Values in psychological network systems compared across groups

Adrian Stanciu[1]

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[1] Faculty of Humanities, Education and Social Sciences (FHSE), University of Luxembourg, Esch-sur-Alzette, Luxembourg

ABSTRACT
According to theory, there is a finite set of existential questions from which a finite set of values as ideals of living derive and are available to people across cultures and history. Drawing on a psychological network approach, this paper revisits this universality principle in human values proposing that wellbeing is a proxy for (un)resolved existential questions. I argue that value motivational goals form together with wellbeing a psychological system structured as a network of dynamically interconnected cognitive and emotional reactions (value systems in short). The present research examined value systems informed in three value theories measured in four representative surveys in Germany between 2012-2014. I argued that demographic groups based on age, gender and education attainment face group specific challenges to wellbeing thus they experience existential questions differently. I compared value systems across these demographics in view of local and global network characteristics. Results highlight that specific value motivational goals are central in the value systems of each group in addition to uncovering novel insights into dynamics amongst value motivational goals and unique associations with wellbeing. The present findings emphasize the contextual embedding of human values, both at a meta-theoretical level and in view of desirable enabling contexts.

KEYWORDS
Values; Wellbeing; Psychological network systems; Demographic groups; Contextual embeddedness

1. Introduction

Human behavior is remarkably similar. For instance, discrimination, physical and verbal aggression, they all reflect actions against wellbeing in people. Beginning with ancient philosophers and up to current evidence, we have been making considerable progress in understanding why that is the case. One explanation is that there is a finite set of existential questions in people from which abstract ideals of living, also known as values, formed as strategies in addressing said questions (Schwartz 1992; Klages 1984; Inglehart 1977; F. R. Kluckhohn and Strodtbeck 1961). People act in ways that resonate

CONTACT: Adrian Stanciu. Email: adrian.stanciu@uni.lu.

with their values, and human behavior is similar because people have a finite number of values to choose from.

Observed behavioral differences suggests that people can prefer certain values more than others. For instance, women tend to orient more towards promoting wellbeing in others whereas men tend to orient more towards promoting own wellbeing (Smallenbroek et al. 2023; Vilar, Liu, and Gouveia 2020). There is no definitive answer to what causes such differences. Several answers are proposed involving, for instance, evolutionary, psychological, sociological, and contextual explanations (Fischer 2017; Atari, Lai, and Dehghani 2020; Schwartz and Rubel 2005). However, none has (systematically) considered thus far that values are emergent in a causal system that can differ across people contingent on faced existential questions. I argue that life satisfaction, as the cognitive facet of wellbeing, reflects (un)resolved existential questions in people thus forming a psychological network system together with value motivational goals.

Psychological network systems re-conceptualize psychological phenomena as emergent from causal dynamics between formative elements such as emotional and cognitive reactions (McNally 2016, 2021; Borsboom 2008). This approach shifts the focus from predicting wellbeing from latent value dimensionality to explicating wellbeing as an integral part of a closed psychological system (henceforth as value systems). This paper examines differences due to gender, age, and education attainment in value systems. It is well documented that these groups face distinct obstacles to wellbeing thus I expect group specific highly influential value motivational goals and moreover uncover previously unobserved dynamics between value motivational goals and wellbeing.

Varying theories address existential questions in people only to some extent similarly. There is no objective way to assess whether one value theory is more accurate than another nor to what degree one encompasses another (see Kaiser 2024). The present study maps values and life satisfaction in value systems informed by theories across fields of research: Value Orientations Theory (VOT) (F. R. Kluckhohn and Strodtbeck 1961) from anthropology, Value Synthesis Theory (VST) (Klages 1984) from sociology, and The Basic Human Value Theory (TBHV) (Schwartz 1992) from psychology.

Disconsidering the cross-cultural variability in the value pursuit of people (Witte, Stanciu, and Boehnke 2020; Minkov 2018; Sagiv and Schwartz 2000) can blur the identification of influential value ideals in value systems compared across groups. There are associations at the societal level between values and wellbeing that do not transfer entirely at the individual or group levels (Fischer et al. 2010). Notably, the present research is carried out in a single country rather than cross-culturally, namely in Germany which is a country with a long tradition in value research in addition to being a prototypical Western culture and having a very high standard of living.

1.1. *Psychological networks*

Psychological network analysis is a method used to examine psychological systems structured as a network of associations. Psychological networks complement the Item Response Theory (IRT) that states that latent constructs are the common cause of similar behaviors (Cai et al. 2016). In IRT one aims to detect appropriate item questions from which multifaceted latent constructs can be reproduced. The more adequately identified the item questions are, the more accurate is the reproduction of a latent construct. Researchers study causes and effects of latent constructs through factors that explain

observed variance across individuals, groups, or societies. Dimensionality is crucial in this research tradition, but dimensionality itself is agnostic to formative causal processes.

Meanwhile, the network approach sees constructs as emergent in formative systems; Item questions are *constitutive* of constructs, not reflective of them. A formative system comprises interconnected elements that operate in unison according to a set of rules, it fulfills a specific function from which a unified, bounded whole is observable. A formative system is understood in a psychological sense as a network of interconnected and causally dependent emotional or cognitive reactions to internal or external stimuli that together form a resulting observable construct.

Let us visualize an example (see McNally 2016). One might observe that a person ruminates about the passing away of one's spouse, experiences insomnia leading to fatigue, and is easily irritable as a result. With persisting insomnia, the person becomes increasingly sad and pessimistic about the future. One might furthermore note that what the person experiences are several interrelated symptoms hinting at the presence of one illness, namely depression. A psychologist working in the IRT tradition would argue that conditioning on the latent outcome eliminates interrelations between symptoms thus curing the person (Borsboom 2008). The network approach on the other hand considers depression as emergent from a causal system of dynamically interrelated symptoms. The person experiences depression because several symptoms had been activated for a specific period and they are mutually influencing each-other. A psychologist working in this tradition would argue that depression is cured when symptoms are deactivated and the causal links between them erode. Outside abnormal psychology, where this novel approach was first developed (McNally 2021; Robinaugh et al. 2020; Borsboom 2008), there have been applications in the study of attitudes (Dalege et al. 2018), personality (Costantini et al. 2017), beliefs (Turner-Zwinkels and Brandt 2022; Brandt and Sleegers 2021), and values (Fischer and Karl 2023).

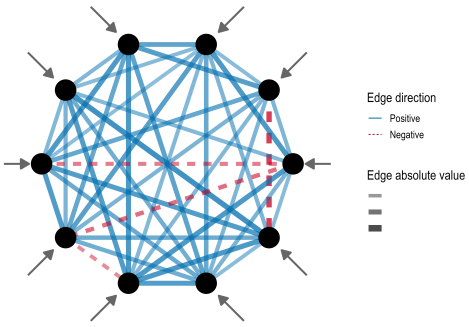


Figure 1. Conceptualization of a psychological network system (code figure Brandt and Sleegers (2021))

Three axioms must hold in conceptualizing a formative system as a psychological network system (see for a detailed discussion: Borsboom 2008; Borsboom et al. 2021). First, the formative elements are interconnected either directly or through a shared element

in at least some populations. Second, there is a causal relationship among the formative elements. It follows that some elements may be more influential than others under specific circumstances whereas changing circumstances can result in distinct influential elements. Third, the emergent system as a whole or specific formative elements are influenced by exogenous factors, which may be other systems or independent constructs. As such, the objects of study in psychological networks are elements of a construct (item questions as nodes) and the causal relationships between them (edges) (see Figure 1). One studies psychological networks globally by examining the overall structure or locally by scrutinizing the centrality of nodes and the edges formed by nodes of interest.

Psychological networks differ in one crucial regard from dimension reduction methodologies such as Principal Component Analysis (PCA) and Multidimensional Scaling (MDS) (Martela, Bradshaw, and Ryan 2019; Golino and Epskamp 2017). MDS and PCA methods map constructs onto a two-dimensional space thus they adhere to the IRT paradigm in extracting dimensionality. Extracted dimensions are utilized in arranging constructs, as measured in item questions, depending on existent spatial distances (e.g. correlations). Meanwhile, psychological networks map causal relationships (often assessed as partial correlations) between elements forming constructs of interest without attempting to extract dimensionality. They can nonetheless provide evidence for dimensionality at face value since causal relationships between item questions belonging to one underlying dimension cluster together. Psychological networks can describe the nature of such causal relationships between system formative elements in view of strength, direction and causality. Whereas in MDS and PCA methodologies the *situation* of construct elements in a two-dimensional space is of interest, in psychological networks the *dynamics* between construct elements is of interest.

Psychological networks inform about the importance of each element relative to all other elements forming the system (i.e. node centrality). Returning to the above-mentioned example, certain symptoms might be more central to depression than other while groups of people might differ in view of prominent depression symptoms (e.g. An et al. 2022). There is no equivalent of the node centrality indicator in data reduction methodologies such as the MDS and PCA.

1.2. *Value theory*

1.2.1. The universality principle

One assumption is common across value theories namely that people belong to one species and therefore experience one set of existential questions for which a finite set of answers can exist (Schwartz 1992; Klages 1984; Inglehart 1977; F. R. Kluckhohn and Strodtbeck 1961). Such answers have developed and have been transmitted throughout generations in written, oral or symbolic form (Fischer 2017; Kashima, Klein, and Clark 2007; Lyons and Kashima 2001). They are preferred modalities of acting. For example, people throughout history and across cultures need to relate to others in their surroundings. This is a basic existential question from which modalities of acting can take either the form of acting with the interests of others in mind or primarily based on own individual interests. Values in people first take shape at an early age through socialization processes in the family and at school (Boehnke 2001; Bourdieau and Passeron 1990) after which they continue to develop throughout the lifespan (Smallenbroek et al. 2023; Daniel et al. 2020; Vecchione et al. 2016). Notably, societal, political, or technological

changes from one generation to another can all contribute to modifications in the values of newer generations compared to older ones (Varnum and Grossmann 2017; Inglehart 2009). Modifications in values of people across generations are possible in view of value orientations and unlikely in the set of values. Despite agreement regarding the universality principle of human values, value theories can differ in view of what qualifies as value contents, what is the structural organization of values as well as which and how many values are universal.

Existent definitions address the relationship between values and behavior in one way or another. Whether values are seen as something desirable (C. Kluckhohn 1949), subjective preferences (Klages 1984), or standard ideals of living (Schwartz 1992), they are that something that people acquire through learning processes and motivate their behavior. That something that people acquire is value content.

Value contents articulate the limited ways of acting available to people across history and cultures and specify at a less abstract level what kind of end states and ideals of living people might pursue. For instance, relationships with others, mastery over the surrounding environment, or the notion of time itself inform contents of human values that transcend situations and contexts. This means that ultimately there are but a limited ways in which any person can relate with others, approach the environment or address time.

There are desirable and undesirable behavioral modes: Desirable in the sense of what a person deems appropriate as well as in the sense of what is common in a socio-cultural environment. Thus, there can be heterogeneity amongst people regarding what value contents they most resonate with; This is known as value orientation. Value orientation is contingent on biological, socio-cultural, developmental and contextual influences and indicates end states a person ultimately might pursue from a finite set of possibilities (Zacharopoulos et al. 2016; Fischer and Schwartz 2011; Esmer and Pettersson 2007). To illustrate, some people might primarily pursue their own interests whereas other might prioritize the benefits of others. People might differ because of an internalized socio-cultural environment that is different from person to person or due to genetic predispositions like neuroticism markers that are either activated or not (Fischer 2017; Zacharopoulos et al. 2016; Fischer et al. 2010). To put it otherwise, people, and societies for that matter, can differ in their value orientations but not in the value contents they may choose from while varying internal and external factors can nurture the differences.

Human values reside internally in individuals. They may have correlational associations or even causal relationships with other traits of individuals such as personality, attitudes or emotions, but human values factually occupy a unique space in our mental resources (Caprara, Vecchione, and Schwartz 2009; Schwartz, Sagiv, and Boehnke 2000; Bilsky and Schwartz 1994). The question is then how exactly does this cognitive space looks like and in which way are value contents organized internally in humans—also known as the question of value structure. Theorists have for a long time believed that human values are organized internally in a hierarchical structure with fundamental standards of living at the bottom and the ideal goals at the top (Inglehart 1977; Rokeach 1970; F. R. Kluckhohn and Strodtbeck 1961; Maslow 1954). This structure however omits to address that people cannot pursue simultaneously two values advocating for opposing end states. As a result, recent advances suggest a circular-like organization where diverging motivational goals oppose each-other while similar end states support each-other (Schwartz 1992, 2017). Accordingly, human behavior derives from existent tensions in value motivational goals.

1.2.2. Specifics of three theories

The present research aims to empirically revisit the thesis that values are answers to a finite set of existential questions faced by people. This research requires adequate data and therefore must (a) be representative for the studied population, (b) contain information on human values in varying theories thus promoting objective insights, and finally, (c) control for contextual influences. Germany provides the context for the present research because the available data meet these requirements. Germany is a prototypical culture in the Western world that is highly individualistic and prioritizes self-determination (Witte, Stanciu, and Boehnke 2020) in addition to having a very high standard of living including, for instance, a very low gender inequality (UNDP 2023, 2021).

Four surveys in Germany meet the inclusion criteria: European Social Survey (ESS), World Value Survey (WVS), German General Social Survey (ALLBUS), and German Socio-Economic Panel (GSOEP). Both the ESS and WVS contain information on human values in the Theory of Basic Human Values (TBHV, Schwartz 1992) however they differ in the applied instruments thus facilitating corroborative evidence. ALLBUS collects data on human values in the Values Synthesis Theory (VST, Klages 1984). Finally, GSOEP collects data on human values in the Values Orientations Theory (VOT, F. R. Kluckhohn and Strodtbeck 1961). Next, I address specifics of these theories.

1.2.2.1. Values Orientation Theory (VOT).

The Values Orientation Theory (VOT) can be traced back to the seminal work of the US-American anthropologist Clyde Kluckhohn. C. Kluckhohn (1949) organized values hierarchically and defined them as a concept of something desirable that influences the selection from available modes, means and ends of action. F. R. Kluckhohn and Strodtbeck (1961) later proposed the VOT drawing on three principles (also see Hills 2002). First, organized groups must deal with and find solutions to a limited number of challenges. Second, the host of possible solutions is finite. Third, societies and people can have preferential solutions but, the host of possible solutions to all possible challenges is present across societies. Drawing on these principles, six universal challenges were identified, namely, time, relationship with the environment, relation with other people, motivation for behavior, human nature, and space. Following extensive anthropological research with the Navajo people of the Southwest of the United States, Kluckhohn and Strodtbeck settled on four existential questions from which they articulated twelve value orientations (see Table 1) (cf. Hills 2002).

Table 1. Value orientations in the Values Orientation Theory (VOT)

Existential question	Value orientation	Value description
Time	Past	Maintain tradition
	Present	Accommodate changes
	Future	Seek ways to replace the old
Relationship with environment	Mastery	Be in control over nature
	Harmony	Be in equilibrium with the nature
	Submissive	Nature has authority over humans

Table 1. Value orientations in the Values Orientation Theory (VOT)

Existential question	Value orientation	Value description
Relationship with other people	Hierarchical	Deffers to authority in groups
	Equality	Finds consensus with others
	Individualistic	Make decisions independently of others
Motivation for behavior	Being	Own activites most important
	Growing	Own activities important but also of others
	Achievement	Own and other activites equally important

Initially, value measurement in the VOT relied on an ordering method. Participants were asked to choose the first and second value orientation (i.e. answer options) that fitted best their own in view of four questions pertaining to the theorized challenges faced by people (for a similar approach see Inglehart 1977). Mezei (1974) factor analyzed data gathered in this instrument and identified three stable dimensions matching the theorized existential questions of relationship with nature, motive for behavior and relationship with others.

The VOT informs value measurement in Germany's long-running panel study–the German Socio-Economic Panel (GSOEP, TNS Infratest Sozialforschung 2013). GSOEP collects data annually since 1984 (started in West Germany) on themes such as family, income, and work. The panel was extended in 1990 to include East Germany and populations of migrants. The panel is representative to households whereas individual data come from all members in the household aged 16 and older. Value measurement was introduced for the first time in 1990 and is repeatedly collected at intervals of two- to four years.

Values measurement in GSOEP draws on the VOT but modifications had been made to the original instrument. Rather than hierarchically organizing items according to preferred choices, participants are asked to indicate on a 4-points how important several statements are to them (Richter et al. 2017). In this instrument there are three dimensions addressed, namely success, family, and altruism, which relate to two existential questions identified in the VOT: Motive for behavior and relationship with other people.

1.2.2.2. Value Synthesis Theory (VST).

The German sociologist Helmut Klages developed the Value Synthesis Theory (VST) drawing on limitations in the initial theory of Postmaterialismus by Roland Inglehart (Inglehart 1977). Klages organized values hierarchically and defined them as subjective preferences on which people base their perceptions and actions (Klages 1984, 2001; Klages and Gensicke 2006). He reasoned that systematic social, political and technological changes in contexts of living (e.g. family, the educational environment) cause dynamic processes of value change involving increasingly highly complex syntheses of motivational goals. Klages reflected that the continuum conservation–progress proposed by Inglehart was unfitting thus proposed three independent dimensions instead. Klages

argued that human values are combinations of preferrable end states in view of duty—convention, self-actualization—creativity and hedonism—power (Klages and Gensicke 2006). Klages observed that people can hold distinct motivational goals derived from existential questions of (material and non-material) self-needs and relationship with the social environment.

The VST measurement instrument was built on the premise that people are self-aware of their value orientation. In the instrument, participants are invited to indicate how important a set of items is to them. On basis of such statements (originally 23 and later 11, see Herbert 1991), value dimensions are identified in data reduction methods like factor analysis. Klages and colleagues then seek to identify typologies of people who hold similar values using cluster analysis (see Table 2). This is a methodological choice and not required by theory.

Table 2. Value typologies in the Value Synthesis Theory (VST)

Typology of people sharing value content	Duty–Convention	Self-actualization–Creativity	Hedonism–Power
Conventionalists	Duty	Creativity	Power
Resigned ones	Convention	Creativity	Power
Realists	Duty	Self-actualization	Hedonism
Hedo-materialists	Duty	Self-actualization	Power
Idealists	Duty	Creativity	Hedonism

The VST informs measurement in several surveys in Germany (e.g. Survey on volunteering, Gensicke and Geiss 2010; Youth study, Albert et al. 2019). Notably, the German General Social Survey (ALLBUS) represents a benchmark for high quality societal monitoring in the unified East-West territory since 1990. ALLBUS collects data every two years in a two-stage sampling design: It first draws a probabilistic sample of communes and then a probabilistic sample of people aged 18 and older. Values are measured at a ten years interval since 2002. An 11-items measurement instrument is used (Herbert 1991).

1.2.2.3. Theory of Basic Human Values (TBHV).

Influenced by Milton Rokeach's seminal work (e.g. Rokeach 1970), the bi-national US-American and Israeli psychologist Shalom H. Schwartz proposed the Theory of Basic Human Values (TBHV, Schwartz 1992, 2012). Schwartz defines values as abstract ideals that motivate action. He identifies a limited number of value contents organized internally in people in a pseudo-circumplex structure according to incompatibility relations (see Figure 2). Schwartz proposes ten (nineteen in the refined theory, Schwartz 2017) basic human values that can be summarized into higher order dimensions of meaning. For instance, universalism opposes power since the motivational goal of the former is welfare of all people whereas of the latter is dominance over people and resources. Universalism along with benevolence belongs to the higher order value of self-transcendence. Meanwhile, power together with achievement correspond to the higher order value of self-enhancement.

