



# Successful Life Conduct in Very Old Age: Theoretical Implications and Empirical Support from a Population-Based Study

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## Abstract

Social survey data on those aged 80 years or older is sparse. Based on a representative sample, this paper validates a multidimensional model proposed for understanding of quality of life (QoL) in very old age. Towards this goal, this paper estimated levels and heterogeneity of personal and environmental resources, well-being, autonomy, and perceived appreciation by society in the population of the very old in Germany. Next, the contribution of personal and environmental resources to QoL outcomes and overlap between these outcomes was estimated using a multivariate approach. Results were based on a representative survey on QoL of the very old in North Rhine-Westphalia, Germany's most populous state. The survey included comprehensive information on socio-demographics, health, social and personal QoL resources including objective testing of cognitive function. The sample comprised 1,863 individuals (mean age 86.5 years, range 80–102 years), including 211 individuals residing in non-private dwellings. Interviews with proxy informants were conducted for 176 individuals that were willing to participate but could not conduct the interview themselves due to limited ability to communicate (PLC). Pronounced differences were found for PLC with respect to environmental and personal resources and QoL outcomes. Pronounced differences were also found both with respect to lower observed levels of QoL outcomes (e.g., autonomy) and predictors of QoL outcomes (e.g., effect of negative “external” appreciation on subjective well-being). Contrary to the deficit-oriented model of old age, a high degree of autonomy was observed. However, substantial and consequential negative “external” appreciation of very old age was also apparent.

**Keywords** Representative survey · Nursing home residents · Welfare · Well-being · Proxy interviews

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Different conceptualizations and assessments of quality of life (QoL) have been brought forward in the last decades, most prominently by the World Health Organization (WHO) (1997) that defines QoL as “individuals’ perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept incorporating in a complex way the persons’ physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationships to salient features of the environment” (WHO, 1997, p. 11). This definition highlights important features of QoL, mainly that it is inherently multidimensional and that living conditions are to be evaluated against the backdrop of individual and societal values and expectations. In this broad understanding of QoL, it is not a single feature (e.g., life satisfaction) that can account for the multiple facets of QoL. Empirical assessments of QoL need to depict these different facets individually and consider simultaneously the relationship between them.

This is even more important in the context of old age which is characterized by the paradoxical empirical observations of high subjective well-being and good subjective health despite highly prevalent multimorbidity or cognitive and functional limitations (Schilling, 2006; Wettstein et al., 2016). Studies on QoL in the very old have shown strong psychological resilience to adverse trajectories in health, function, and participation (Jopp et al., 2008; Jyväkorpi et al., 2018) implicated by biological (Mitnitski et al., 2001), psychological (Schaie, 1983) and social (Bennett & Ahamer, 1977; Cumming & Henry, 1961) perspectives informing a deficit-model of ageing. Moreover, QoL in the oldest old has been described as geared towards specific ways to negotiate demands for autonomy, identity, and well-being in light of limited health and functioning (Botes et al., 2019; Cho et al., 2011; Kruse, 2021), some of which are more highly appreciated in society than others (e.g., informal caregiving, generativity, technology use).

## Conceptual Model of Quality of Life

Within the scope of the large-scale representative survey NRW80+, the Challenges and Potentials model of QoL in very old age (CHAPO, Fig. 1) was developed as an interdisciplinary framework and a grid of operationalization (Wagner et al., 2018). CHAPO explicitly considers different dimensions of QoL and suggests operationalizations with a specific focus on old age within each of these dimensions. The dimensions are developed based on Veenhoven’s (2000) “Four Qualities of Life Model”. His differentiation between QoL ‘chances’ and ‘results’ and between ‘inner’ and ‘outer’ qualities leads to the four dimensions of QoL, namely, livability of the environment (CHAPO: livable environment), life-ability of the individual (CHAPO: life-ability of the person), external utility of life (CHAPO: appreciation by others), inner appreciation of life (CHAPO: appreciation of own life). The CHAPO model extends Veenhoven’s (2000) model by (1) explicitly considering values held by the person and the environment and (2) proposing ‘successful life conduct’ as a third QoL result characterized by person-environment fit and congruency of values of the individual and their environment. CHAPO achieves specificity with respect to very

