally significant relationships. For some participants, the size of their personal networks increased because they had more time for social contacts after retirement. Furthermore, many participants' family networks expanded with the addition of grandchildren.

Among retirees, 7 out of 13 continued to work part-time, thereby maintaining connections with colleagues and clients. Even full-time retirees stayed in touch with former colleagues whom they considered vital for their well-being, viewing them as friends. These findings align with both socioemotional selectivity theory and the social convoy model, where long-standing work relationships play a crucial role in retirees' social lives. Retirees thus actively managed their networks by prioritising positive relationships and minimising interactions within more challenging ones, thereby enhancing their overall well-being.

We found three main characteristics of working participants' personal networks. First, these participants had more ambivalent ties than retired participants. Second, their limited time for social relationships hindered their well-being, and upon retirement, they anticipated having more time for meaningful connections. In contrast to retirees, working participants considered only a subset of their colleagues as friends, with the majority being acquaintances or simply

professional relationships. Third, working participants frequently experienced network changes due to relocations or job transitions.

In terms of the size of networks in relation to well-being, both retired and working older participants reported that the size of their networks had decreased due to the passing away of significant others. Compensating for these losses was challenging, as these relationships had previously provided crucial social support.

4.5.2. Multiplexity of personal network ties

The significance of multiplex relationships became evident through the creation of network maps, allowing participants to provide detailed insights into key relationships and individuals' multifaceted roles. Participants often initially categorised individuals simply as friends or neighbours, for example, but the maps revealed deeper connections, such as friends who were also colleagues or neighbours who were also close friends. Similarly, relationships with children who also worked with their parents were initially highlighted for their importance to well-being, but further exploration during interviews uncovered their dual roles.

Furthermore, the network maps also demonstrated the density of participants' social networks, which tends to be greater where more multiplex relationships are present (Mollenhorst, 2008). Multiplex ties contribute to network stability by providing more opportunities for interactions, thus supporting network maintenance (Mollenhorst et al., 2014). Joining social groups such as carnival clubs can be seen as an active strategy to maintain personal networks. If, for example, person A, a colleague and friend of person B, is part of the club and encourages others, including person B, to join, this will increase their meeting opportunities. When A retires, one meeting opportunity is lost, which would originally have led to a uniplex relationship: however, with both A and B being members of the carnival club, they can meet outside of the club as friends, but they can also meet at club events.

However, multiplex relationships can have drawbacks, especially if they represent difficult or ambivalent ties. Within such relationships, interacting with individuals in multiple contexts, such as both work and social clubs, can negatively impact well-being. According to socioemotional selectivity theory, weaker ties involving challenging relationships are often abandoned, but this is more complicated when interactions occur across multiple domains. Most friendships observed were multiplex, except for very long-standing ones, underscoring the importance of duration in relationships, in line with the principles of the social convoy model.

4.5.3. Personal network management

During the interviews, it became evident that many participants actively and rationally managed their social networks to enhance their well-being. A key aspect of this management involved navigating difficult relationships. Research suggests that older adults often encounter more challenging family dynamics, which are typically harder to dissolve than non-kin relationships (Offer & Fischer, 2018). However, retirement can lead to the dissolution of other challenging relationships, potentially explaining why retired adults tend to report higher satisfaction with their networks. Participants mostly described ambivalent rather than difficult relationships, in line with both socioemotional selectivity theory and the social convoy model, which propose that older adults prioritise maintaining emotionally close relationships while gradually disengaging from less significant ones.

Joining clubs emerged as a common method for expanding social networks. Many participants mentioned joining carnival clubs despite not having considerable interest in the carnival itself, highlighting the value of social interaction and having a consistent group of people with whom to socialise. Participants also employed various rational strategies to maintain their social connections, such as joining a hometown carnival club to stay in touch with childhood friends, establishing regular contact such as weekly phone calls or biannual trips and exchanging daily voice messages. Consistency and commitment were identified as crucial factors in sustaining relationships, regardless of proximity.

Interestingly, the two themes explored here – multiplexity of social relationships and network management – are intertwined. While multiplex relationships are generally viewed positively when they are supportive, they can pose challenges when they become ambivalent or difficult. A newly ambivalent multiplex relationship is harder to manage than an ambivalent uniplex relationship, as it is harder to disengage from multiple roles within a relationship than just one. This duality of multiplex relationships underscores their complexity and potential to shift from being beneficial to burdensome, depending on the dynamics involved.