Schwartz theorizes that values are answers to human needs, namely of people as biological organisms, of coordinated interactions, and of survival and welfare of groups. Since,

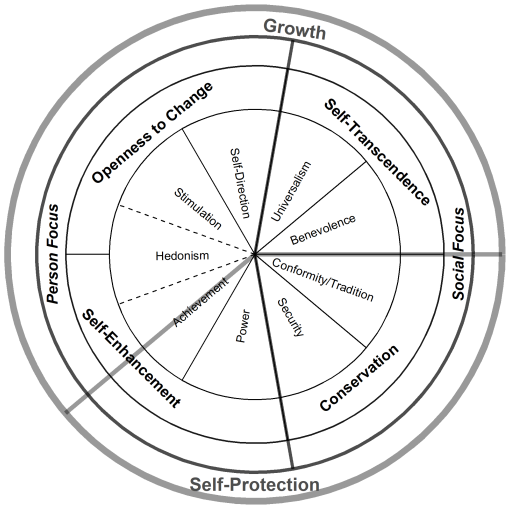


Figure 2. Circular Value Structure in The Refined Theory of Basic Human Values

according to him, humans cannot cope alone with such complex existential challenges, they needed to develop abstract goals that can be communicated with others and used in practice. Self-transcendence and conservation values tap into the existential question of survival and welfare of groups including also the relationship with the environment. Self-enhancement and openness to change values tap into the existential question of self-needs. The question of coordinated action is not directly addressed as a human value but rather as a cultural value (see Schwartz 2006). The proposals of the TBHV surpasses situations, contexts, and cultures-it is described as a universal values theory.

Schwartz and colleagues have devised two measurement approaches. The first approach draws on the premise that people are self-aware of their value preferences–this is known as the Schwartz Value Survey (SVS, Schwartz 1992). The SVS presents study participants with 57 abstract items and asks to indicate how important each is to them. This approach however is time consuming and unreliable in populations with a more concrete thinking style (Roccas, Sagiv, and Navon 2017; Schwartz et al. 2001). A second measurement approach recognizes that identifying one's own value preferences is a resource-demanding task and therefore asking for evaluating concrete items can be comparably less demanding. This approach, termed the Portrait Value Questionnaire (PVQ), presents participants with a set of vignettes describing a person in view of a specific value content. Participants are asked to evaluate how similar they see themselves to the described person.

The TBHV informs measurement in two multinational projects involving Germany: European Social Survey (ESS, Beullens et al. 2014) and World Values Survey (WVS, Inglehart et al. 2018). ESS is a cross-sectional multinational survey geared toward periodically documenting social realities in the European context. ESS collects data every two years since 2001 and uses a random probabilistic sample of persons aged 15 years or older. Germany is a founding member of ESS. WVS is a cross-sectional multinational survey geared toward periodically documenting social realities in the global context and therefore facilitates equivalent measurement at this scale. WVS uses a full probability sample of the population aged 18 years and older. Germany is a participating country since 1997. Values are measured with a 21 items version of the PVQ (Schwartz 2003)

in ESS, and with a 10 items version of the PVQ in WVS.

1.3. *The present research*

The present research draws on three principles. First, people gain a sense of wellbeing when existential questions are resolved adequately. Notably, determinants of wellbeing are multiple whereas wellbeing itself is a multifaceted construct comprising emotional and cognitive aspects (Ryff and Keyes 1995; Diener 1984); Resolved existential questions may be linked with some but not all facets of wellbeing. The link between values and wellbeing is reflective of existential questions that are of immediate concern to individuals. The link may be strong and positive as well as strong and negative suggesting that an existential question is of immediate concern either because it is gratifyingly addressed or because it poses an acute challenge. Other weaker links confound a plethora of mediators and moderators thus they underscore existential questions that are indirectly relevant to the wellbeing of people.

Second, values develop at an early age with developmental processes continuing throughout the lifespan. As children, we first acquire, for instance, from family members the values that are common in our social environments and subsequently develop our won. Value pursuit in people can differ cross-culturally and can change over time to better reflect the living contexts. For example, people become more social oriented with age (Smallenbroek et al. 2023) whereas life events such as entering parenthood (Lönnqvist, Leikas, and Verkasalo 2018) as well as societal events such as global health crises (Daniel et al. 2020) can inform changes in the value pursuit of individuals. These observed value changes are a proxy for disturbances in the established value goal pursuit of individuals in addressing existential questions. That is, different life circumstances equates with experiencing of existential questions differently.

Third, differences between people in their value pursuit are contingent on internal and external factors whereas differences between values observed in groups signal a common experience in view of faced existential questions (Witte, Stanciu, and Boehnke 2020). Not all populations have the same circumstances in life (also see Henrich, Heine, and Norenzayan 2010). Each group and population have developed specific means of action that may not match the needs of other populations. Furthermore, there can be structural advantages to some but not all populations in pursuing personally meaningful end states. Thus, there are historical and socio-political reasons to expect that groups of people can differ in what they deem as desired end states. Differences between groups and populations in their value pursuit can emerge collectively due to shared experiences rooted in the human lifespan or due to shared trans-situational and transcultural contexts.

Following, the present research studies value systems compared across age, gender and educational attainment groups. These demographics are selected because they are known to experience existential questions differently; They have unique obstacles to wellbeing that is.

Chronological age is used in the literature as a cross-section in the lifespan of people with several distinguishable life phases. Childhood and adolescence are crucial periods in the development of individuals and values during these periods are highly volatile (Daniel et al. 2020; Vecchione et al. 2016). Beginning with adulthood, value development continues albeit at a slower pace (Smallenbroek et al. 2023). Both cross-sectional and

longitudinal studies distinguish three life stages after adolescence, namely early adulthood, adulthood and old age. Each is characterized by its specific challenges and comes with unique opportunities for the individual. Typically, young adults (18-40) strive to establish themselves as self-sufficient and contributing individuals in society and this can mean finishing studies, finding and keeping a job long-term and perhaps establishing a family as well. Adults (41-60) tend to have security and stability. Meanwhile, they are at an age when intergenerational struggles become increasingly pressing while thoughts regarding retirement and the old age itself become relevant themes. Finally, older people (61+) need to reinvent themselves to remain relevant after their societal roles such as in family and at work progressively give way to a newly found free time. At the same time, older individuals face challenges associated with the ageing process, both in terms of biology due to deteriorating health and in view of socio-cultural views on what old age imply.

I argue that taken together these observations indicate that different phases in the lifespan of individuals are characterized by different existential questions or better said different weights are being given to existential questions across the lifespan. I predict there will be differences between adults when compared to young adults and older people in view of value systems. That is, there are age specific values of immediate importance to the wellbeing of age group members beyond an apparent global similarity in view of their value pursuit (hypothesis 1).

A traditional view on gender is the distinction between men and women. Since gender itself is a socio-cultural construct implying historically ascribed roles in society, there are specific challenges and opportunities to each of them. Historically speaking, and here I mainly refer to Western societies, there has been a movement toward gender equality across domains of life including for example family structures, at work and within the health systems. However, women still have lower income when compared to men working in the same field (Goldin 2014). Women are still expected to take on the role of motherhood in detriment to career whereas men are encouraged by the socio-political structures in place to have career continuity (Angelov, Johansson, and Lindahl 2016). Moreover, there are biological differences that can go along with the gender of a person. Women who want to become mothers, for instance, must factor in their decision-making processes the biological timing of their reproductive system whereas men have no such concerns. For women this might mean different challenges compared to men in organizing their careers and planning their life as autonomous individuals.

It is therefore no surprise that research shows differences between women and men in their value pursuit, albeit research cannot agree on one cause for all the differences. For instance, studies converge on the finding that women tend to be more other-oriented than men who tend to be self-oriented whereas men more than women seem to be concerned with notions of competition, power and achievement in general (Hanel, Maio, and Manstead 2019; Schwartz and Rubel 2005). Taken together, these observations suggest that men and women address the finite set of existential questions that value theories discuss differently. I expect that there are gender specific values that are more central than others to the wellbeing of individual members of these groups. That is, there are specific values of immediate importance to the wellbeing of men and women in addition to an apparent global similarity in their value pursuit (hypothesis 2).

Formal education seeks to prepare younger people to function well in society. What is seen as a well-functioning society member can differ across societies but typically is an individual who is literate, holds specific competencies and therefore can provide

for self and contribute to society in general. Basic levels of formal education, referring here primarily to Western societies, cover language, mathematical and reasoning competencies that are the minimal requirements for lower paid jobs. With higher levels of formal education, and implicitly more complex and specialized skills and competencies, so do opportunities for accessing upper hierarchies on the job market multiply as well as the status and power dynamics between the individual and the community changes accordingly (Reimer and Pollak 2010). Attainment of higher education levels is not only a choice of the individual but often results from promoting structures (Blossfeld and Roßbach 2019; Thomson 2018). The formal education system is moreover a value multiplier (Oeschger, Makarova, and Döring 2022; Bardi et al. 2014; Boehnke 2008). Individuals are exposed to cultures that are common in their educational institutions while educators can shape value development in students. Formal education is a value multiplicator also because certain preferrable end states can be acquired and sustained as a result. For example, lower levels of education are more associated with anxiety avoidant end states whereas higher levels of education are associated with more growth-oriented ideals of living (Smallenbroek et al. 2023).

These observations suggest that there can be structural and personal factors resulting in a differential experience of existential questions in people depending on the attained formal education. I expect differences between groups with a low education level compared to groups with middle and higher education levels in view of what values are most central to their wellbeing. In other words, there are specific values that are of immediate importance to the wellbeing of people with a low, middle and higher levels of formal education in addition to an apparent global similarity in their value pursuit (hypothesis 3).

The present research is conducted in Germany, one of the most economically and technologically advanced nations in the world generally considered culturally Western (UNDP 2021; Witte, Stanciu, and Boehnke 2020; Hofstede, Hofstede, and Minkov 2010; Schwartz 2006). Germany provides structures that are different by default than many, if not most, other countries in the world. For instance, the gender, age, and educational issues mentioned above pose relatively speaking fewer challenges for local populations than in other societies, aspects captured in the country's very high human development index (UNDP 2023, 2021). Culturally speaking, the German cultural environment is one that prioritizes uncertainty avoidance, is primarily focused on the individual while it also concerns itself with achievement and success (Witte, Stanciu, and Boehnke 2020; Schwartz 2006). Moreover, there is a strong middle-class traditionally in Germany which is noticeable in the weak cultural orientation toward power (Hofstede, Hofstede, and Minkov 2010). These important macro-contextual factors are intertwined in a society where the weights people bestow implicitly and explicitly on the finite set of existential questions can understandably differ from other contexts. Values may differ due to macro-contextual factors but, an analysis at this scale is beyond the scope of the present research.

2. Method

2.1. *Data*

Secondary data collected between 2012-2014 in four surveys in Germany were used. A detailed description of the sampling strategy and data collection procedure is provided in the survey methodology reports: ALLBUS (Wasmer et al. 2014), ESS (Beullens et al. 2014), WVS (Inglehart et al. 2018), and GSOEP (TNS Infratest Sozialforschung 2013).

The initial sample size ranged from $N = 2046$ in WVS to $N = 27940$ in GSP. After cleaning the data for cases with identical answers on more than 75 % of the value items (see Kim et al. 2019), the final samples for the present analyses were $N = 3478$ in ALLBUS, $N = 25171$ in GSOEP, $N = 2947$ in ESS, and $N = 2046$ in WVS. Across the surveys, adults aged 40-60 were in majority (36.75 % in WVS or higher) and women generally had a sample share of more than 50 %, excepting ESS where men had 50.49 %. About 1/3 of samples in ALLBUS, ESS and WVS had low levels of education, whereas in GSOEP the percentage of people with a low education was considerably smaller (12.43 %). Detailed information regarding sample composition can be seen in the Supplement, Table 8). Missing information was listwise deleted for analyses.

2.2. *Measurement*

2.2.1. Gender, age, educational attainment

Gender was self-reported as male or female. From self-reported age in years, three age groups were construed: Young adults (18-40 years old), adults (41-60 years old), and older persons (61 years old and older)[1]. Participants chose which education level they had from survey-specific lists, which were used to construe categories of low, intermediary, and high education. Intermediary education levels were not intuitive to code in WVS and therefore education was categorized as low, high, and very high. Additional information about the construction of education categories is provided in the Supplement, Table 9).

2.2.2. Values

ALLBUS asked study participants to indicate how important were eleven statements to them (e.g., To respect law and order), each measuring a specific facet of the VST theory (Herbert 1991). The answers were recorded using a 7-point Likert scale, where 1 = *unimportant* and 7 = *exceedingly important*.

GSOEP asked study participants how important were to them nine statements (e.g., Being able to afford to buy things for myself) derived from the VOT theory (Headey 2008). The responses were documented using a 4-point Likert scale, where 1 = *very important* and 4 = *not at all important*. This scale was reverse coded for the analyses.

Both the ESS and WVS applied the Person Value Questionnaire (PVQ, Schwartz 2003) which is a standard value instrument that asks study participants to indicate how similar

[1] UN defines an older person as typically being between 60 or 65 years and older (UN DESA, 2021).

they see themselves in relation to descriptions of fictitious people (e.g., It's important to him/her to show his/her abilities. He/She wants people to admire what he/she does). Each description has a gender-neutral formulation and refers to one of the basic human values theorized in the TBHV (Schwartz 2012). ESS applied the PVQ instrument with 21 descriptions and recorded responses using a 6-point Likert scale, where 1 = *very likely like me* and 6 = *not like me at all*. WVS used a PVQ version[2] with ten descriptions and recorded answers using the same format as in ESS. Scales in the ESS and WVS was reverse coded for the present research.

2.2.3. Life satisfaction

Study participants were asked how satisfied they were in general with their life. ALLBUS and ESS used a 11-point scale with answer options ranging from 0 = *entirely dissatisfied* to 10 = *completely satisfied*. GSOEP used likewise a 11-point scale but had the answer options ranging from 0 = *low satisfaction* to 10 = *high satisfaction*. Finally, WVS used a 10-point scale with answer options ranging between 1 = *completely dissatisfied* to 10 = *completely satisfied*.

2.3. *Analysis*

All analytical steps were carried out separately in ALLBUS, GSOEP, ESS, and WVS. Data preparation and analyses were performed in *R* (R Core Team 2023). Network analyses were conducted using the *bootnet* package (Epskamp, Borsboom, and Fried 2018) and network comparisons were calculated using the *NetworkComparisonTest* package (Borkulo et al. 2021). Study material is open access at the associated OSF project (blind review link; will be made publicly available upon publication) https://osf.io/cqp4m/?view_only=0e5079fae65645ebb4e1473796537bfb.

Rows in the data referred to cases and columns were variables (i.e., network nodes). Network edges were operationalized as partial correlations between pairs of nodes. Partial correlations are correlations between two variables conditioned for the effects of all other variables in the estimated model. Causality cannot be inferred in this way but robust indication about the strength and correlational direction between two nodes in the network can be quantified systematically and reliably (McNally 2016). Table 3 gives an overview of node correspondence in the value theories.

Results reliability was evaluated against indicators of edge accuracy and network stability (Borsboom et al. 2021; Epskamp, Borsboom, and Fried 2018). Edge accuracy quantifies the degree of confidence that an estimated edge is the one found and not another. Edge accuracy was calculated in a bootstrapping procedure that re-samples from the original data multiple times with an optimal network being estimated in each iteration. Confidence intervals were calculated from aggregated bootstrapped solutions. For the present research, 95 % bootstrapped CI from m = 1,000 iterations were interpreted. Network stability quantifies the stability of node centrality indices if data were to be dropped, which is formally known as the correlation stability coefficient (CS). In

[2]Benevolence was measured in WVS in split questionnaire: Half of the participants read "It is important for this person to do something for the good of society", whereas the other half of the participants read "It is important for this people to help the people nearby; to care for their wellbeing". These two items were merged for the analyses.

other words, the CS specifies the 95 % degree of probability that a correlation of at least 0.70 with the original node centrality indicators is found if x % of information were to be removed from the network estimation procedure. The greater the CS is, the higher is the network stability. The minimally acceptable CS threshold equals or is greater than 0.50 (Epskamp, Borsboom, and Fried 2018).

I estimated optimal network structures combining the GLASSO approach (Tibshirani 1996; Friedman, Hastie, and Tibshirani 2007)—estimation of a series of networks ranging from most connected to least—with the EBIC criterion tuned to lambda = .05—a Bayesian algorithm that penalizes against networks with fewer and weaker edges (Chen and Chen 2008). In psychological networks, partial correlations as small as .10, corresponding to small effect sizes, are substantially meaningful (McNally 2016). Previous research has shown that correlations between values and life satisfaction can be as small as r = .01 (Sagiv and Schwartz 2000). Fischer and Karl (2023), the only other study examining values and life satisfaction in a psychological network approach, reported partial correlations greater than $r_{xy.c} = |.10|$ but, analyzed higher order values rather than basic human values as I did. For the present research, I interpreted edges between values and life satisfaction equal or greater than $r_{xy.c} = |.01|$, and edges among values equal or greater than $r_{xy.c} = |.10|$.

Node centrality was examined in view of strength, betweenness, and closeness (Borsboom et al. 2021; Costantini et al. 2015). Node strength centrality specifies how important one node is for the un-mediated changes in other nodes in the network. Substantially, it defines a variable that has a strong direct impact on other variables. Node betweenness centrality quantifies how often one node is present in the shortest possible path that connects two other nodes in the network and therefore specifies which variable is highly important for other variables to influence each-other. Node closeness centrality is the inverse sum of the distances from the focal node to all other nodes in the network. Substantially, this centrality indicator describes a variable that is likely to be quickly influenced by other variables in the network, while its impact on other variables will be much quicker than of variables with a low closeness centrality.