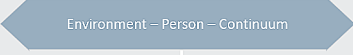
	Environment		Person	
Life Chances	Livable Environment		Life-Ability of the Person	
	Standards (reference)	- External value system	- Internal value system	
				
	Conditions (actual)	- Environmental conditions and opportunity structures	- Disposable resources, skills and competencies of the person	
Life Results	Appreciation by Others		Successful Life Conduct	Appreciation of Own Life
	<ul style="list-style-type: none"> <li>- Appreciation of (life) achievement</li> <li>- Acceptance of personhood</li> <li>- Social status</li> </ul>		<ul style="list-style-type: none"> <li>- Functionality</li> <li>- Coherence</li> <li>- Social embeddedness</li> </ul>	<ul style="list-style-type: none"> <li>- Experienced affect</li> <li>- Mental distress</li> <li>- Life satisfaction</li> </ul>

Fig. 1 Challenges and potentials model of Quality of Life in very old age (CHAPO, Wagner et al., 2018)

old age by the selection of QoL markers within conceptual domains that allow for testing competing mechanisms proposed by major ageing theories about how QoL is generated or retained in very old age (Erikson, 1998; Heckhausen et al., 2013; Wahl et al., 2012).

### Life Results

In line with the distinction between inner valuation and external worth (utility) of an individual’s life as two kinds of life results (Veenhoven, 2000), we consider an individual’s life to be evaluated not only by themselves, but also by their social environment. As manifestations of such external evaluations, the environment’s explicit attitudes on and behaviors towards older individuals give them an impression of their *appreciation by others* (Neise et al., 2019). In a performance-oriented society holding generalized prejudice against old age, very old individuals are expected to be confronted with particularly negative evaluations such as constituting an unproductive burden to society (Fürstenberg, 2013). Although evidence for adverse effects of age stereotype on developmental outcomes (including health, well-being and even mortality) have been reported before (Dionigi, 2015; Levy et al., 2002; Levy, 2009), knowledge about the individual factors contributing to such adverse perceptions of external appraisal and potential protective effects remain limited.

As an indicator of subjective appreciation of own life, *positive affect* in very old individuals has been studied extensively. Maximizing positive affect and minimizing suffering are overarching motives of hedonic concepts of QoL. In contrast to rational evaluative judgements such as life satisfaction, however, affective well-being may also result from less conscious processing of goal approach and may signal need satisfaction and successful adaptation to ageing, for example in the competence press model by Nahemow and Lawton (1973) and late-life development (Erikson, 1998). In light of diminishing options for agency and control over one’s life and increasing likelihood of chronic disease and unrecoverable loss at the end of life, Tesch-Römer

and Wahl (2017) focus on subjective well-being (SWB) as a marker of successful ageing in very old age. Similarly, in their discussion of an ecological theory of ageing, Wahl et al. (2012) propose autonomy, identity and well-being as developmental outcomes, highlighting the role of adaptive and supportive environments and processes of belonging to achieve these late-life outcomes.

In addition, CHAPO explicitly refers to the concept of *successful life conduct* as a behavioral QoL result. Acknowledging both social-normative and personal goals, we suggest that successful life conduct is characterized by a specific quality of the person-environment constellation (e.g., fit) or congruence between actual behavior and multi-dimensional stipulations held by individuals and society about the good life in very old age (e.g., autonomy, generativity, ego integrity). In this study, we consider *perceived autonomy over one's life* as an indicator of successful life conduct. According to WHO (2002), "*autonomy is the perceived ability to control, cope with and make personal decisions about how one lives on a day-to-day basis, according to one's own rules and preferences*" (WHO, 2002, p. 13). In ageing policy, autonomy of the individual is a key characteristic of responsible citizenship (WHO, 2002). As self-regulation implies autonomy of the individual, it is a widespread presumption and implicit outcome in ageing theories (Baltes & Baltes, 1990; Carstensen, 1991; Heckhausen, 1997).