4.6. Conclusion

This study aimed to investigate the strategies employed by both working and retired adults to maintain their well-being networks. To do so, we adopted a qualitative personal network lens focusing on how individuals managed their social relationships. We found that participants actively maintained their personal networks, while their relationships were also shaped by the other members of the respective networks. Our examples thus illustrate that individuals do not exert complete control over their relationships but are also positioned within them by others.

Ambivalent ties, in particular, highlight the interplay of agency within social networks. For instance, despite efforts on the part of participants to maintain positive connections, the attitudes and behaviours of alters could influence whether relationships remained supportive or became challenging. This dynamic emphasises that social networks are co-created and maintained through mutual interactions and negotiations (Keim-Klärner et al., 2023).

Furthermore, the study reveals that individuals often find themselves situated within relational contexts shaped by others' actions and responses. Even in cases where participants actively manage their relationships, the responses and behaviours of their social ties can redefine the nature and outcomes of these interactions (Feld, 1981). This relational interdependence highlights the complexity of maintaining social networks and underscores the importance of understanding social dynamics beyond the perspective of individual agency alone (Cornwell, 2015).

This study has various limitations and strengths that shape its findings and implications. In offering a snapshot of the well-being networks of both working and retired adults, it highlights the need for further longitudinal studies, both quantitative and qualitative, to comprehensively understand the life-course evolution of personal networks and the strategies necessary for their maintenance. A notable limitation of the present study is its focus on members of carnival clubs within an urban population in a single German state. This demographic specificity means that our findings may not fully capture the experiences of working and retired adults in rural areas, who likely face distinct challenges in maintaining their social networks. Moreover, all participants held German citizenship, thereby limiting the relevance of our findings to members of non-citizen communities, who might have different experiences and strategies for network maintenance. Regarding the retired participants, our sample predominantly included younger older adults (aged 60–69 years), with fewer participants in the older age categories (including only one aged over 79). This age distribution is critical because older age groups often experience unique challenges related to declining health, which can significantly impact their ability to maintain and manage their social networks effectively (Broese van Groenou et al., 2013; Van Tilburg & Broese van Groenou, 2002). A strength of the study, however, lies in the selectivity of our sample, consisting of adults actively engaged in formal social participation through social clubs. This offers specific insights into the network maintenance and management strategies of individuals who are not socially isolated but rather choose to participate actively in formal social settings. Our findings thus shed light on how active agency strategies, such as joining social clubs, contribute to enhancing social connectedness and well-being in adulthood.

Methodologically, we employed qualitative interviews alongside the creation of network maps, allowing participants to visually represent and reflect on their personal networks. This approach facilitated a deeper understanding of the intricate relationships and roles existing within these networks. Continuous engagement with the network maps during the interviews also served as a method of validating the interview data by enabling participants to refine their responses and provide more detailed insights into their social connections. While our study thus offers valuable insights into personal network management among adults involved in social clubs, future research should aim to address the identified limitations by exploring more diverse populations, incorporating longitudinal designs and examining the implications of age-related health changes on network dynamics. Such efforts would contribute to a more comprehensive understanding of how individuals navigate and sustain their social networks across different life stages and contexts.

This study has important implications. Our findings reveal the importance of examining social networks beyond confidant and core discussion networks to include those of well-being, which encompass relationships, such as those with pets, that may not involve deep discussions but are nonetheless significant. This perspective facilitates novel insights into the personal network maintenance strategies employed by both working and retired adults. While previous research has suggested that the size of personal networks does not necessarily decrease upon retirement (Broese van Groenou et al., 2013; Cornwell et al., 2014), our study identifies the underlying strategies and mechanisms that contribute to this maintenance. Another key finding is the significant role played by formal social participation, particularly through membership in carnival clubs, in enhancing participants' well-being. This suggests that such venues can effectively mitigate social isolation. Public health interventions should capitalise on this point by targeting individuals who may be at risk of social isolation and introducing them to various low-threshold organisations where they can engage in different social roles (e.g. neighbour, volunteer). While carnival clubs are prevalent in North Rhine-Westphalia, Germany, similar local social clubs, such as community centres, can serve as viable alternatives for fostering social participation. Our insights emphasise the potential of formal social participation as a proactive strategy for maintaining and enhancing social connections in adulthood.

4.7. References

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