Table 3. Nodes IDs and corresponding labels

ID	Survey	Node	(Value) Item	Value dimension	Abbreviation	Existential question
1	ALBS	lifesat	Life satisfaction	-	LS	-
2	ALBS	order	Order	Duty-Convention	DC	Relationship others
3	ALBS	security	Security	Duty-Convention	DC	Relationship others
4	ALBS	dilligence	Dilligence	Duty-Convention	DC	Relationship others
5	ALBS	standard	Standard in life	Hedonism-Power	HP	Self-needs
6	ALBS	power	Power	Hedonism-Power	HP	Self-needs
7	ALBS	assertive	Assertive	Hedonism-Power	HP	Self-needs
8	ALBS	hedonism	Hedonism	Hedonism-Power	HP	Self-needs
9	ALBS	creativity	Creativity	Selfactualization-Creativity	SC	Self-needs
10	ALBS	help	Help	Selfactualization-Creativity	SC	Self-needs
11	ALBS	tolerance	Tolerance	Selfactualization-Creativity	SC	Self-needs
12	ALBS	polengagmt	Political engagement	Selfactualization-Creativity	SC	Self-needs
1	ESS	lifesat	Life satisfaction	-	LS	-
2	ESS	safe	Safe	Conservation	CON	Survival and welfare of groups
3	ESS	rules	Rules	Conservation	CON	Survival and welfare of groups
4	ESS	modest	Modest	Conservation	CON	Survival and welfare of groups
5	ESS	stronggov	Strong government	Conservation	CON	Survival and welfare of groups
6	ESS	behave	Behave appropriately	Conservation	CON	Survival and welfare of groups
7	ESS	tradition	Tradition	Conservation	CON	Survival and welfare of groups
8	ESS	creative	Creative	Openness to change	OCH	Needs of people
9	ESS	newthings	New things	Openness to change	OCH	Needs of people
10	ESS	goodtime	Good time	Openness to change	OCH	Needs of people
11	ESS	free	Free	Openness to change	OCH	Needs of people
12	ESS	adventure	Adventure	Openness to change	OCH	Needs of people
13	ESS	fun	Have fun	Openness to change	OCH	Needs of people
14	ESS	rich	Rich	Self-enhancement	SEN	Needs of people
15	ESS	admired	Admired	Self-enhancement	SEN	Needs of people
16	ESS	hvsuccess	Have success	Self-enhancement	SEN	Needs of people

Table 3. Nodes IDs and corresponding labels

ID	Survey	Node	(Value) Item	Value dimension	Abbreviation	Existential question
17	ESS	respect	Respect	Self-enhancement	SEN	Needs of people
18	ESS	equalopport	Equal opportunities	Self-transcendence	STR	Survival and welfare of groups
19	ESS	understand	Understand	Self-transcendence	STR	Survival and welfare of groups
20	ESS	hlpppl	Help people	Self-transcendence	STR	Survival and welfare of groups
21	ESS	loyal	Loyal	Self-transcendence	STR	Survival and welfare of groups
22	ESS	environment	Environment	Self-transcendence	STR	Survival and welfare of groups
1	WVS	lifesat	Life satisfaction	-	LS	-
2	WVS	security	Security	Conservation	CON	Survival and welfare of groups
3	WVS	followrules	Follow rules	Conservation	CON	Survival and welfare of groups
4	WVS	tradition	Tradition	Conservation	CON	Survival and welfare of groups
5	WVS	creative	Creative	Openness to change	OCH	Needs of people
6	WVS	hedonism	Hedonism	Openness to change	OCH	Needs of people
7	WVS	adventure	Adventure	Openness to change	OCH	Needs of people
8	WVS	rich	Rich	Self-enhancement	SEN	Needs of people
9	WVS	hvsuccess	Have success	Self-enhancement	SEN	Needs of people
10	WVS	benevolence	Benevolence	Self-transcendence	STR	Survival and welfare of groups
11	WVS	environment	Environment	Self-transcendence	STR	Survival and welfare of groups
1	GSP	lifesat	Life satisfaction	-	LS	-
2	GSP	hlpothers	Help others	Altruism	Alt	Motive behavior
3	GSP	polactv	Politically active	Altruism	Alt	Motive behavior
4	GSP	trvl	Travel	Altruism	Alt	Motive behavior
5	GSP	owncar	Own a car	Family	Fam	Relationship with other people
6	GSP	hppymarriage	Happy marriage	Family	Fam	Relationship with other people
7	GSP	hvchildrn	Have children	Family	Fam	Relationship with other people
8	GSP	affordsmth	Afford something	Success	Scc	Motive behavior
9	GSP	flflpotent	Fulfil potential	Success	Scc	Motive behavior
10	GSP	success	Success	Success	Scc	Motive behavior

I compared psychological networks across groups in view of two global criteria and one local criterion (Borkulo et al. 2021). Comparisons were carried out between genders (men and women), age groups (middle aged and younger; middle aged and older), and education groups (low levels and intermediate; low levels and upper). First, I examined whether the overall strength of associations (global edge strength) was invariant between groups, which is quantified in the maximum strength test (the M test). Second, I examined whether the overall node strength centrality (global node strength centrality) was invariant between groups, which is quantified as the weighted absolute sum of all edges (the S test). Third, I examined whether edges between values and life satisfaction were invariant across groups, information quantified in the local test statistic E. Fourth, I investigated whether differences in node centrality indices between groups were systematic. All tests were calculated in a permutation approach wherein group membership was first estimated from data, then repeatedly randomly permuted, and, finally, the original and permuted distributions were tested against each-other. Tests statistics were calculated from p = 100 permutations and interpretation was facilitated by p-values at alpha = 95 %.

3. Results

3.1. *Overall network*

3.1.1. Edges

Figure 3 displays the overall network structures estimated across surveys. There were 16 edges between values in ALLBUS, 14 in GSOEP, 29 in ESS, and 16 in WVS with partial correlations equal or greater than $r_{xy.c} = |.10|$ and significant given a bootstrapped 95 % CI (see Table 4). Edges within a value cluster (i.e., value dimension as theorized in the respective value theory) were more common than edges across value clusters (i.e., values pertaining to distinct value dimensions as theorized in the respective value theory), excepting WVS where the opposite was true. The strongest edges within value clusters were for ALLBUS standard–power (HP-HP) corresponding to the existential question of Self needs ($r_{xy.c} = 0.36$, bootstrapped 95 % CI [0.32;0.39]); for GSOEP flflpotent–success (Scc-Scc) corresponding to the existential question of Motive for behavior ($r_{xy.c} = 0.38$, bootstrapped 95 % CI [0.37;0.39]); for ESS goodtime–fun (OCH-OCH) corresponding to the existential question of Needs of people ($r_{xy.c} = 0.38$, bootstrapped 95 % CI [0.35;0.41]); and for WVS security–followrules (CON-CON) corresponding to the existential question of Survival and welfare of groups ($r_{xy.c} = 0.28$, bootstrapped 95 % CI [0.24;0.32]).

Conversely, the strongest edges across value clusters were for ALLBUS power–polengagmt (HP-SC) corresponding to the existential question of Self needs ($r_{xy.c} = 0.21$, bootstrapped 95 % CI [0.16;0.25]); for GSOEP affordsmth–trvl (Scc-Alt) corresponding to the existential question of Motive for behavior ($r_{xy.c} = 0.15$, bootstrapped 95 % CI [0.14;0.17]); for ESS environment–tradition (STR-CON) corresponding to the existential question of Survival and welfare of groups ($r_{xy.c} = 0.13$, bootstrapped 95 % CI [0.09;0.17]); and for WVS rich–hedonism (OCH-SEN) corresponding to the existential question of Needs of people ($r_{xy.c} = 0.22$, bootstrapped 95 % CI [0.18;0.27]).

In addition, there were 13 edges across value clusters beyond one existential question,

namely 3 in ALBS; 2 in ESS; 3 in GSP; and 5 in WVS. The strongest edges were for ALLBUS standard–security (DC-HP) corresponding to the existential questions Relationship others–Self needs ($r_{xy.c} = 0.16$, bootstrapped 95 % CI [0.12;0.19]); for GSOEP hlpothers–hvchildrn (Fam-Alt) corresponding to the existential questions Motive for behavior–Relationship with others ($r_{xy.c} = 0.14$, bootstrapped 95 % CI [0.13;0.16]); for ESS behave–respect (CON-SEN) corresponding to the existential questions Survival and welfare of groups–Needs of people ($r_{xy.c} = 0.12$, bootstrapped 95 % CI [0.08;0.16]); and for WVS creative–environment (OCH-STR) corresponding to the existential questions Needs of people–Survival and welfare of groups ($r_{xy.c} = 0.19$, bootstrapped 95 % CI [0.13;0.24]).

Table 4. Edges Between Values with Partial Correlations Equal or Greater than |.10| That Are Significant Given a Bootstrapped 95 % CI

Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
1	ALBS	order–dilligence	DC-DC	Relationship others	0.14	0.14 (0.02)	[0.1;0.18]
2	ALBS	order–security	DC-DC	Relationship others	0.21	0.2 (0.02)	[0.17;0.25]
3	ALBS	security–dilligence	DC-DC	Relationship others	0.23	0.23 (0.02)	[0.19;0.27]
4	ALBS	assertive–dilligence	DC-HP	Relationship others–Self needs	0.15	0.15 (0.02)	[0.12;0.19]
5	ALBS	standard–security	DC-HP	Relationship others–Self needs	0.16	0.15 (0.02)	[0.12;0.19]
6	ALBS	order–help	DC-SC	Relationship others–Self needs	0.14	0.13 (0.02)	[0.1;0.17]
7	ALBS	assertive–hedonism	HP-HP	Self needs	0.15	0.15 (0.02)	[0.12;0.19]
8	ALBS	power–assertive	HP-HP	Self needs	0.21	0.21 (0.02)	[0.18;0.25]
9	ALBS	standard–hedonism	HP-HP	Self needs	0.18	0.18 (0.02)	[0.15;0.22]
10	ALBS	standard–power	HP-HP	Self needs	0.36	0.35 (0.02)	[0.32;0.39]
11	ALBS	creativity–hedonism	HP-SC	Self needs	0.13	0.13 (0.02)	[0.09;0.16]
12	ALBS	power–polengagmt	HP-SC	Self needs	0.21	0.2 (0.02)	[0.16;0.25]
13	ALBS	creativity–help	SC-SC	Self needs	0.15	0.15 (0.02)	[0.11;0.18]
14	ALBS	creativity–polengagmt	SC-SC	Self needs	0.13	0.13 (0.02)	[0.1;0.17]
15	ALBS	help–polengagmt	SC-SC	Self needs	0.19	0.18 (0.02)	[0.15;0.22]
16	ALBS	tolerance–polengagmt	SC-SC	Self needs	0.19	0.19 (0.02)	[0.16;0.23]
1	GSP	polactv–trvl	Alt-Alt	Motive for behavior	0.15	0.15 (0.01)	[0.14;0.16]
2	GSP	hlpothers–hvchildrn	Fam-Alt	Motive for behavior–Relationship with others	0.14	0.14 (0.01)	[0.13;0.16]
3	GSP	hppymarriage–hvchildrn	Fam-Fam	Relationship with others	0.28	0.28 (0.01)	[0.26;0.29]
4	GSP	owncar–hppymarriage	Fam-Fam	Relationship with others	0.16	0.17 (0.01)	[0.15;0.18]
5	GSP	owncar–hvchildrn	Fam-Fam	Relationship with others	0.15	0.15 (0.01)	[0.14;0.17]

Table 4. Edges Between Values with Partial Correlations Equal or Greater than |.10| That Are Significant Given a Bootstrapped 95 % CI

Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
6	GSP	affordsmth–polactv	Scc-Alt	Motive for behavior	-0.12	-0.12 (0.01)	[-0.13;-0.1]
7	GSP	affordsmth–trvl	Scc-Alt	Motive for behavior	0.15	0.15 (0.01)	[0.14;0.17]
8	GSP	flflpotent–trvl	Scc-Alt	Motive for behavior	0.12	0.12 (0.01)	[0.11;0.13]
9	GSP	hlpothers–flflpotent	Scc-Alt	Motive for behavior	0.12	0.12 (0.01)	[0.11;0.13]
10	GSP	affordsmth–owncar	Scc-Fam	Motive for behavior–Relationship with others	0.10	0.1 (0.01)	[0.09;0.12]
11	GSP	success–hppymarriage	Scc-Fam	Motive for behavior–Relationship with others	0.10	0.1 (0.01)	[0.09;0.12]
12	GSP	affordsmth–flflpotent	Scc-Scc	Motive for behavior	0.13	0.13 (0.01)	[0.12;0.14]
13	GSP	affordsmth–success	Scc-Scc	Motive for behavior	0.13	0.13 (0.01)	[0.12;0.14]
14	GSP	flflpotent–success	Scc-Scc	Motive for behavior	0.38	0.38 (0.01)	[0.37;0.39]
1	ESS	modest–behave	CON-CON	Survival and welfare of groups	0.14	0.14 (0.02)	[0.1;0.18]
2	ESS	rules–behave	CON-CON	Survival and welfare of groups	0.21	0.22 (0.02)	[0.18;0.25]
3	ESS	rules–tradition	CON-CON	Survival and welfare of groups	0.10	0.1 (0.02)	[0.06;0.13]
4	ESS	safe–behave	CON-CON	Survival and welfare of groups	0.16	0.16 (0.02)	[0.12;0.2]
5	ESS	safe–stronggov	CON-CON	Survival and welfare of groups	0.26	0.26 (0.02)	[0.22;0.3]
6	ESS	stronggov–tradition	CON-CON	Survival and welfare of groups	0.10	0.11 (0.02)	[0.06;0.14]
7	ESS	behave–respect	CON-SEN	Survival and welfare of groups–Needs of people	0.12	0.13 (0.02)	[0.08;0.16]

Table 4. Edges Between Values with Partial Correlations Equal or Greater than |.10| That Are Significant Given a Bootstrapped 95 % CI

Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
8	ESS	safe–adventure	OCH-CON	Needs of people–Survival and welfare of groups	-0.18	-0.19 (0.02)	[-0.21;-0.14]
9	ESS	adventure–fun	OCH-OCH	Needs of people	0.17	0.17 (0.02)	[0.13;0.2]
10	ESS	creative–free	OCH-OCH	Needs of people	0.14	0.14 (0.02)	[0.09;0.18]
11	ESS	creative–newthings	OCH-OCH	Needs of people	0.13	0.14 (0.02)	[0.1;0.17]
12	ESS	goodtime–free	OCH-OCH	Needs of people	0.15	0.16 (0.02)	[0.12;0.19]
13	ESS	goodtime–fun	OCH-OCH	Needs of people	0.38	0.38 (0.02)	[0.35;0.41]
14	ESS	newthings–adventure	OCH-OCH	Needs of people	0.23	0.23 (0.02)	[0.2;0.26]
15	ESS	newthings–fun	OCH-OCH	Needs of people	0.13	0.13 (0.02)	[0.09;0.17]
16	ESS	newthings–goodtime	OCH-OCH	Needs of people	0.15	0.15 (0.02)	[0.11;0.19]
17	ESS	rich–adventure	OCH-SEN	Needs of people	0.12	0.13 (0.02)	[0.09;0.16]
18	ESS	admired–hvsuccess	SEN-SEN	Needs of people	0.29	0.29 (0.02)	[0.26;0.33]
19	ESS	admired–respect	SEN-SEN	Needs of people	0.10	0.1 (0.02)	[0.06;0.14]
20	ESS	hvsuccess–respect	SEN-SEN	Needs of people	0.17	0.17 (0.02)	[0.13;0.21]

Table 4. Edges Between Values with Partial Correlations Equal or Greater than |.10| That Are Significant Given a Bootstrapped 95 % CI

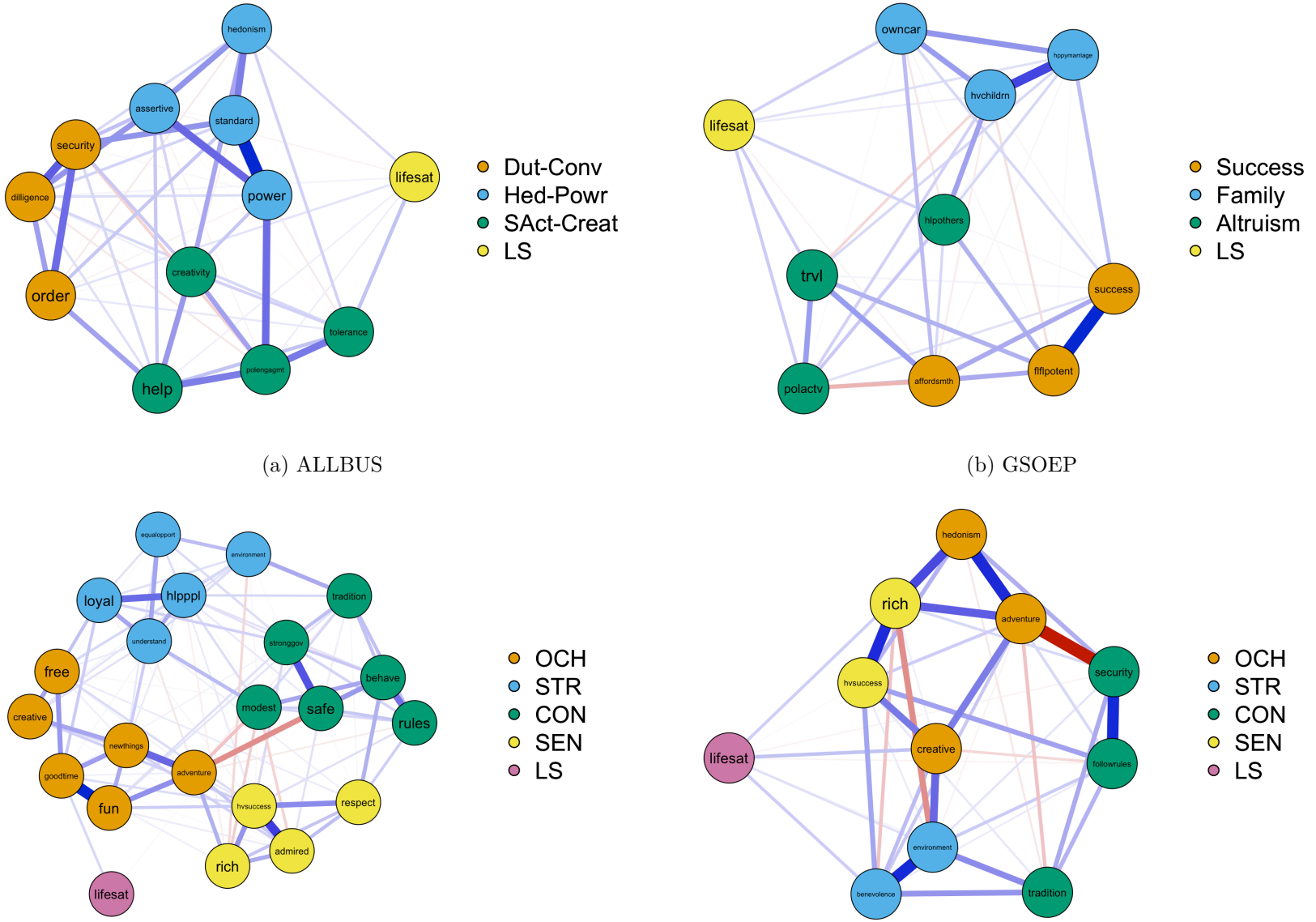
Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
21	ESS	rich–admired	SEN-SEN	Needs of people	0.13	0.13 (0.02)	[0.09;0.16]
22	ESS	rich–hvsuccess	SEN-SEN	Needs of people	0.16	0.17 (0.02)	[0.13;0.19]
23	ESS	environment–tradition	STR-CON	Survival and welfare of groups	0.13	0.13 (0.02)	[0.09;0.17]
24	ESS	understand–modest	STR-CON	Survival and welfare of groups	0.11	0.12 (0.02)	[0.07;0.15]
25	ESS	equalopport–environment	STR-STR	Survival and welfare of groups	0.10	0.11 (0.02)	[0.07;0.14]
26	ESS	equalopport–understand	STR-STR	Survival and welfare of groups	0.14	0.14 (0.02)	[0.1;0.18]
27	ESS	hlpppl–loyal	STR-STR	Survival and welfare of groups	0.22	0.22 (0.02)	[0.18;0.27]
28	ESS	understand–hlpppl	STR-STR	Survival and welfare of groups	0.13	0.13 (0.02)	[0.08;0.17]
29	ESS	understand–loyal	STR-STR	Survival and welfare of groups	0.14	0.14 (0.02)	[0.1;0.18]
1	WVS	security–followrules	CON-CON	Survival and welfare of groups	0.28	0.27 (0.02)	[0.24;0.32]
2	WVS	security–tradition	CON-CON	Survival and welfare of groups	0.11	0.1 (0.02)	[0.06;0.15]
3	WVS	hvsuccess–followrules	CON-SEN	Survival and welfare of groups–Needs of people	0.12	0.11 (0.02)	[0.07;0.16]
4	WVS	security–adventure	OCH-CON	Needs of people–Survival and welfare of groups	-0.31	-0.31 (0.02)	[-0.36;-0.26]