Research into the mutual relationship between different aspects of QoL results in very old age is limited. Reliable data on many facets of QoL in the general population of the very old, including those in institutional settings, remains sparse. Especially data that allows for a combined analysis of how individual and environmental chances impact on different QoL results is rare. Wettstein et al. (2015) for example have shown substantial overlap (i.e., within-person correlation across time) between indicators of positive activation (positive affect, depressive symptoms, mastery) but a rather independent pattern of change in perceived autonomy in a substantial sample of very old community-dwelling individuals.

Conducting a representative study of very old people also means giving people who, because of their health, can no longer be interviewed themselves, a chance to participate. In dementia and stroke research, proxies are seen as valuable sources of information (Burks et al., 2021; Leontjevas et al., 2012; Sneeuw et al., 1997). With respect of the QoL results considered here, proxy interviews are more common in well-being research (Martyr et al., 2018), but rarely employed to assess personal values or autonomy. There is critical debate with respect to the validity and potential measurement error in proxy assessment (Vuorisalmi et al., 2012). In a total-survey-error framework, however, such measurement errors need to be weighed against representation errors resulting from systematic non-response of particularly vulnerable individuals. For the current study, first analyses show that including vulnerable people via proxy interviews comes with substantive benefits regarding the representativity of the sample but only minor measurement bias in core QoL indicators such as positive affect (Kaspar et al., 2023).

## Life Chances

Livable environment refers to social norms or values and the opportunities to achieve own goals (Wagner et al., 2018). Of the plethora of aspects of the natural, cultural, social, built or material human environment, the following environmental aspects of life chances were exemplarily included in this paper: social contact, financial resources, internet usage, and societal values. Research on *social contact* shows that larger social networks go along with higher social support (Cornwell & Schaffer, 2016) and are positively associated with SWB as well as mental or physical health in older adults (Hawton et al., 2011; Huxhold et al., 2013; Smith & Victor, 2019). A meta-analysis showed that the quality of social contact correlates more strongly with SWB than the quantity (Pinquart & Sörensen, 2000). The frequency of contacts was, however, found to be associated with QoL (Netuveli et al., 2006) in older adults. Available *financial resources* characterize the socioeconomic position of an individual within society. Research has identified an indirect effect of financial resources on QoL via health inequalities as well as direct effects on different QoL results (Pratschke et al., 2017). For older people (65+) with reduced self-care capacity, poor financial resources are associated with lower life satisfaction (Borg et al., 2006). A literature review shows significant correlations of income with SWB operationalized as either life satisfaction, self-esteem, or happiness (Pinquart & Sörensen, 2000). Results of the Survey of Health and Retirement in Europe show that there are significant associations between income and QoL in the age group 65+ (Knesbeck et al., 2007). Information and communication technologies (ICT) have become indispensable in most areas of life and represent a major means of societal participation. *Internet usage* allows for knowledge acquisition, entertainment, or social interaction, and has the potential to preserve independency and autonomy (Czaja & Lee, 2007). Previous research indicated that internet use in old age increases self-efficacy (Erickson & Johnson, 2011), perceived control, social support, and life satisfaction, while reducing depressive symptoms and loneliness (Heo et al., 2015; Shapira et al., 2007; Szabo et al., 2019). According to the SIM study (Medienpädagogischer Forschungsverbund Südwest, 2022), 86% of the very old who use the internet do so at least once a week. *Societal values* co-determine opportunities of expression, pursuit, and attainment of individual goals (Bobowik et al., 2011; Sagiv et al., 2004). Due to societal and technological change, people in old age are regarded particularly likely to experience discrepancies between societal and their own values (Brandtstädter & Wentura, 1994), leading to feelings of alienation, disorientation, or exclusion (Sagiv et al., 2004). Such experiences – referred to here as *anomie* – provoke loneliness (Kaspar, 2004), decreased life satisfaction (Brandtstädter & Wentura, 1994), and suicidal tendencies (Schaller, 2008).