Table 4. Edges Between Values with Partial Correlations Equal or Greater than |.10| That Are Significant Given a Bootstrapped 95 % CI

Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
5	WVS	creative–adventure	OCH-OCH	Needs of people	0.16	0.16 (0.02)	[0.12;0.21]
6	WVS	hedonism–adventure	OCH-OCH	Needs of people	0.27	0.27 (0.02)	[0.23;0.32]
7	WVS	creative–hvsuccess	OCH-SEN	Needs of people	0.16	0.16 (0.02)	[0.12;0.21]
8	WVS	rich–adventure	OCH-SEN	Needs of people	0.20	0.2 (0.02)	[0.15;0.25]
9	WVS	rich–hedonism	OCH-SEN	Needs of people	0.22	0.22 (0.02)	[0.18;0.27]
10	WVS	creative–environment	OCH-STR	Needs of people–Survival and welfare of groups	0.19	0.18 (0.03)	[0.13;0.24]
11	WVS	rich–hvsuccess	SEN-SEN	Needs of people	0.27	0.27 (0.02)	[0.22;0.32]
12	WVS	benevolence–tradition	STR-CON	Survival and welfare of groups	0.13	0.13 (0.04)	[0.06;0.21]
13	WVS	environment–tradition	STR-CON	Survival and welfare of groups	0.14	0.14 (0.02)	[0.09;0.19]
14	WVS	benevolence–hvsuccess	STR-SEN	Survival and welfare of groups–Needs of people	0.11	0.11 (0.04)	[0.04;0.19]
15	WVS	rich–environment	STR-SEN	Survival and welfare of groups–Needs of people	-0.14	-0.14 (0.02)	[-0.19;-0.09]
16	WVS	benevolence–environment	STR-STR	Survival and welfare of groups	0.28	0.28 (0.03)	[0.22;0.35]

Table 5. Edges Between Values and Life Satisfaction with Partial Correlations Equal or Greater than |.01| That Are Significant Given a Bootstrapped 95 % CI

Nr.	Survey	Edge label	Edge link	Existential question	Sample edge	Bootstrapped edge (SD)	Bootstrapped 95% CI
1	ALBS	hedonism–lifesat	LS-HP	Self needs	0.06	0.05 (0.02)	[0.02;0.09]
2	ALBS	order–lifesat	LS-DC	Relationship social environment	0.05	0.04 (0.02)	[0.01;0.08]
3	ALBS	tolerance–lifesat	LS-SC	Self needs	0.09	0.09 (0.02)	[0.05;0.13]
1	GSP	affordsmth–lifesat	LS-Scc	Motive for behavior	-0.02	-0.02 (0.01)	[-0.04;-0.01]
2	GSP	hlpothers–lifesat	LS-Alt	Motive for behavior	0.07	0.07 (0.01)	[0.06;0.09]
3	GSP	hppymarriage–lifesat	LS-Fam	Relationship with other people	0.06	0.06 (0.01)	[0.04;0.07]
4	GSP	hvchildrn–lifesat	LS-Fam	Relationship with other people	0.04	0.04 (0.01)	[0.02;0.05]
5	GSP	owncar–lifesat	LS-Fam	Relationship with other people	0.07	0.07 (0.01)	[0.06;0.09]
6	GSP	polactv–lifesat	LS-Alt	Motive for behavior	0.08	0.08 (0.01)	[0.07;0.1]
7	GSP	trvl–lifesat	LS-Alt	Motive for behavior	0.08	0.08 (0.01)	[0.07;0.09]
1	ESS	goodtime–lifesat	LS-OCH	Needs of people	0.07	0.07 (0.02)	[0.03;0.1]
1	WVS	creative–lifesat	LS-OCH	Needs of people	0.08	0.08 (0.02)	[0.03;0.13]
2	WVS	hedonism–lifesat	LS-OCH	Needs of people	0.06	0.06 (0.03)	[0.01;0.12]



(a) ALLBUS

(b) GSOEP

(c) ESS

(d) WVS

Figure 3. Psychological networks comprising human values and life satisfaction

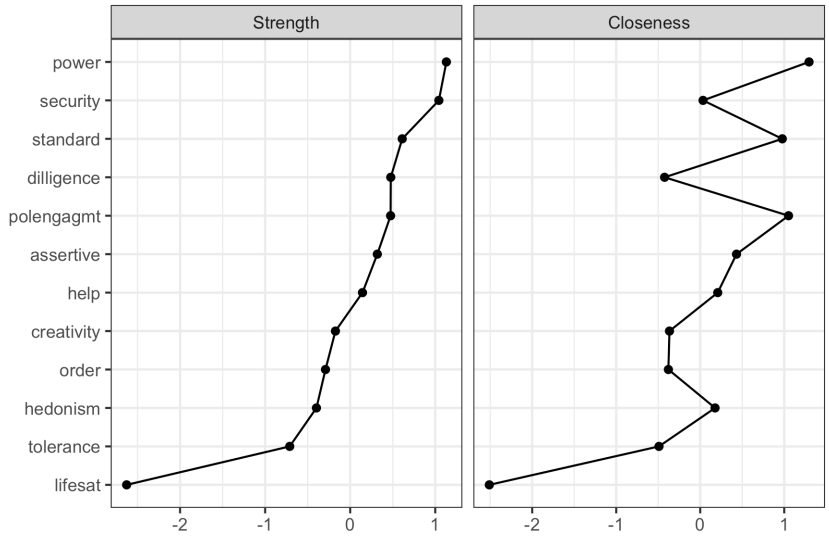
There were 3 edges between values and life satisfaction in ALLBUS, 7 in GSOEP, 1 in ESS, and 2 in WVS with partial correlations equal or greater than $r_{xy.c} = |.01|$ and significant given a bootstrapped 95 % CI (see Table 5). Life satisfaction had a significant edge with each of the three value clusters in ALLBUS as well as at least one significant edge with each of the three theorized value clusters in GSOEP. Notably, life satisfaction had significant edges only with openness to change in both ESS (1 edge) and in WVS (2 edges). Overall, edges between values and life satisfaction had positive partial correlations ranging from $r_{xy.c} = 0.04$ in GSP (hvchildrn–lifesat, 95 % CI [0.02;0.05]; corresponding to existential question Relationship with other people) to $r_{xy.c} = 0.09$ in ALBS (tolerance–lifesat, 95 % CI [0.05;0.13]; corresponding to existential question Self needs). One edge was negative, namely affordsmth–lifesat in GSP ($r_{xy.c} = -0.02$, 95 % CI [-0.04;-0.01]; corresponding to existential question Motive for behavior).

3.1.2. Nodes

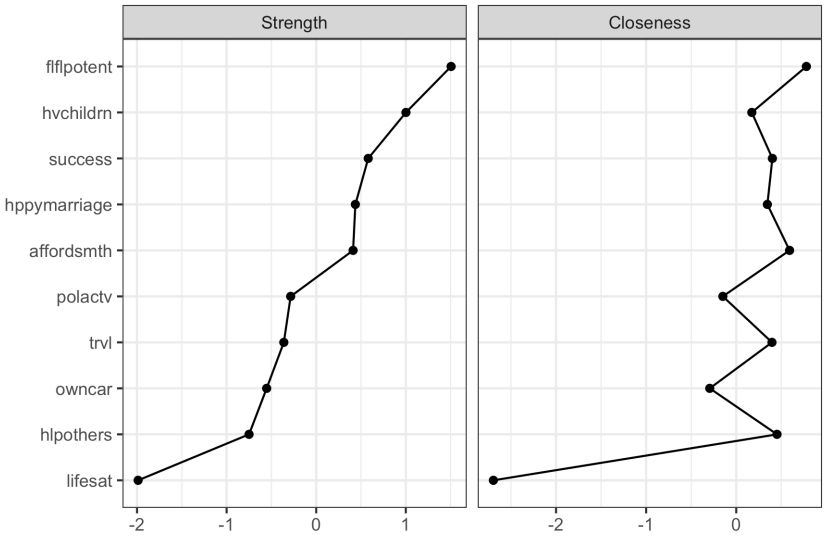
Node strength centrality was above the threshold in all surveys (CS > 0.75). Likewise, node closeness centrality was above the threshold in every instance (CS > 0.67). Node betweenness centrality was below the threshold in GSOEP (CS = 0.21) and WVS (CS = 0.28) but above the threshold in ALLBUS (CS = 0.59) and ESS (CS = 0.59). Node betweenness centrality is not discussed further as it is hard to interpret whether the inconsistency across surveys is random or due to an underlying systematic cause.

Node centrality indicators are presented in Figure 4. The central nodes in view of strength of associations with other nodes in the respective networks were in ALLBUS Power ($z = 1.13$ corresponding to value dimension of Hedonism-Power and the existential question of Self-needs); in GSOEP Fulfil potential ($z = 1.51$ corresponding to value dimension of Success and the existential question of Motive for behavior); in ESS Have success ($z = 1.65$ corresponding to value dimension of Self-enhancement and the existential question of Needs of people); and in WVS Adventure ($z = 1.65$ corresponding to value dimension of Openness to change and the existential question of Needs of people). Nodes with weakest strength centrality were in ALLBUS Tolerance ($z = -0.71$ corresponding to value dimension of Selfactualization-Creativity and the existential question of Self-needs); in GSOEP Help others ($z = -0.75$ corresponding to value dimension of Altruism and the existential question of Motive for behavior); in ESS Equal opportunities ($z = -1.33$ corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups); and in WVS Tradition ($z = -0.83$ corresponding to value dimension of Conservation and the existential queston of Survival and welfare of groups).

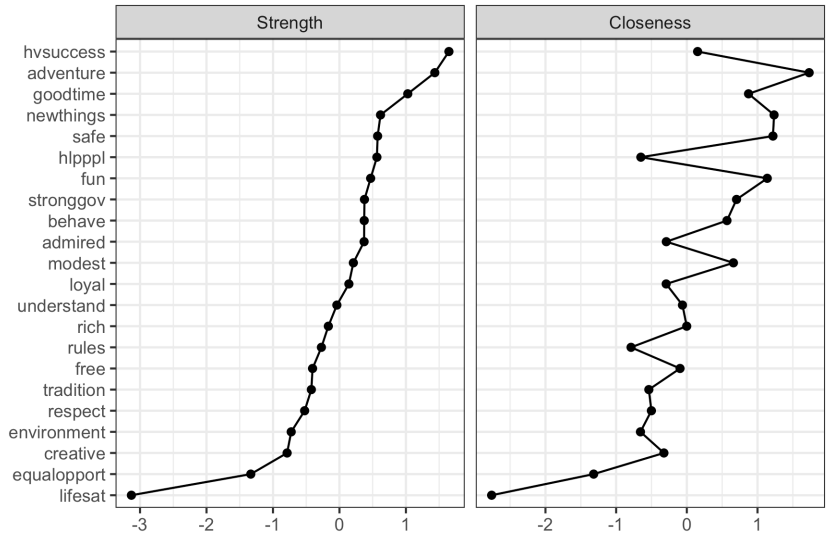
Life satisfaction had the weakest node strength centrality in all surveys (ALLBUS, $z = -2.63$; GSOEP, $z = -1.99$; ESS, $z = -3.13$; and WVS, $z = -2.27$).



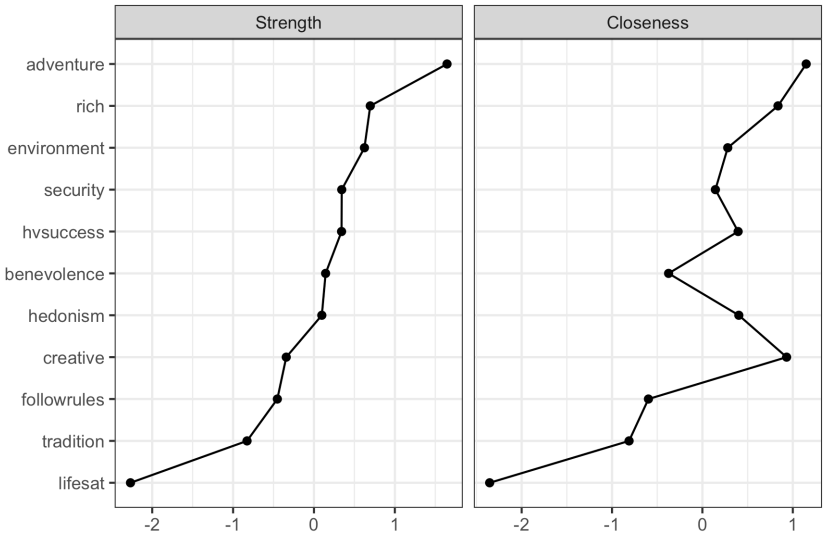
(a) ALLBUS



(b) GSOEP



(c) ESS



(d) WVS

Figure 4. Node centrality indicators for overall networks

The central nodes in view of closeness of associations with other nodes in the respective networks were in ALLBUS Power (z = 1.3 corresponding to value dimension of Hedonism-Power and the existential question of Self-needs); in GSOEP Fulfil potential (z = 0.78 corresponding to value dimension of Success and the existential question of Motive for behavior); in ESS Adventure (z = 1.73 corresponding to value dimension of Openness to change and the existential question of Needs of people); and in WVS Adventure (z = 1.15 corresponding to value dimension of Openness to change and the existential question of Needs of people). Nodes with weakest closeness centrality were in ALLBUS Tolerance (z = -0.49 corresponding to value dimension of Selfactualization-Creativity and the existential question of Self-needs); in GSOEP Own a car (z = -0.29 corresponding to value dimension of Family and the value dimension of Relationship with other people); in ESS Equal opportunities (z = -1.32 corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups); and in WVS Tradition (z = -0.81 corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups).

Life satisfaction had also the weakest node closeness centrality in all surveys (ALLBUS, z = -2.51; GSOEP, z = -2.7; ESS, z = -2.76; and WVS, z = -2.35).

3.2. *Network comparisons*

Table 6 provides an overview of all edges between life satisfaction and values that varied between genders, age, and educational groups. Table 7 provides an overview of all nodes with variant node centrality indices between genders, age, and educational attainment groups. Visualization of group specific estimated networks and group specific centrality indices are provided in the Supplement, Figure 5 – Figure 16.

3.2.1. Gender

The overall network structure was invariant in ALLBUS (M = 0.63, p = 0.44), ESS (M = 0.58, p = 0.44), and WVS (M = 0.34, p = 0.8), but it was variant in GSOEP (M = 0.11, p = 0.01). The global node strength was invariant in ALLBUS (4.67, 4.04; S = 0.63, p = 0.26), ESS (9.47, 8.9; S = 0.58, p = 0.3), and WVS (3.79, 3.45; S = 0.34, p = 0.65), and in GSOEP (3.48, 3.37; S = 0.11, p = 0.26).

Across the surveys, 4 edges between life satisfaction and values were variant between genders (see Table 6). These were in ALLBUS lifesat–dilligence (E = 0.07, p = 0.05) corresponding to value dimension of Duty-Convention and the existential question of Relationship others; in GSOEP lifesat–success (E = 0.04, p = 0.01) corresponding to value dimension of Success and the existential question of Motive for behavior; and in ESS there were 2: lifesat–understand (E = 0.04, p = 0.04) corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups, and lifesat–free (E = 0.04, p = 0.05) corresponding to value dimension of Openness to change and the existential question of Needs of people. All edges were invariant in WVS.

Considering all surveys together (see Table 7), there were 5 nodes that had at least one node centrality indicator variant in view of strength or of closeness.

When comparing men with women, the following nodes were central in view of strength

of association. In ALLBUS, Assertive corresponding to value dimension of Hedonism-Power and the existential question of Self-needs (delta = 0.263, $p = 0.03$); and in GSOEP the node with the strongest centrality indicator was Have children corresponding to value dimension of Family and the existential question of Relationship with other people (delta = 0.225, $p = 0.01$). No nodes were found in ESS and WVS with variant strength centrality indicators.

When comparing men with women, these nodes were central in view of closeness of association. In ESS, Loyal corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups (delta = 0.001, $p = 0.03$); and in GSOEP was Politically active corresponding to value dimension of Altruism and the existential question of Motive for behavior (delta = 0.002, $p = 0.01$). No nodes were found in ALLBUS and WVS with variant closeness node centrality indicators.