Life-ability of the person refers to resources within the individual, such as values, skills, or experience and knowledge (Wagner et al., 2018). Functional, cognitive, and mental health (i.e., independence in activities of daily living, cognitive impairment, and depressive symptoms) as well as personal values were considered in this study. *Functional health* has been identified as an indicator of individual (health) resources and as a key predictor of QoL results in old age. Henchoz et al. (2019) reported an association between an improvement in activities of daily living (ADL) and an

increase of QoL. Schilling et al. (2013) found a strong linear effect of ADL deterioration on decline in overall life satisfaction among community-dwelling very old adults. This was also observed among institutionalized individuals (Liu et al., 2020). Furthermore, the ability to perform ADL was positively associated with perceived autonomy in both community-dwelling (Sánchez-García et al., 2019) and institutionalized older adults (Liu et al., 2020). In old age, *dementia* and *depression* belong to the most prevalent psychiatric diseases (Lilford and Hughes 2020) and they were identified as the main cause of reduction in disability-adjusted life years (Wittchen et al., 2011). The prevalence of major depression and subclinical depressive symptoms continues to increase across older age groups (Charlson et al., 2019). Symptoms of depression such as negative mood and reduced interest for enjoyment (WHO, 1992) directly affect subjective well-being. As a trans-situational reference system, *personal values* serve as benchmarks for cognitive judgements of satisfaction or more implicit experiences of coherence or achievement. Different values might be adaptive in different stages of life. For instance, a prioritization of values focusing on loss prevention instead of growth is expected to help manage a shift towards a less positive balance between gains and losses in later life (Ebner et al., 2006). An age-related decrease of self-centeredness and an increase of values focusing on the welfare of others can be expected based on Erikson's stage theory of human development (1998) and the model of gero-transcendence (Tornstam, 1997). This view is supported by previous studies on age differences in values (Robinson, 2013; Tulviste et al., 2017).

## Research Aims

Germany as an affluent society can build on a strong tradition of high-quality population-based monitoring of living conditions of older adults since at least 1996 (Tesch-Römer, 2023). However, substantive additional investment to better capture the hard-to-survey very old population is necessary to validly identify determinants of late-life QoL and inform policymaking (Kaspar et al., 2023). Thus, the aim of this paper is twofold. First, to offer a comprehensive and reliable account on the status quo of QoL chances and results in Germany's very old population and subpopulations characterized by retained or limited abilities to communicate. Second, to test the validity of the CHAPO model by relating selected QoL chances for older adults to QoL results including successful life conduct.

## Research Design and Methods

### Participants and Procedures

Data are from a representative survey NRW80+ conducted in Germany's most populated state North-Rhine Westphalia. The random community sample of persons aged 80 and over was selected in a multi-stage sampling procedure assuring adequate coverage of very old persons living both in private households and institutional set-

tings. Details about the study and sample design have been reported by Hansen et al. (2021). A total of 1,863 computer-assisted personal interviews were conducted at participants' homes by trained interviewers to assess QoL chances and subjective QoL results. Study nonresponse was found to be unrelated to respondent characteristics such as age, gender and living privately or in long-term care facilities (Kaspar et al., 2023). Mean age of the realized sample at time of interview was  $87.0 \pm 4.5$  years (age range 80.1 to 102.9 years). A total of 211 interviews (11.3%) were conducted in nursing homes. The sample includes 176 interviews with proxy informants conducted if target persons were willing to be included in the study but were not able to conduct the 90 min interview themselves due to health impairments. The target person was present in 45 of these interviews (25.6%). Proxy informants had a relationship of mutual trust with the target person and offered their best account of the target person's perspective. They included 42 (23.9%) spouses, 85 (48.3%) children, 9 (5.1%) professional caregivers, 9 (5.1%) children in law and 31 (17.6%) persons with other types of relationship. Age of proxy informants ranged from 19 to 99 years (mean age:  $66.2 \pm 14.9$  years) and the majority were female (124, 70.4%).

## Outcome Measures

*Burdensomeness* was used as an indicator of *appreciation by others* with the question "Do you have the feeling that society treats you like a burden (e.g., due to physical impairments)?" and a 4-point response scale from 1 (*not at all*) to 4 (*very much*).

The *positive affect* subscale of the short form of the Positive and Negative Affect Schedule (Kercher, 1992) was used as an indicator of *appreciation of own life*. Frequency of positive affective states (e.g., "enthusiastic", "excited") across the past 12 months was reported on a five-point response scale from 1 (*never*) to 5 (*very often*). Favorable psychometric properties of this very brief instrument were reported for age-diverse and old-old samples (Hilleras et al., 1998; Kercher, 1992; Mackinnon et al., 1999). Scale consistency in our sample was satisfying (MacDonald's  $\omega = 0.88$ ).

*Autonomy* was used as an indicator of *successful life conduct*. Perceived autonomy was assessed by responses to the question "Do you lead your life according to your own preferences?" on a 4-point scale from 1 (*not at all*) to 4 (*very much*).

## Predictors

Regarding *social contact*, respondents were asked how much time they spend with other people such as friends or family. Response options were 1 (*never*) to 5 (*very often*).

Net equivalence income was computed based on monthly all-source net income in private households. For respondents residing in long-term care (LTC), actual costs for accommodation and care per month were considered as a lower threshold estimate of *financial resources*.

*Internet use* across the last 12 months (yes, no) was considered as a lower bound estimate of digital resources available to the individual. Internet use comprised both the use of computer devices (e.g., laptop, desktop) and digital devices such as smartphones, tablets or wearables running web-based applications.

To measure respondents' reflection of *societal values*, two items (capturing difficulties with modern societal lifestyle, and perceived discrepancy between societal and personal values) from the Future Time Perspective Scale by Brandtstädter et al. (1997) and one item (capturing feelings of disorientation) from the anomia scale suggested by Gümüs et al. (2014) were used. Response options range from 1 (*not at all*) to 4 (*very much*). Scale consistency was found to be moderate in the current sample (MacDonald's  $\omega=0.69$ ) and comparable to Cronbach's alpha of 0.72 reported for the five-item obsolescence subscale by Brandtstädter et al. (1997).

Independence in ADL (Fillenbaum, 1988; Lawton & Brody, 1969) was used as an index of *functional health*. Items included seven basic ADL (e.g., eating, dressing, walking) and six instrumental ADL (IADL, e.g., preparing meals, handling finances) with response options 0 (*not possible without help*), 1 (*some help needed*), or 2 (*no help needed*). Four domain-heterogeneous parcels of ADL and IADL items were used as observed indicators of the second-order construct of functional health (Cole et al., 2016).

The DemTect has been developed as a brief screening tool for *mild cognitive impairment* (MCI) and early stages of *dementia* (Kalbe et al., 2004). It comprises subtests targeting immediate/delayed word recall, digit span, number transcoding and verbal fluency. Favorable diagnostic properties in identifying MCI have been reported (Kalbe et al., 2013) and age-specific scoring instructions for persons 80 years or older have been reported by Kessler et al. (2014). In proxy interviews, cognitive status was reported with the Global Deterioration Scale (GDS) (Reisberg et al., 1982) in seven stages from 1 (*no cognitive impairment*) to 7 (*most severe*). Reisberg et al. (2011) aligned GDS stage 3 to correspond to a clinical presentation of MCI.

*Depressive symptoms* across the past two weeks were assessed with the short form of the Depression in Old Age Scale (DIA-S4; Heidenblut & Zank, 2014, 2020). The four items ask for the occurrence of lack of motivation, feelings of sadness, worrying, or inability to enjoy life. The DIA-S4 was shown to distinguish groups of depressed and non-depressed geriatric inpatients (Heidenblut & Zank, 2014). In this non-clinical sample, we use a continuous latent variable estimated from reported symptoms as an indicator of depressive state.

*Personal values* were assessed with the ten-item version of the Portrait Values Questionnaire (PVQ) (Datler et al., 2013; infas, 2006; Schwartz, 2003; Verkasalo et al., 2009). In line with previous research on the dimensionality of the PVQ (Verkasalo et al., 2009), responses in the current sample could best be represented by a three-factor model comprising „self-transcendence“ (with the markers universalism, benevolence, self-direction, and tradition), „self-enhancement“ (containing conformity, security and stimulation), and „conservation vs. openness to change“ (containing power, achievement, hedonism and stimulation) (Reissmann et al., 2021). Only a single factor (termed “generic value orientation” here) could be extracted from proxy reports of the value-system of target persons.