Table 6. Variant Edges Life Satisfaction—Values For Comparisons on Gender, Age, and Educational Attainment in All Surveys

Survey	Comparison	Edge	Value dimension	Existential question	Test statistic E	p-value
ALBS	Male vs. Female	lifesat–dilligence	Duty-Convention	Relationship others	0.07	0.05
GSP	Male vs. Female	lifesat–success	Success	Motive for behavior	0.04	0.01
ESS	Male vs. Female	lifesat–understand	Self-transcendence	Survival and welfare of groups	0.04	0.04
ESS	Male vs. Female	lifesat–free	Openness to change	Needs of people	0.04	0.05
ALBS	Middle age vs. Young age	lifesat–dilligence	Duty-Convention	Relationship others	0.08	0.04
ALBS	Middle age vs. Old age	lifesat–standard	Hedonism-Power	Self-needs	0.06	0.03
ALBS	Middle age vs. Old age	lifesat–creativity	Selfactualization-Creativity	Self-needs	0.05	0.03
ALBS	Middle age vs. Old age	lifesat–help	Selfactualization-Creativity	Self-needs	0.06	0.05
GSP	Middle age vs. Young age	lifesat–owncar	Family	Relationship with other people	0.04	0.02
GSP	Middle age vs. Young age	lifesat–hppymarriage	Family	Relationship with other people	0.04	0.05
GSP	Middle age vs. Young age	lifesat–polactv	Altruism	Motive for behavior	0.03	0.02
GSP	Middle age vs. Young age	lifesat–trvl	Altruism	Motive for behavior	0.04	0.01
GSP	Middle age vs. Old age	lifesat–flflpotent	Success	Motive for behavior	0.05	0.01
GSP	Middle age vs. Old age	lifesat–hppymarriage	Family	Relationship with other people	0.07	0.01
GSP	Middle age vs. Old age	lifesat–trvl	Altruism	Motive for behavior	0.04	0.03
ESS	Middle age vs. Old age	lifesat–hlpppl	Self-transcendence	Survival and welfare of groups	0.04	0.05
ESS	Middle age vs. Old age	lifesat–environment	Self-transcendence	Survival and welfare of groups	0.07	0.02
ALBS	Low vs. Intermediate education	lifesat–assertive	Hedonism-Power	Self-needs	0.08	0.01

Table 6. Variant Edges Life Satisfaction—Values For Comparisons on Gender, Age, and Educational Attainment in All Surveys

Survey	Comparison	Edge	Value dimension	Existential question	Test statistic E	p-value
ALBS	Low vs. High education	lifesat–security	Duty-Convention	Relationship others	0.05	0.02
GSP	Low vs. Intermediate education	lifesat–flflpotent	Success	Motive for behavior	0.04	0.01
GSP	Low vs. Intermediate education	lifesat–hppymarriage	Family	Relationship with other people	0.07	0.01
GSP	Low vs. High education	lifesat–hppymarriage	Family	Relationship with other people	0.08	0.01
ESS	Low vs. Intermediate education	lifesat–admired	Self-enhancement	Needs of people	0.05	0.01
ESS	Low vs. Intermediate education	lifesat–modest	Conservation	Survival and welfare of groups	0.06	0.05
ESS	Low vs. High education	lifesat–safe	Conservation	Survival and welfare of groups	0.01	0.03
ESS	Low vs. High education	lifesat–goodtime	Openness to change	Needs of people	0.08	0.02
ESS	Low vs. High education	lifesat–environment	Self-transcendence	Survival and welfare of groups	0.06	0.01

Table 7. Estimations for Node Centrality Differences Between Compared Groups in All Surveys

Nr.	Survey	Comparison	Value item	Value dimension	Existential question	Centrality	Delta	p-value
1	ALBS	Male vs. Female	Assertive	Hedonism-Power	Self-needs	strength	0.263	0.03
2	ESS	Male vs. Female	Loyal	Self-transcendence	Survival and welfare of groups	closeness	0.001	0.03
3	GSP	Male vs. Female	Have children	Family	Relationship with other people	strength	0.225	0.01
4	GSP	Male vs. Female	Travel	Altruism	Motive for behavior	strength	-0.109	0.01
5	GSP	Male vs. Female	Politically active	Altruism	Motive for behavior	closeness	0.002	0.01
1	ALBS	Middle age vs. Old age	Power	Hedonism-Power	Self-needs	strength	-0.204	0.02
2	ESS	Middle age vs. Old age	Modest	Conservation	Survival and welfare of groups	strength	-0.395	0.02
3	ESS	Middle age vs. Old age	Loyal	Self-transcendence	Survival and welfare of groups	strength	-0.343	0.02
4	ESS	Middle age vs. Old age	New things	Openness to change	Needs of people	strength	-0.244	0.01
5	ESS	Middle age vs. Old age	Have fun	Openness to change	Needs of people	strength	-0.206	0.05
6	ESS	Middle age vs. Young age	Strong government	Conservation	Survival and welfare of groups	strength	0.205	0.04
7	GSP	Middle age vs. Old age	Travel	Altruism	Motive for behavior	strength	-0.187	0.01
8	GSP	Middle age vs. Old age	Afford something	Success	Motive for behavior	strength	0.151	0.03
9	GSP	Middle age vs. Old age	Success	Success	Motive for behavior	closeness	-0.003	0.01
10	GSP	Middle age vs. Old age	Fulfil potential	Success	Motive for behavior	closeness	-0.003	0.01

Table 7. Estimations for Node Centrality Differences Between Compared Groups in All Surveys

Nr.	Survey	Comparison	Value item	Value dimension	Existential question	Centrality	Delta	p-value
11	GSP	Middle age vs. Old age	Happy marriage	Family	Relationship with other people	closeness	-0.002	0.01
12	GSP	Middle age vs. Old age	Travel	Altruism	Motive for behavior	closeness	-0.002	0.01
13	GSP	Middle age vs. Old age	NA	Life satisfaction	Life satisfaction	closeness	-0.001	0.03
14	GSP	Middle age vs. Young age	Have children	Family	Relationship with other people	strength	-0.241	0.01
15	GSP	Middle age vs. Young age	NA	Life satisfaction	Life satisfaction	strength	0.189	0.01
16	GSP	Middle age vs. Young age	Fulfil potential	Success	Motive for behavior	strength	-0.126	0.01
17	GSP	Middle age vs. Young age	Travel	Altruism	Motive for behavior	strength	-0.089	0.05
18	GSP	Middle age vs. Young age	NA	Life satisfaction	Life satisfaction	closeness	0.002	0.01
19	GSP	Middle age vs. Young age	Politically active	Altruism	Motive for behavior	closeness	0.001	0.02
20	GSP	Middle age vs. Young age	Travel	Altruism	Motive for behavior	closeness	-0.001	0.03
21	GSP	Middle age vs. Young age	Own a car	Family	Relationship with other people	closeness	0.001	0.05
22	GSP	Middle age vs. Young age	Success	Success	Motive for behavior	closeness	-0.001	0.01
23	WVS	Middle age vs. Young age	Follow rules	Conservation	Survival and welfare of groups	strength	0.336	0.02
1	ALBS	Low vs. High education	Standard in life	Hedonism-Power	Self-needs	strength	-0.307	0.01
2	ESS	Low vs. High education	Help people	Self-transcendence	Survival and welfare of groups	strength	0.267	0.04
3	ESS	Low vs. High education	Rich	Self-enhancement	Needs of people	strength	-0.262	0.05
4	ESS	Low vs. High education	Strong government	Conservation	Survival and welfare of groups	strength	0.223	0.04

Table 7. Estimations for Node Centrality Differences Between Compared Groups in All Surveys

Nr.	Survey	Comparison	Value item	Value dimension	Existential question	Centrality	Delta	p-value
5	ESS	Low vs. Intermediate education	Admired	Self-enhancement	Needs of people	strength	0.283	0.04
6	GSP	Low vs. High education	Success	Success	Motive for behavior	strength	0.280	0.01
7	GSP	Low vs. High education	Afford something	Success	Motive for behavior	strength	-0.206	0.03
8	GSP	Low vs. High education	Help others	Altruism	Motive for behavior	strength	-0.180	0.04
9	GSP	Low vs. High education	Travel	Altruism	Motive for behavior	strength	0.156	0.03
10	GSP	Low vs. High education	Afford something	Success	Motive for behavior	closeness	-0.003	0.01
11	GSP	Low vs. High education	Happy marriage	Family	Relationship with other people	closeness	0.002	0.04
12	GSP	Low vs. Intermediate education	Success	Success	Motive for behavior	strength	0.262	0.01
13	GSP	Low vs. Intermediate education	Travel	Altruism	Motive for behavior	strength	0.143	0.02
14	GSP	Low vs. Intermediate education	Happy marriage	Family	Relationship with other people	closeness	0.002	0.05
15	GSP	Low vs. Intermediate education	Success	Success	Motive for behavior	closeness	0.001	0.05

3.2.2. Age

When comparing the middle age group (41-60) with the young age group (18-40), the overall network structure was invariant in ALLBUS ($M = 0.15$, $p = 0.18$), ESS ($M = 0.56$, $p = 0.18$), and WVS ($M = 1.08$, $p = 0.19$), but it was variant in GSOEP ($M = 0.1$, $p = 0.01$). The global node strength was invariant in ALLBUS (4.13, 3.98; $S = 0.15$, $p = 0.73$), ESS (8.89, 8.33; $S = 0.56$, $p = 0.39$), and WVS (3.82, 2.74; $S = 1.08$, $p = 0.16$), and in GSOEP (3.44, 3.54; $S = 0.1$, $p = 0.4$).

Meanwhile, when comparing the middle age group (41-60) with the old age group (61+), the overall network structure was invariant in ALLBUS ($M = 0.11$, $p = 0.91$), ESS ($M = 1.45$, $p = 0.3$), and WVS ($M = 0.47$, $p = 0.54$), but variant in GSOEP ($M = 0.01$, $p = 0.01$). The global node strength was invariant in ALLBUS (4.13, 4.24; $S = 0.11$, $p = 0.77$), ESS (8.89, 10.34; $S = 1.45$, $p = 0.12$), and WVS (3.82, 3.35; $S = 0.47$, $p = 0.5$), and in GSOEP (3.44, 3.43; $S = 0.01$, $p = 0.99$).

Across the surveys, 13 edges between life satisfaction and values were variant between age groups (see Table 6).

Regarding the comparison middle age vs. young age, there were 1 variant edge in ALLBUS (lifesat–dilligence, $E = 0.08$, $p = 0.04$; corresponding to value dimension of Duty-Convention and the existential question of Relationship others); 4 in GSOEP (edge with the highest E-test value was lifesat–owncar, $E = 0.04$, $p = 0.02$; corresponding to value dimension of Family and the existential question of Relationship with other people). All edges were invariant in ESS and WVS.

Regarding the comparison middle age vs. old age, there were 3 variant edges in ALLBUS (edge with the highest E-test value was lifesat–standard, $E = 0.06$, $p = 0.03$; corresponding to value dimension of Hedonism-Power and the existential question of Self-needs); 3 in GSOEP (edge with the highest E-test value was lifesat–hppymarriage, $E = 0.07$, $p = 0.01$; corresponding to value dimension of Family and the existential question of Relationship with other people); 2 in ESS (edge with the highest E-test value was lifesat–environment, $E = 0.07$, $p = 0.02$; corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups). All edges were invariant in WVS.

Considering all surveys and all age-based comparisons together (see Table 7), there were 23 nodes that had at least one node centrality indicator variant in view of strength or of closeness.

When comparing the middle age group with the young age group, the following nodes were variant in view of strength of association. In ESS, Strong government corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups (delta = 0.205, $p = 0.04$); in GSOEP the node with the strongest centrality indicator was Have children corresponding to value dimension of Family and the existential question of Relationship with other people (delta = -0.241, $p = 0.01$); and in WVS Follow rules corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups (delta = 0.336, $p = 0.02$). No nodes were found in ESS with variant strength centrality indicators. Moreover, the following nodes were variant in view of closeness of association. In GSOEP, the node with strongest centrality indicator was Politically active corresponding to value dimension of Family and the existential question of Motive for behavior (delta = 0.001, $p = 0.02$). No nodes were found in ALLBUS, ESS and WVS with variant closeness centrality indicators.

When comparing the middle age group with the old age group, the following nodes were variant in view of strength of association. In ALLBUS, Power corresponding to value dimension of Hedonism-Power and the existential question of Self-needs (delta = -0.204, $p = 0.02$); in ESS the node with the strongest centrality indicator was Modest corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups (delta = -0.395, $p = 0.02$); and in GSOEP the node with the strongest centrality indicator was Travel corresponding to value dimension of Altruism and the existential question of Motive for behavior (delta = -0.187, $p = 0.01$). No nodes were found in WVS with variant strength centrality indicators. Furthermore, the following nodes were variant in view of closeness of association. In GSOEP, the node with the strongest centrality indicator was Success corresponding to value dimension of Success and the existential question of Motive for behavior (delta = -0.003, $p = 0.01$). No nodes were found in ALLBUS, ESS and WVS with variant closeness centrality indicators.

3.2.3. Education attainment

Comparing the groups with low and middle education (high in WVS respectively), the overall network structure was invariant in ALLBUS ($M = 0.19$, $p = 0.1$), ESS ($M = 0.46$, $p = 0.39$), and WVS ($M = 0.41$, $p = 0.58$), but it was variant in GSOEP ($M = 0.12$, $p = 0.05$). The global node strength was invariant in ALLBUS (4.31, 4.5; $S = 0.19$, $p = 0.65$), ESS (9.65, 9.19; $S = 0.46$, $p = 0.53$), and WVS (3.83, 4.24; $S = 0.41$, $p = 0.73$), and in GSOEP (3.5, 3.39; $S = 0.12$, $p = 0.6$).

Meanwhile, comparing the groups with low and high education (very high in WVS respectively), the overall network structure was invariant in ALLBUS ($M = 0.08$, $p = 0.16$), and WVS ($M = 0.89$, $p = 0.49$), but variant in ESS ($M = 0.46$, $p = 0.02$) and GSOEP ($M = 0.11$, $p = 0.02$). The global node strength was invariant in ALLBUS (4.31, 4.5; $S = 0.19$, $p = 0.65$), ESS (9.65, 9.19; $S = 0.46$, $p = 0.54$), and WVS (3.83, 2.94; $S = 0.89$, $p = 0.31$), and in GSOEP (3.5, 3.61; $S = 0.11$, $p = 0.62$).

Across the surveys, 10 edges between life satisfaction and values were variant between groups with different levels of education (see Table 6).

Regarding the comparison between groups with low and middle levels of education (high levels in WVS respectively), there were 1 variant edge in ALLBUS (lifesat–assertive, $E = 0.08$, $p = 0.01$; corresponding to value dimension of Hedonism-Power and the existential question of Self-needs); 2 in GSOEP (edge with the highest E-test value was lifesat–modest, $E = 0.06$, $p = 0.05$; corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups); 2 in ESS (edge with the highest E-test value was lifesat–modest, $E = 0.06$, $p = 0.05$; corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups). All edges were invariant in WVS.

Meanwhile, regarding the comparison between groups with low and high levels of education (very high levels in WVS respectively), there were 1 variant edge in ALLBUS (lifesat–hppymarriage, $E = 0.08$, $p = 0.01$; corresponding to value dimension of Family and the existential question of Relationship with other people); 1 variant edge in GSOEP (lifesat–hppymarriage, $E = 0.08$, $p = 0.01$; corresponding to value dimension of Family and the existential question of Relationship with other people); 2 variant edge in ESS (edge with highest E-test value was lifesat–modest, $E = 0.06$, $p = 0.05$; corresponding to value dimension of Conservation and the existential question of Survival and welfare of groups). All edges were invariant in WVS.

Considering all surveys and all education-based comparisons together (see Table 7), there were 15 nodes that had at least one node centrality indicator variant in view of strength or of closeness.

When comparing the group with low levels of education and the group with intermediary levels of education (high levels of education in WVS respectively), the following nodes were variant in view of strength of association. In ESS, Admired corresponding to value dimension of Self-enhancement and the existential question of Needs of people (delta = 0.283, $p = 0.04$); in GSOEP the node with the strongest centrality indicator was Success corresponding to value dimension of Success and the existential question of Motive for behavior (delta = 0.262, $p = 0.01$). No nodes were found in ALLBUS and WVS with variant strength centrality indicators. Moreover, the following nodes were variant in view of closeness of association. In GSOEP, the node with strongest centrality indicator was Happy marriage corresponding to value dimension of Success and the existential question of Relationship with other people (delta = 0.002, $p = 0.05$). No nodes were found in ALLBUS, ESS and WVS with variant closeness centrality indicators.

Moreover, when comparing the group with low levels of education and the group with high levels of education (very high levels of education in WVS respectively), the following nodes were variant in view of strength of association. In ALLBUS, Standard in life corresponding to value dimension of Hedonism-Power and the existential question of Self-needs (delta = -0.307, $p = 0.01$); in GSOEP the node with the strongest centrality indicator was Success corresponding to value dimension of Success and the existential question of Motive for behavior (delta = 0.28, $p = 0.01$); in ESS the node with the strongest centrality indicator was Help people corresponding to value dimension of Self-transcendence and the existential question of Survival and welfare of groups (delta = 0.267, $p = 0.04$). No nodes were found in WVS with variant strength centrality indicators. Regarding closeness node centrality, the following nodes were variant. In GSOEP, the node with the strongest centrality indicator was Afford something corresponding to value dimension of Success and the existential question of Motive for behavior (delta = -0.003, $p = 0.01$). No nodes were found in ALLBUS, ESS and WVS with variant closeness centrality indicators.

4. Discussion

Varying theories address the link between existential questions in people and human values as guiding principles in life (Schwartz 1992; Klages 1984; F. R. Kluckhohn and Strodtbeck 1961). Taking advantage of methodological and theoretical advances in fields of abnormal psychology and network analysis (McNally 2016, 2021; Borsboom 2008), I argued that value motivational goals are constitutive of psychological network systems that differ across demographic groups experiencing common existential obstacles to wellbeing. To tease this information out, I suggested that life satisfaction is an indicator of (un)resolved existential questions in people. I examined differences due to age, gender, and education attainment in psychological network systems comprising values and life satisfaction captured in three value theories measured in four representative surveys in Germany between 2012-2014. Overall, I expected specific (i.e. node and edges) but not global differences (i.e. structure) in the value systems of these groups. Moreover, I expected to uncover previously unobserved insights into the dynamic interrelations between value motivational goals and between values and life satisfaction in people in

general and across demographic groups.

The present findings uncover a dynamic interrelationship between value motivational goals in addition to specific value ideals being more central to the value system of a group. Furthermore, the present research contributes to values research with a discussion of the contextual embedding of value systems; The experience of existential questions in people is a dynamic process resulting in pursued values important for wellbeing.

4.1. *There are other worlds out there*

Three existential questions are addressed across the theories considered in the present research – Theory of Basic Human Values (TBHV, Schwartz 1992), Values Orientation Theory (VOT, F. R. Kluckhohn and Strodtbeck 1961) and Value Synthesis Theory (VST, Klages 1984) – namely the needs of people as independent organisms[3] and the nature of their relationship with society and the environment (note that these latter two are not always clearly disentangled). The emphasis of these existential needs is on the individual and his or her relationships with the material world. This take on the existential questions that concerns humanity is rooted in the Western philosophy, especially the Kantian school of thought.

In his seminal work "The three critiques" (German version, Kant 1971/2021), Immanuel Kant advocated for critical thinking moving away from religious beliefs rooted in the non-material. Following, several philosophical streams evolved over the years including the scientific method with the seminal work of Karl Popper who reasoned that science should be objective and based on material evidence rather than on the non-material (Popper 1935/2002). Premonition (e.g. Bem 2011), for instance, is pseudo-science because there is no instrument devised (yet) that can reliably and validly capture said phenomena.

However, to quote Stephen King, there are other worlds out there. Critical perspectives on the psychological discipline (Comas-Diaz, Adames, and Chavez-Duenas 2024; Dudgeon, Bray, and Walker 2023; Thomas 2014) argue that current knowledge on human behavior is not truly universal as it is rooted in theories and data that insufficiently accommodate perspectives other than the Western one. This discussion highlights an interesting paradox concerning theory and research on human values. For instance, one of the first modern value theories – the VOT (C. Kluckhohn 1949) – drew on anthropological research carried out with the Navajo, Native American people of the Southwest of the United States. Although existential questions of time and space had initially been proposed as a result, these were dropped from further theorizing due to lacking adequate methodology (cf. Hills 2002). Value theorists have since considered the notion of time as a question of societal organization – long term orientation, for example (e.g. Hofstede, Hofstede, and Minkov 2010) – but only marginally considered time as an existential question in individuals.

The Western world, including Germany, is highly modernized and secularized despite several religious denominations co-existing and influencing societal organization and human behavior. Conversely, spirituality is strongly culturally embedded in specific other contexts, for instance, in the Amazonian regions of Ecuador and Brazil (Naranjo 1976; Monteiro de Barros et al. 2022), two regions with development indices considerably

[3]The VOT addresses this existential question as Motive for behavior, F. R. Kluckhohn and Strodtbeck (1961)

lower than Germany's very high level. Common among adherents to spirituality is the belief in life after death thus time has somewhat a different meaning to them than, for example, agnostics or people from strong secularized societies. In fact, the entire premise of the Postmodernization theory by Inglehart and colleagues (Inglehart 1977; Inglehart, Basanez, and Moreno 2008) is that societal change motivated by economic growth shifts the interest in people from pursuit of traditional non-materialistic beliefs such as the religious and spiritual ones to postmodern materialistic beliefs such as self-determination.

Researchers in Brazil note the cultural embedding of spirituality in a value theory that reflects this reality more accurately – the Functional Theory of Human Values (FTHV, Gouveia, Milfont, and Guerra 2014a). There is known divergence of opinions between originators of the FTHV and TBHV (Gouveia, Milfont, and Guerra 2014b; Schwartz 2014) especially in view of whether one theory econmpasses the other or whether each theory brings about unique insights into human values. Moreover, at least concerning the present value theories, there has been a convergence over the years toward the value orientations and measurement philosophy devised by proponents of the TBHV (see Hills 2002; Headey 2008; also see Smallenbroek et al. 2023).

The universality principle addressed in the modern value theories is shaped by the Western school of thought which may be ill equipped in systematic observations of human values as informed by existential questions pertinent in other cultural contexts. The modern value theories may be universal to a specific cultural sphere but the evidence is unsystematic in addition to being insufficient to warrant a *universal* status indeed. Since the present research was carried out in one country belonging to the Western world, there is a high applicability of the presently considered theories. Research carried out in other cultural spheres however might not be able to tease out the entire dynamics from existential questions and values in people.

4.2. *Central value motivational goals*

The present results show that central to the value systems in the German population are value ideals referring to the self and self-determination which derive from the existential question of self-needs, theory proposes (F. R. Kluckhohn and Strodtbeck 1961; Klages 1984; Schwartz 1992). Not only are value motivational goals of power, fulfilling one's potential and adventure most likely to have the strongest un-mediated impact on other value motivational goals but they also are most likely to be impacted and therefore quicker (relatively seen) to change contingent on changes in other value motivational goals.

These results bring novel insights into human values and their contextualization, and they are *not* alternative evidence for value prioritization. There are two reasons for this. First, value item measurement was not person-centered because that is recommended only when using them as predictors in model estimation; Person-centering is standard procedure in the literature to arrive at value preference relative to all other values (e.g. Schwartz 2003). Second, node centrality was calculated based on partial correlations of the focal node with all other nodes included in network estimation. This approach was not bound to theoretical dimensionality of presently used theories thus it allowed for a data-driven estimation of node centrality considering all the connections within and

across "value dimensions".[4]

Roughly between 30 % and 40 % of the German population engages politically and civicaly with broader societal issues (Simonson et al. 2021; Braun 2014) corroborating results from values research that other oriented values such as universalism and benevolence are strongly preferred by the population overall (Witte, Stanciu, and Boehnke 2020). Paradoxically, it would appear, the present results suggest that central to the value system in the German population are values reflecting existential needs of people thus value motivational goals highlighting self-needs. Although the overall population has a strong orientation towards the wellbeing of others, self-needs are central to values system in the German population. What might this mean substantially?

One interpretation is that there is separation in the German society between public duties and personal needs thus the self is construed outside the larger social sphere– Germany is high on Individualism (Hofstede, Hofstede, and Minkov 2010). Embedding of the self socially is common in more collectivist contexts. Notably, individualistic practices such as those emphasized here are on the rise globally motivated by socioeconomic growth (Santos, Varnum, and Grossman 2017). Reminiscent of Maslow's hierarchy of needs (Maslow 1943), the identified central value motivational goals of power, fulfilling one's potential and adventure are particularly influential in the pursuit of all other values by Germans. These value motivational goals are strongly associated with others and they are particularly sensitive to changes in other value goals. These value goals can be pursued considering the enabling socio-economic context in the country and their contents, whether or not the highest priority values, convey a readiness for the pursuit of other goals more intensively. In other words, as long as these value motivational goals are resolved (people are satisfied or acceptant of their value pursuit outcome), the pursuit of other value goals follows. On the other hand however, as long as the identified central values are not resolved (people are disatisfied or rejecting the value pursuit outcome), the pursuit of the other value goals is halted and possibly sanctioned internally through processes of cognitive dissonance (McGrath 2017) and enhanced value tension (Schwartz 1992).

4.3. *Dynamics between value motivational goals*

Significant value edges were found most frequently between value motivational goals belonging to one dimension as theorized in the respective theories (see colored node clustering, Figure 3). The only case where the opposite was true – more value edges across theorized value dimensions – were the WVS data that measured human values in the TBHV (Schwartz 1992). This is not too surprising since past research has unearthed serious limitations of this 10-items instrument (e.g. Held et al. 2009) resulting in discontinuing its use in the WVS in the most recent rounds.

Considering the significant edges across value clusters, the strongest edges were found in view of value motivational goals derived from one existential question. In three out of four cases, the existential question was in view of self-needs of people (ALLBUS, GSOEP and WVS), with the existential question of relationship with others including survival

[4] Although value dimensionality is not a precise term to use in the method of psychological network systems, it is lingua understood by most. To be more accurate, in the present research value dimensionality refers to theoretical propositions whereas narrow and strongly inter-connected clusters of nodes is the empirical corresponding term. See for example the colored clusters in Figure 3.

and welfare of groups being the case in ESS. Substantially, this evidence suggests that although value motivational goals may be summarized into specific dimensions, they mostly inherent the undertone of the existential question from which they derive, which is clearly observable in groups of people.

There were edges ($n = 13$) between value motivational goals beyond the confines of one existential question, a finding observed across the surveys. Past research has shown that value motivational goals (i.e. value item questions) do not perfectly load on the theorized value dimensions (i.e. factors) (e.g. Schwartz and Boehnke 2004; Schwartz and Cieciuch 2022). In fact, in scale construction efforts that draw on the IRT paradigm, the standard method in the social sciences, there are varying degrees of empirical fit to theoretical propositions but never a perfect one since measurement error can never be entirely controlled for (e.g. Witte, Stanciu, and Zenker 2022; Witte and Stanciu 2023). Cross-loadings of value items on multiple factors was interpreted as noise or measurement error previously. The present study suggests that what was previously considered methodological error might be substantial information in view of a dynamic interplay between value ideals which current theories are yet to accommodate.

One insight can be drawn as a result. For instance, the pursuit of high standards of living (self-needs) is strongly impacted by striving for security derived from fitting relationships with others (VST, Klages 1984). The goal of having children thus an orientation toward kinship is strongly associated with the motivation to help others (VOT, F. R. Kluckhohn and Strodtbeck 1961). The personal ideal of being respected by others is strongly dependent on all others behaving appropriately (TBHV, Schwartz 1992). Finally, the personal goal of being creative and doing things one's way is strongly associated with caring for the environment and protecting resources (TBHV, Schwartz 1992). These observations match core postulates of situationalist theories of cognition and behavior, for instance, situated cognition (Brown, Collins, and Duguid 1989; Wilson and Golonka 2023), embodied cognition (Lynott, Connell, and Holler 2013), and the person-environment fit idea (Vianen 2018; Kandler et al. 2024): An individual's cognition and behavior are indistinguishable from the social domain and environment.

Changes in human values (and personality for that matter) is possible in view of experienced life events throughout the lifespan and changes in contexts of living (Smallenbroek et al. 2023; Bühler et al. 2024; Daniel et al. 2022; Tormos, Vauclair, and Dobewall 2017). The present results suggest that not only changes in value pursuit is possible throughout the lifespan, but also in the dynamics between value motivational goals. Certain motivational goals may be pursued contingent on enabling contexts, or at the least an assumption that the surrounding social and natural environment promote the ideal value pursuit. For some people, safe environments begets the pursuit of high standards of living. For others, an orientation toward kinship promotes helping others. And so on. Once the established enabling contexts erode, the value dynamics may change accordingly. (Perceptions of) Unsafe environments may threaten the pursuit of high standards of living in some people who might resort to protective mechanisms against such threats. (Perceptions of) Blurring kinship identities may re-direct the attention from helping others to re-defining kinship first.

In other words, dynamics between values of people might not be fixed but vulnerable to acute faced existential questions: What are my needs as an individual, how do I relate with others in society, and how do I relate with the environment. One might be satisfied or at least content with one's answers to such questions. However, one might also be dissatisfied with one's answers resulting in strategies to resolving existent

dissonance or value tensions. Erik Erikson – the famous developmental psychologist – observed that people develop a sense of self and independence during adolescence, the identity formation stage (Erikson 1994). In light of the present findings, it might be that (perceived) erosions in the established enabling contexts of value pursuit can trigger processes of identity re-formation matched or caused (test for causality is still needed) by adjustments in value dynamics.

4.4. *Life satisfaction in value systems*

I argued that life satisfaction (cognitive domain of wellbeing) is a proxy for resolved or unresolved existential questions faced by people depending on the sign of associations. Of thirteen significant edges between life satisfaction and value ideals across three value theories and in four datasets, only one had a negative sign (to be able to afford something – life satisfaction). This value motivational goal derives from the existential question of self-needs (VOT, F. R. Kluckhohn and Strodtbeck 1961). Despite the positive wording of the value item and the answer options (after reverse coding the scale, 1 = *not at all important* to 4 = *very important*), the association with life satisfaction was negative. One might expect a positive association indeed. Note however that the value item question was about the importance that people attributed to that specific ideal. One interpretation is that the ability to afford something, free for interpretation for each respondent, is a value ideal hinting at an un-resolved domain in the existential question of self-needs of Germans. The "something" that needs affording is elusive remaining constantly out of reach.

One further observation is that all items belonging to the family dimension in the VOT (own a car, have children, and have a happy marriage, F. R. Kluckhohn and Strodtbeck 1961) formed positive edges with life satisfaction, a compelling insight in light of the evidence that an orientation toward long-term family bonds is associated with psychological wellbeing (Ko et al. 2020; Pick et al. 2022). These value motivational goals derived from the existential question of how to relate with others. This finding further contributes to the narrative of the present research, namely that central value motivational goals and the value dynamics are reminescent of a context where the self is construed outside the larger social embedding. In individualistic societies such as Germany, the needs of the self and of immediate kinship are prioritized over the needs of the larger society, which is more common in collectivistic societies. The existential question of relating with others seems to be "resolved" in a satisfactory manner (i.e. established, agreed upon, accepted or taken at face value) in the studied populations of Germans, at least in view of family ideals.

All value motivational goals that draw on the existential question of self-needs in individuals and formed significant edges with life satisfaction can be organized into those that through their pursuit promote hedonic wellbeing and those that promote eudaimonic wellbeing (Ryff and Keyes 1995; Diener 1984; Ryan and Deci 2001). Hedonia is wellbeing that consists of pure happiness by maximization of pleasure and minimization of pain. Eudaimonia is wellbeing that consists of living in accord with one's true self, to fulfill one's true potential that is. The ideals of hedonism (VST, Klages 1984), travel and afford something (as not an important goal, mind you) (VOT, F. R. Kluckhohn and Strodtbeck 1961) and having a good time (TBHV, Schwartz 1992) reflect hedonic value motivational contents. Meanwhile, the standards of tolerating opinions that one really cannot argue with (VST, Klages 1984), helping others and being politically active

(VOT, F. R. Kluckhohn and Strodtbeck 1961), and creativity (TBHV, Schwartz 1992) highlight eudaimonic value motivational contents.

The existential question of self-needs in the studied German population seems to be "resolved" via two paths, one of pure happiness and one of fulfilling one's true calling. Interestingly, the path from the central value motivational goal (in the case of ESS dataset, adventure was ranked second most central value motivational goal immediately after success) to the value motivational goal directly associated with life satisfaction was maximum of order two highlighting the importance of values of power, fulfilling one's potential, and adventure for the wellbeing of the studied population.

For example, the ALLBUS data shows that the ideal of power was strongly associated with both the ideals of high standards of living and of being politically engaged. The former was directly associated with the ideal of hedonism (Hedonia) whereas the latter was directly associated with the ideal of being tolerant for opinions that cannot be argued with (Eudaimonia). The GSOEP data indicates that the ideal of fulfilling one's potential was directly associated with hedonic ideals of travelling and affording something. Fulfilling one's potential was also directly associated with the eudaimonic ideal of helping others and moreover was indirectly associated with the eudaimonic goal of being politically active via the ideal of affording something (negative association). The ESS results show that the ideal of adventure was indirectly associated with the hedonic ideal of having a good time through the goal of having fun. Finally, the ideal of adventure in WVS was directly associated with the eudaimonic goal of being creative.

Past evidence from longitudinal research hints at the temporal cyclicity of the associations between value fulfillment and wellbeing – fulfillment of value ideals predicts wellbeing which in turn predicts an enhanced ability to fulfill one's pursued values the following day (Hanel et al. 2024). The temporal cyclicity of the value goals–wellbeing link further supports the insight that some contexts may be more enabling than others in the value pursuit in people. Nonetheless, to the best of my knowledge, the present results are the first to address dynamics between value motivational goals involving for instance relations of mediation between each-other in explaining wellbeing. It is too premature to argue that some value motivational goals may mediate the relationship of certain highly influential ones with wellbeing considering only the present results. Furture research can longitudinally test the mediatory links amongst value goals in explaining wellbeing in people.

4.5. *Specifics of demographic groups*

The applied network comparison testing has limitations. First, testing for network differences is sensitive to the number of estimated nodes and edges. Significance level alpha becomes inflated with increasing coefficients to be estimated. This limitation can be minimized through post-hoc corrections (e.g. Bonferroni) but in exploratory research it is comparably less problematic provided that results are reported transparently (Borkulo et al. 2021). Second, although significant network differences can be disentangled from random noise there is currently no test for directionality in view of edge differences. The present discussion is exploratory aiming to highlight insights that can contextualize value systems in people through faced acute existential questions.

4.5.1. No systematic gender differences

Considering a direct impact of one value motivational goal on another, asserting oneself and one's needs against others (VST, Klages 1984) and have children (VOT, F. R. Kluckhohn and Strodtbeck 1961) were more central to the value system of men compared to women whereas the ideal of travel (VOT, F. R. Kluckhohn and Strodtbeck 1961) was more central to the value system of women compared to men. Meanwhile, being loyal (TBHV, Schwartz 1992) and politically active (VOT, F. R. Kluckhohn and Strodtbeck 1961) were more central to the value system of men than women in view of closeness of association with other goal standards.

There were gender differences also considering the association of life satisfaction with a select few value motivational goals. Ideals of diligence (VST, Klages 1984), success (VOT, F. R. Kluckhohn and Strodtbeck 1961), and understanding people who are different and being free and not depend on others (TBHV, Schwartz 1992) were differently associated with life satisfaction in men compared to women: The edges between wellbeing and specific value ideals were stronger or weaker in men compared to women.

Enabling socio-economic and cultural contexts provide an explanation. For instance, contexts that enable men to be assertive might indirectly enable (or be enabled by) their pursuit of other value motivational goals, for example, power, security and hedonism. On the other hand, contexts that promote the ideal of travel in women, thus perhaps the contents of autonomy in exploration, might indirectly facilitate (or be facilitated by) their pursuit of other value motivational goals, for example, being politically active, affording something and fulfilling one's potential. Moreover, certain value ideals might be more relevant to the wellbeing of men than women, and vice versa, certain other value ideals might be more important to the wellbeing of women than men depending on contexts of living, in particular the gender equality that permeates them.

All in all, no systematic patterns can be observed. This is indication that although existential questions are differently experienced by men and women, these may be considerably too mild in Germany to warrant a different values system between the genders. Relatively seen, Germany is a context with a very high standard of living including a very low gender inequality (UNDP 2023, 2021). Men and women are exposed to specifics of culture and social roles that can be gender different (e.g. Jurczyk et al. 2019), which can be more articulated in some contexts than other. A cross-contextual study of the experience of existential questions might be more suitable in revealing systematic differences in the value systems of men and women than the present research conducted in Germany.

4.5.2. A balance between self-needs and relating with others with age

Compared to the younger age group (18-40), ideals of strong government and following rules (TBHV, Schwartz 1992) as well as owning a car and being politically active (VOT, F. R. Kluckhohn and Strodtbeck 1961) were central in the value system of the middle aged group (41-60). Excepting being politically active that pertained to self-needs, all other standards central to the value systems of the middle aged group derived from the existential question of relating with others involving the survival of groups. For the younger age group, having children, fulfilling one's potential and travel as well as having success (VOT, F. R. Kluckhohn and Strodtbeck 1961) were central in their value system. Save for having children that derived from the existential question of relating

with other, all other ideals central to the value system of the younger age group derived from self-needs of individuals.

Wellbeing was differently associated with five value motivational goals in the middle aged group compared to the younger age group, namely diligence (VST, Klages 1984), owning a car, having a happy marriage, being politically active and fulfilling one's potential (VOT, F. R. Kluckhohn and Strodtbeck 1961). The former three derived from the existential question of relating with others whereas the latter two derived from the existential question of needs of individuals.

Compared to the older age group (61+) however, the value goal of affording something (VOT, F. R. Kluckhohn and Strodtbeck 1961) was central in the value system of the middle aged group. This ideal derived from the existential question of needs of individuals. For the older age group, the ideals of power, always seeking new things to do, being modest and loyal (TBHV, Schwartz 1992) as well as travelling, having success, fulfilling one's potential, and having a happy marriage (VOT, F. R. Kluckhohn and Strodtbeck 1961) were central in their value systems. A balance between the representation of self-needs and the existential question of relating with others including group survival could be observed in this age group.

Wellbeing was differently associated with five value ideals in the value systems of the middle aged group compared to the older age group, namely fulfilling one's potential and travel (VOT, F. R. Kluckhohn and Strodtbeck 1961) as well as helping other and caring for the environment (TBHV, Schwartz 1992) and having a happy marriage (VOT, F. R. Kluckhohn and Strodtbeck 1961). The former two value goals derived from the existential question of needs of individuals whereas the latter three derived from the existential question of relating with other involving also survival of groups.

Comparisons between the middle age group and the younger and older age groups highlight specifics of the links between existential questions and value systems as they might unravel in the lifespan (longitudinal test is still needed). Central in the value system of younger people is the ability to fulfill one's goals whereas central in the value system of the middle aged group is the notion of stability and having the means to achieve it. Meanwhile, central in value systems of the middle aged groups is the means to achieve one's goals when compared to the old aged group for whom central in their value system is seeking new challenges from a familiar status quo. The present findings add nuances to the observation that peoople become more social oriented with age (Smallenbroek et al. 2023; Löckenhoff and Carstensen 2004) and that younger age is primarily concerned with identity formation and self-determination (Roberts and Nickel 2017; Vecchione et al. 2016; Erikson 1994). It is not only that people become increasingly oriented toward others over time but, the present findings suggest, people in the lifespan also shift from the existential question addressing self-needs to the existential question addressing relationships with others. Notably, once a sense of social belonging has been gained and established, own family, for instance, individuals once again face existential questions of self-needs however less in view of success and achieving something in life, which is common at younger age, but considering fulfillment of one's potential rather.

Experiencing existential questions differently depending on age becomes more intuitive in view of a true lifespan perspective on human development. Human life in modern societies is embedded in societal structures and there are specific roles being ascribed at each age. In the first years of life, the majority of children are in the care of their parents and close kinship and are expected to develop concepts of the self and the surrounding world. Subsequently, as children become adults they are expected to have

payed jobs, pay taxes, have families of their own while it is up to them to finding an optimal balance between private life and responsibilities. Later in life, as adults become older individuals they benefit from retirement plans while they enjoy a newly found "free time", for better or worse. With older age, topics of death and preparation for the final stages of life become increasingly salient and thus the life cycle completes with death of the individual. Individuals in their lifespan seem to first face the existential question of self-needs more intensely followed by the existential question of relating with other and possibly the environment and finally a combination of the two, at least in the average individual in the modern, Western, with a very high standard of living, world. Approaching death, the existential question of time and possibly one of life after death is acute for the individual (e.g. Gire 2014). Notably, human agency, defined as the intentional influencing of one's functioning and life circumstances has a temporal component in forethought, defined as setting goals and anticipating likely outcomes of prospective actions to guide and motivate efforts of people (Bandura 2006). The existential question of time is not systematically addressed in current value theories that draw on the Western philosophy and that might limit a true lifespan perspective on value systems in people.

4.5.3. Agency in resolving self-needs with education

Compared to higher educated group, ideals of helping people, having a strong government (TBHV, Schwartz 1992), a happy marriage as well as travel and success (VOT, F. R. Kluckhohn and Strodtbeck 1961) were central in the value system of the lower educated group. The latter two value motivational goals derived from the existential question of self-needs whereas the former three derived from the existential question of relating to others including group survival. For the higher educated group, being rich (TBHV, Schwartz 1992), affording something, helping others (VOT, F. R. Kluckhohn and Strodtbeck 1961) and a high standard of living (VST, Klages 1984) were central in their value systems. All these ideals derived from the existential question of self-needs.

Wellbeing was differently associated with five value motivational goals in the lower educated group compared to the higher educated group. These were security (VST, Klages 1984), having a happy marriage, safety, care for the environment as well as having a good time (TBHV, Schwartz 1992). Save for the latter that derived from the existential question of self-needs, all other standards derived from the existential question of relating to others including group survival.

Compared to the group with an intermediate level of education, value motivational goals of being admired (TBHV, Schwartz 1992), having success, travelling and having a happy marriage (VOT, F. R. Kluckhohn and Strodtbeck 1961) were central in the value systems of the lower educated group. Exempting having a happy marriage that derived from the existential question of relating to others, all other ideals derived from the existential question of self-needs. No ideals were found to be more central in the value systems of the group with intermediate education levels when compared to the low educated group.

Wellbeing was differently associated with five ideals in the lower educated group compared to the group with intermediary education levels. These were being assertive (VST, Klages 1984), fulfilling one's potential, having a happy marriage (VOT, F. R. Kluckhohn and Strodtbeck 1961), be admired and being modest (TBHV, Schwartz 1992). The former two value goals derived from the existential question of self-needs whereas the

latter three derived from the existential question of relating to others including survival and welfare of groups.

These findings highlight that for the lower educated group, self-needs (e.g. success, travel) are linked with and impacted by their social environment acting in specific desirable ways (e.g. strong government, a happy marriage). Meanwhile, central in the value systems of highly educated groups are motivational goals promoting the fulfillment of self-needs either through Hedonia (e.g. be rich) or Eudaimonia (e.g. help others). In other words, enabling and supportive social environments are important ideals for lower educated groups in the pursuit of goals pertinent to self-needs. This seems not the case for highly educated groups: The existential question of relating to others including group survival appears resolved (the system enables them, for instance) in this group and thus the focus is rather on resolving the existential question of personal needs.

Postulates from theories on human agency and system justification provide avenues for interpretation. A psychological perspective on human agency argues that people are agents who intentionally influence their functioning and life circumstances (e.g. Bandura 2006), albeit the ability to accomplish set goals depends not only on individual agency but also on the agency of their collective. In other words, individuals are as able to fulfill their goals as the social environment enables them. Some contexts may be stronger enablers than others whereas some people more than others may benefit from such contexts. Imbalanced relationships of power and status between advantaged and disadvantaged groups is systemic in specific contexts involving not only specific relationships but also an internalization of the system as being justified, by the advantaged and the disadvantaged alike (e.g. Jost, Banaji, and Nosek 2004). Justifications of the status quo of a system – societies where educated, rich, white, male have increased advantages, for instance – generally convey a (false) sense of mutually beneficial relationships between the advantaged and disadvantaged. The advantaged benefit from their clear advantages in the system while they can experience psychological distress if the system does not meet their expectations (e.g. Grubbs and Exline 2016). The disadvantaged, on the other hand, use (pseudo-)explanations and misinterpret their powerlessness in changing the system through justifications involving a lack of "true" agency. Following, the disadvantaged revert to heuristic thinking in addition to exhibiting favoritism directed toward the advantaged group while generally being more supportive of the system and its authorities.

Formal education is a systemic mechanism through which individual members of society learn and develop specialized skills required in functioning well in society. Through formal education, a sense of agency develops in people involving, for instance, enabling systemic opportunities in pursuing personally meaningful ideals of living. But, different life circumstances can mean challenges in benefiting from the agentic self in some individuals. With challenging life circumstances, disadvantaged individuals depend on society as a whole to function well while justifying their situation might be a more intuitive response to them rather than unraveling their individual agency despite unjust systems, a reality that seems more likely for lower than higher educated groups.

4.6. *Limitations and future research*

The links between existential questions and values in people is implicit and derived from theory. With the available data it is not possible to study these associations empirically as values and existential questions are theoretically complexly intertwined:

Value theories suggest that human values have developed over time from a finite set of existential questions. To some extent, empirical evidence supports the notion that human values are strongly associated with specific indicators reflecting what we might consider objective instances of existential questions (e.g. Witte, Stanciu, and Boehnke 2020) – because there is no inherent value in indices such as the income inequality but there is an outcome that people benefit of or struggle with as observed in their wellbeing involving, for example, life satisfaction. The present discussion remains strongly shaped by the assumption that values reflect existential questions accurately as described in the respective value theories.

The present study was carried out on data from Germany (time cross-section 2012-2014) which is prototypical Western with a very high standard of living including comparably low gender inequality. In other words, the ecological context in which the present research was carried out is one where existential questions have a different meaning to people residing here than to people residing elsewhere, for instance, in contexts of low or very low standards of living. In other contexts therefore many of the obstacles to wellbeing faced by people might be more accentuated than in Germany: Gender inequality, discrimination based on age, and access to formal education are habitual indicators used in comparing societies across the world (e.g. Group 2024; UNDP 2023, 2021). Such contextual differences may reflect differences in psychological network systems comprising values and life satisfaction in people. Future research can use multinational surveys such as the ESS and WVS to carry out country comparisons testing the hypothesis that different standards of living reflect existential questions associated with values and life satisfaction in people forming psychological network systems differently. A research question may be "Are the differential value pursuit in people across societies acute symptoms of different standards of living?"

Measurement instruments for human values used in the present surveys were modified over the years and no longer reflect the initial theoretical propositions accurately, except the PVQ instruments that are well established in the assessment of values in the TBHV (Schwartz 1992; Roccas, Sagiv, and Navon 2017). Because of this, it is impossible to tell whether theoretical propositions continue to be well addressed by the applied instruments. The TBHV tacitly dominates research on human values in disciplines of psychology, sociology, and political science today thus some of the initial postulates in other theories might have been lost in recent iterations of measurement instruments.

5. Conclusion

The present research revisted the universality principle of value theories which states that people face a finite set of existential questions from which a finite set of values as ideals of living derive. Drawing on advances in psychological network analysis, I argued that value motivational goals form together with wellbeing value systems in groups that experience existential questions differently. While gender differences may be present in the German society, these appear unsystematic in view of a network of dynamically interconnected value motivational goals and life satisfaction. Meanwhile, a true lifespan perspective hints at an age specific experience of existential questions reflecting self-needs and the relationship with others and the environment, and possibly that time and life after death as being an important and yet ommitted other existential question in people. Human agency is highlighted as particularly influential in resolving the ex-

istential question of self-needs however enabling contexts might be more favorable to those with higher levels of education. All in all, the present results highlight contextually embedding as important in furthering discussions on theories human values both at a meta-theoretical level and in view of enabling contexts in the value pursuit.

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7. Supplement

7.1. *Further sample details*

Table 8. Sample composition across surveys

Demographic	Survey	Category	n	Total N	Proportion	Cummulative
Age	ALBS	young	1085	3478	31.20	31.20
Age	ALBS	middle age	1344	3478	38.64	69.84
Age	ALBS	old	1042	3478	29.96	99.80
Age	ALBS	NA	7	3478	0.20	100.00
Age	GSP	young	8869	25171	35.23	35.23
Age	GSP	middle age	9769	25171	38.81	74.05
Age	GSP	old	6533	25171	25.95	100.00
Age	ESS	young	972	2947	32.98	32.98
Age	ESS	middle age	1107	2947	37.56	70.55
Age	ESS	old	861	2947	29.22	99.76
Age	ESS	NA	7	2947	0.24	100.00
Age	WVS	young	672	2046	32.84	32.84
Age	WVS	middle age	752	2046	36.75	69.60
Age	WVS	old	622	2046	30.40	100.00
Gender	ALBS	male	1723	3478	49.54	49.54
Gender	ALBS	female	1755	3478	50.46	100.00
Gender	GSP	male	11244	25171	44.67	44.67
Gender	GSP	female	13927	25171	55.33	100.00
Gender	ESS	male	1488	2947	50.49	50.49
Gender	ESS	female	1459	2947	49.51	100.00
Gender	WVS	male	1015	2046	49.61	49.61
Gender	WVS	female	1031	2046	50.39	100.00
Education	ALBS	low	1161	3478	33.38	33.38

Table 8. Sample composition across surveys

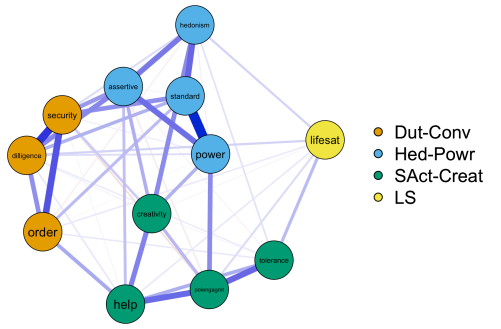
Demographic	Survey	Category	n	Total N	Proportion	Cummulative
Education	ALBS	middle (high)	1231	3478	35.39	68.78
Education	ALBS	high (very high)	1068	3478	30.71	99.48
Education	ALBS	other	16	3478	0.46	99.94
Education	ALBS	NA	2	3478	0.06	100.00
Education	GSP	low	3128	25171	12.43	12.43
Education	GSP	middle (high)	15132	25171	60.12	72.54
Education	GSP	high (very high)	6098	25171	24.23	96.77
Education	GSP	NA	813	25171	3.23	100.00
Education	ESS	low	842	2947	28.57	28.57
Education	ESS	middle (high)	1076	2947	36.51	65.08
Education	ESS	high (very high)	1014	2947	34.41	99.49
Education	ESS	other	4	2947	0.14	99.63
Education	ESS	NA	11	2947	0.37	100.00
Education	WVS	low	630	2046	30.79	30.79
Education	WVS	middle (high)	1017	2046	49.71	80.50
Education	WVS	high (very high)	385	2046	18.82	99.32
Education	WVS	NA	14	2046	0.68	100.00

Table 9. Detail breakdown of educational attainment categories

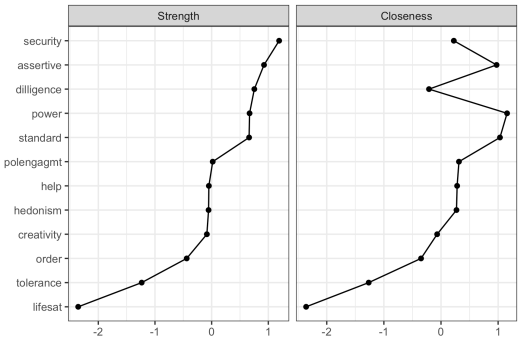
Survey	Code in dataset	Label	Education category
ALBS	1	No formal education	1 = Low
ALBS	2	Primary school	1 = Low
ALBS	7	Still a school student	1 = Low
ALBS	3	Intermediate secondary school	2 = Intermediate
ALBS	4	Fachhochschule	3 = High
ALBS	5	Hochschule	3 = High
ALBS	6	Other education	99 = missing
ESS	0	No formal education	1 = Low
ESS	1	Primary school finished but no diploma	1 = Low
ESS	2	Primary school	1 = Low
ESS	3	Intermediate secondary school	2 = Intermediate
ESS	4	Fachhochschule	3 = High
ESS	5	Hochschule	3 = High
ESS	5555	Other education	99 = missing
WVS	1	No formal education	1 = Low
WVS	2	Incomplete primary school	1 = Low
WVS	3	Complete primary school	1 = Low
WVS	4	Incomplete secondary: Technical	2 = High
WVS	5	Complete secondary: Technical	2 = High
WVS	6	Incomplete secondary: University preparatory	2 = High
WVS	7	Complete secondary: University preparatory	2 = High
WVS	8	University-level, without a degree	3 = Very high
WVS	9	University level, with a degree	3 = Very high
GSP	1	Less than high school	1 = Low
GSP	2	High school	2 = Intermediate
GSP	3	More than high school	3 = High

7.2. *Plots: Gender comparisons*

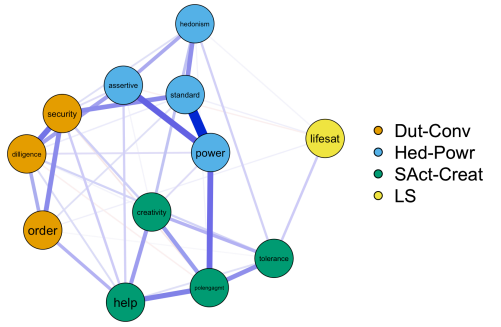
7.2.1. ALLBUS



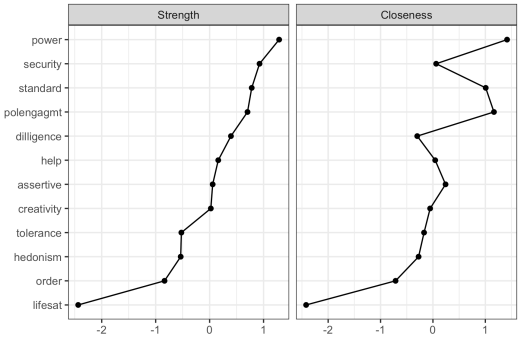
(a) Network men



(b) Centrality indicators men



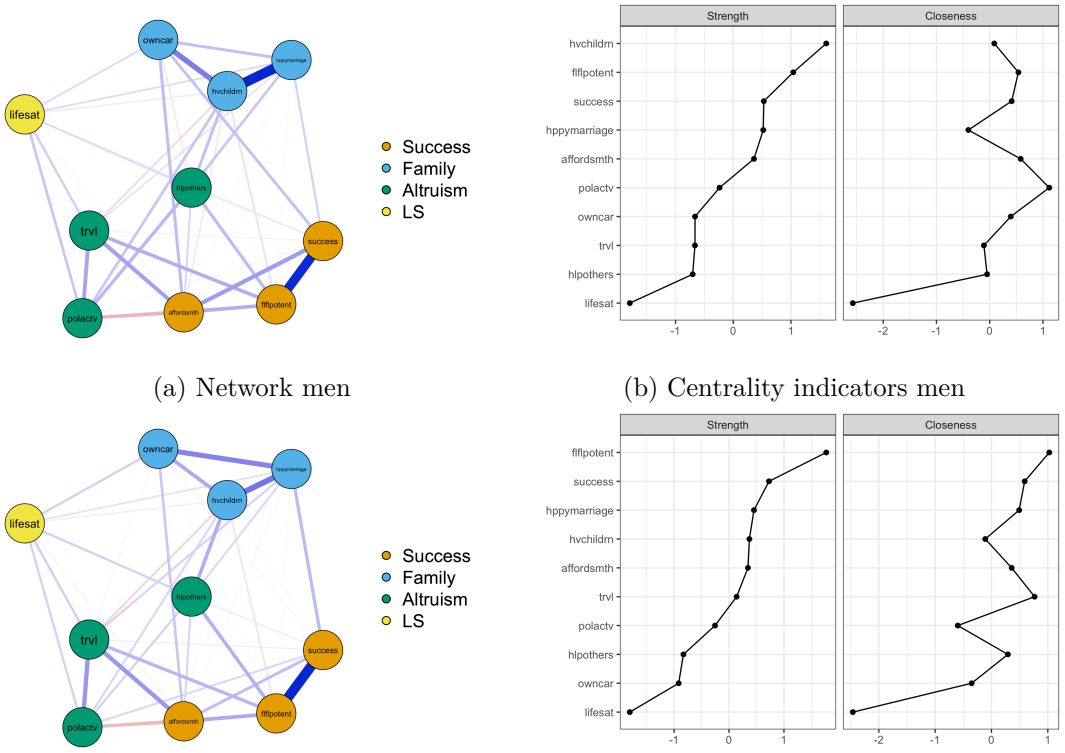
(c) Network women



(d) Centrality indicators women

Figure 5. Psychological networks for men and women in ALLBUS

7.2.2. GSOEP



(a) Network men

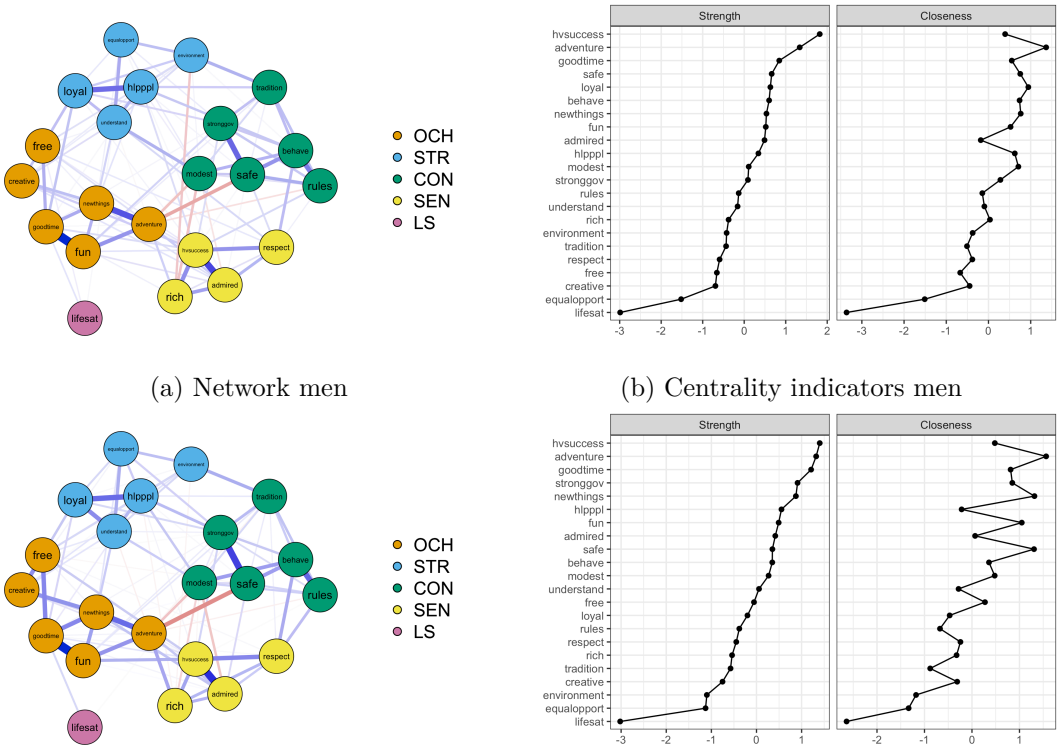
(b) Centrality indicators men

(c) Network women

(d) Centrality indicators women

Figure 6. Psychological networks for men and women in GSOEP

7.2.3. *ESS*



(a) Network men

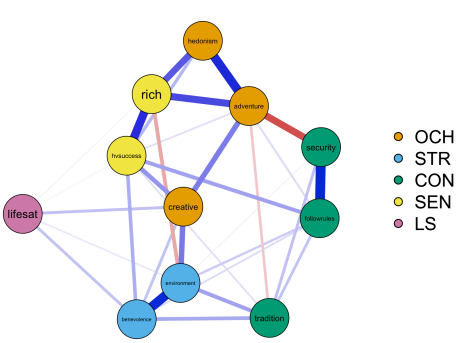
(b) Centrality indicators men

(c) Network women

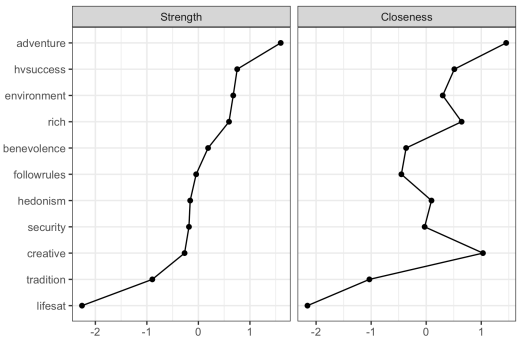
(d) Centrality indicators women

Figure 7. Psychological networks for men and women in ESS

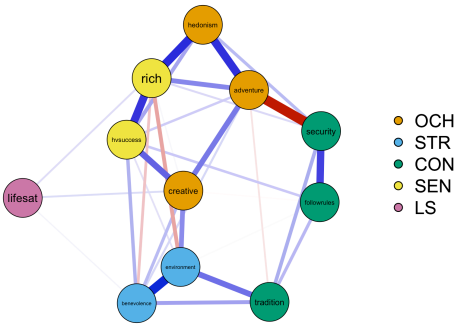
7.2.4. WVS



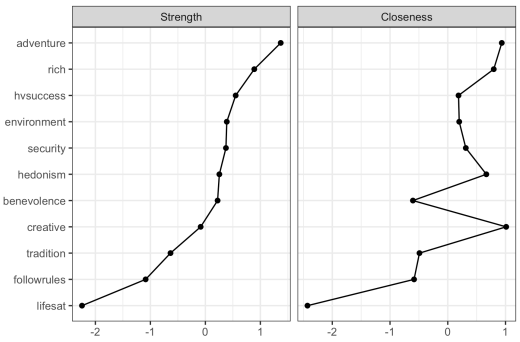
(a) Network men



(b) Centrality indicators men



(c) Network women

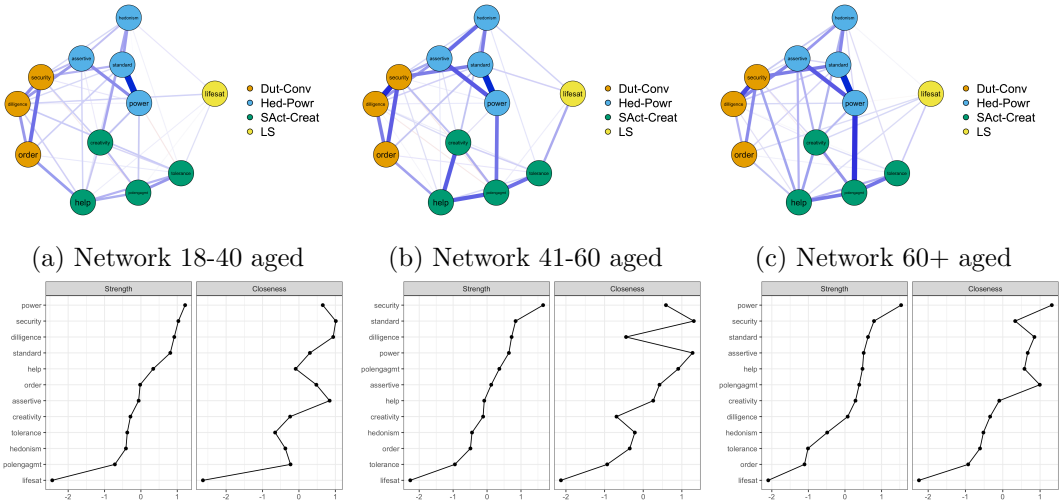


(d) Centrality indicators women

Figure 8. Psychological networks for men and women in WVS

7.3. *Plots: Age groups comparisons*

7.3.1. ALLBUS

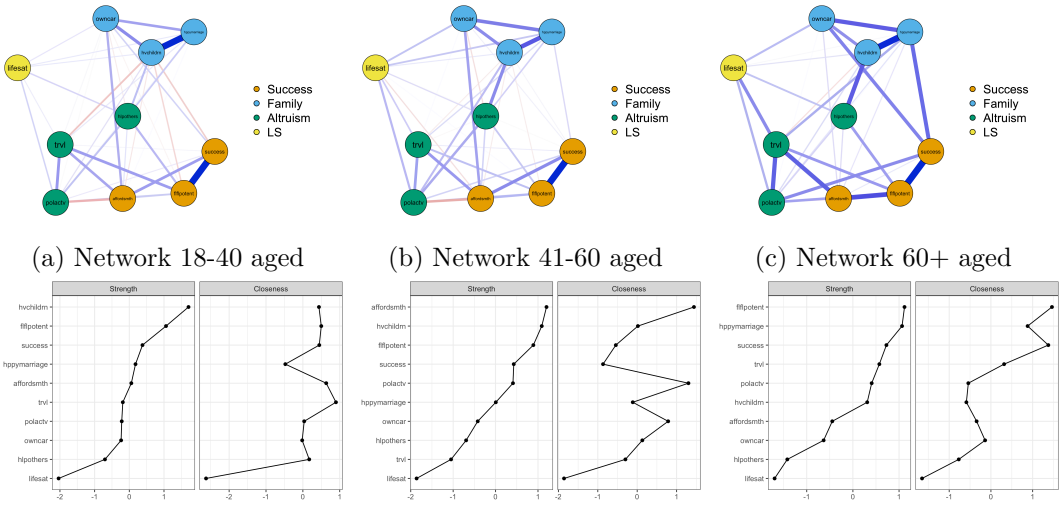


(a) Network 18-40 aged (b) Network 41-60 aged (c) Network 60+ aged

(d) Centrality indicators 18-40 aged (e) Centrality indicators 41-60 aged (f) Centrality indicators 60+ aged

Figure 9. Psychological networks for young, middle aged, and older groups in ALLBUS

7.3.2. GSOEP

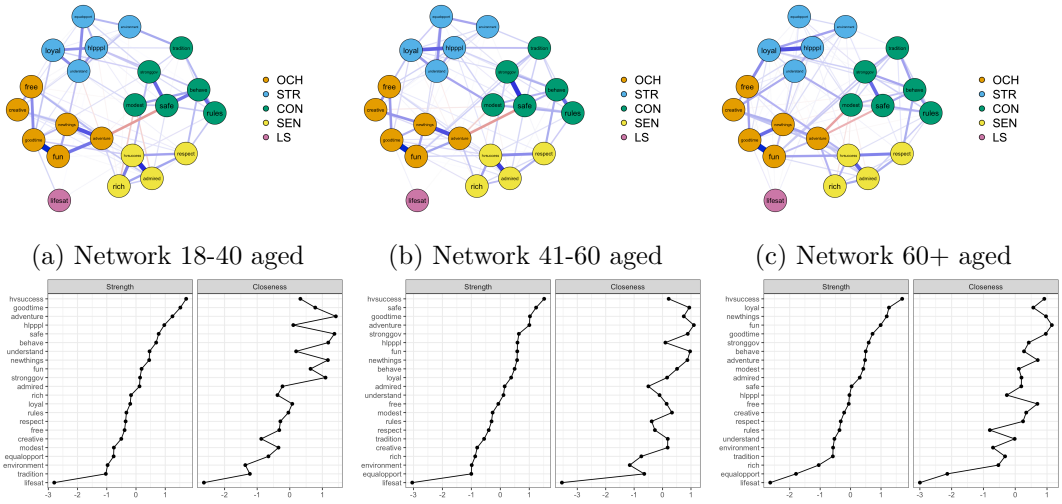


(a) Network 18-40 aged (b) Network 41-60 aged (c) Network 60+ aged

(d) Centrality indicators 18-40 aged (e) Centrality indicators 41-60 aged (f) Centrality indicators 60+ aged

Figure 10. Psychological networks for young, middle aged, and older groups in GSOEP

7.3.3. ESS

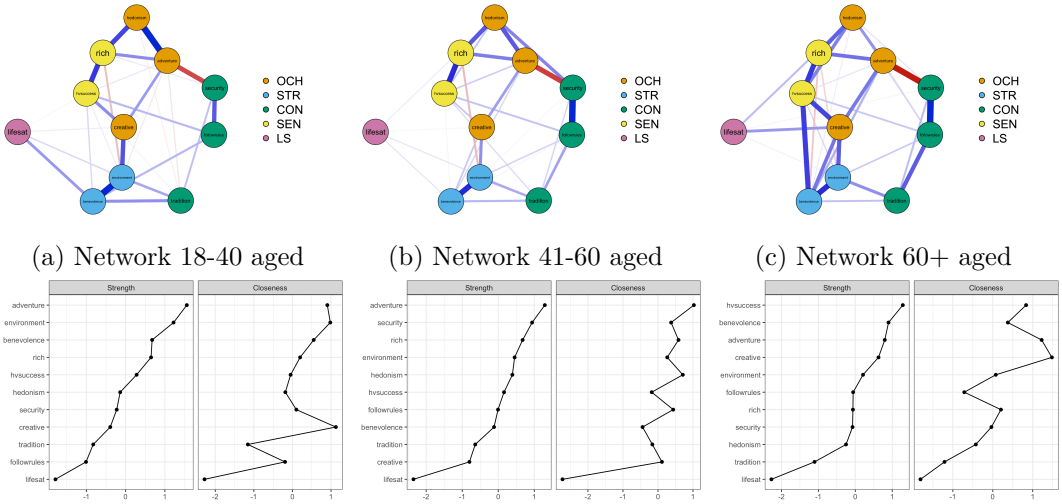


(a) Network 18-40 aged (b) Network 41-60 aged (c) Network 60+ aged

(d) Centrality indicators 18-40 aged (e) Centrality indicators 41-60 aged (f) Centrality indicators 60+ aged

Figure 11. Psychological networks for young, middle aged, and older groups in ESS

7.3.4. *WVS*



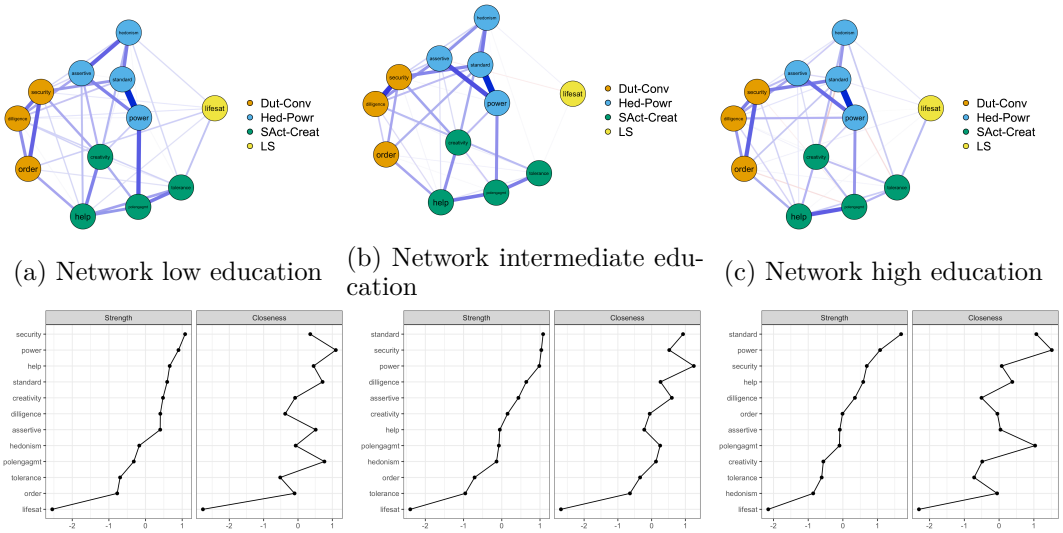
(a) Network 18-40 aged (b) Network 41-60 aged (c) Network 60+ aged

(d) Centrality indicators 18-40 aged (e) Centrality indicators 41-60 aged (f) Centrality indicators 60+ aged

Figure 12. Psychological networks for young, middle aged, and older groups in WVS

7.4. *Plots: Education attainment comparisons*

7.4.1. ALLBUS

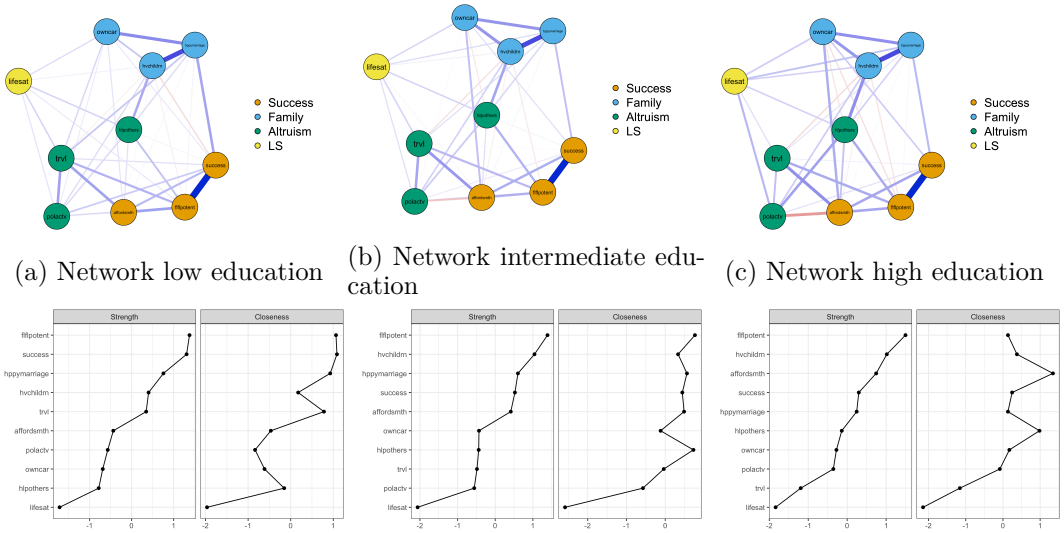


(a) Network low education (b) Network intermediate education (c) Network high education

(d) Centrality indicators low education (e) Centrality indicators intermediate education (f) Centrality indicators high education

Figure 13. Psychological networks for low, intermediate, and high education attainment groups in ALLBUS

7.4.2. GSOEP

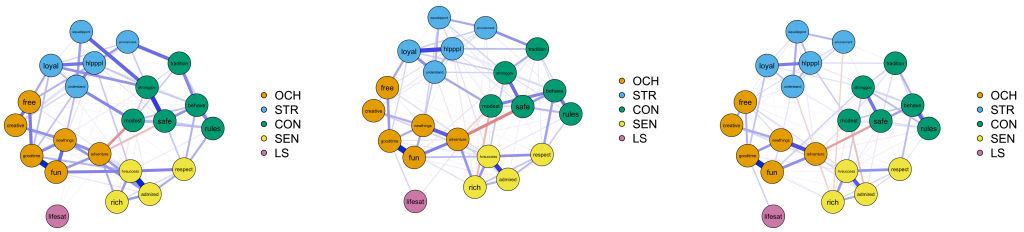


(a) Network low education (b) Network intermediate education (c) Network high education

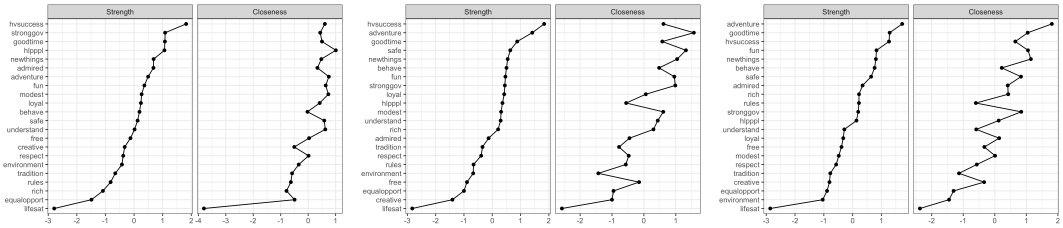
(d) Centrality indicators low education (e) Centrality indicators intermediate education (f) Centrality indicators high education

Figure 14. Psychological networks for low, intermediate, and high education attainment groups in GSOEP

7.4.3. ESS



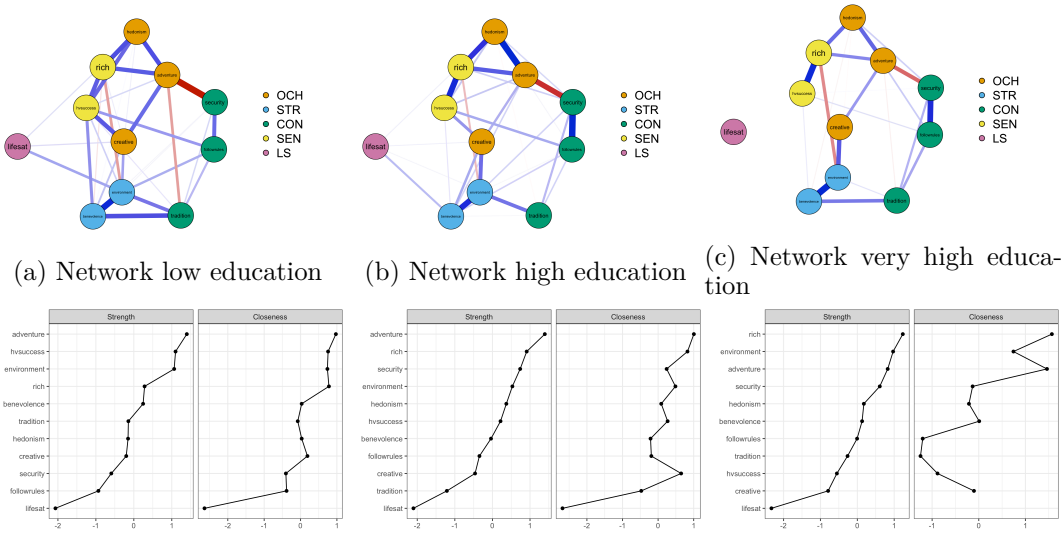
(a) Network low education (b) Network intermediate education (c) Network high education



(d) Centrality indicators low education (e) Centrality indicators intermediate education (f) Centrality indicators high education

Figure 15. Psychological networks for low, intermediate, and high education attainment groups in ESS

7.4.4. *WVS*



(a) Network low education (b) Network high education (c) Network very high education

(d) Centrality indicators low education (e) Centrality indicators high education (f) Centrality indicators very high education

Figure 16. Psychological networks for low, high education, and very high education attainment groups in WVS