## Plan of Analysis

In a first step, we describe levels and heterogeneity of person and environment chances as well as the prevalence of QoL results in very old age. All analyses include



available proxy information in case the targeted individual was unable to respond (i.e., persons with limited ability to communicate, PLC) to avoid under-representation of this most vulnerable part of the population. However, because perspectives of persons able to communicate themselves (PC) and proxies of PLC may diverge based on item content (e.g., factual versus subjective), analyses were conducted in parallel for both subgroups. For multi-item scales, measurement invariance (MI) was tested using a structural equation model multi-group approach and equality constraints of factor loadings and item intercepts. If at least partial MI was established, information for the whole population with combined PC and PLC data was additionally reported and the expected bias when omitting PLC from the analysis was discussed.

In a second step, we use multiple linear regression to estimate the relative contribution of personal and environmental chances to predict differences in metric QoL results. Generalized logistic regressions were estimated for ordinal outcome measures (i.e., autonomy, perceived burdensomeness). In addition, we use correlation analysis to estimate the empirical overlap between these QoL results in very old age.

All analyses used weights to correct for the disproportional sampling design and survey nonresponse (Valliant et al., 2013). Standard errors of parameter estimates were corrected for the clustering due to the two-stage sampling procedure. All analyses were performed using SAS 9.4 (SAS Institute, Cary, NC) and Mplus 8.4 (Muthén & Muthén 1998–2017) software.

## Results

### Descriptive Results

Estimated population means and prevalence for QoL chances and results are given in Table 1 for the PC and PLC subgroups separately.

Most older adults did not report feelings of being treated like a burden by society. However, one in eight adults aged 80 years or older reported such experiences quite a bit or very much. The share of older adults reporting such potentially ageist sentiments in PLC was approximately double the size of that in PC (i.e., 24.9% versus 12.9%).

With respect to positive affect, MI testing suggested that latent scores from proxy reports could be validly combined with those from self-reports to estimate levels of positive appraisal of own life in the very old population (Supplementary Table S1). Participants capable of self-report showed an overall mean of 3.3 on the five-point scale, corresponding to the “sometimes” and “often” categories. Average positive affect in PLC was significantly lower (2.6).

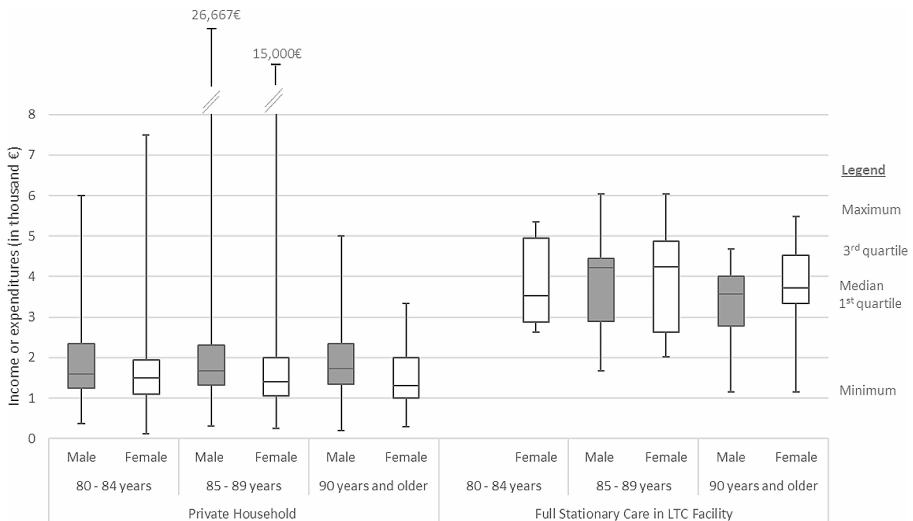
On the four-point autonomy scale, more than nine out of ten PC reported high levels of perceived autonomy (very much or quite a bit). In contrast, the majority of PLC was characterized as not living their lives according to their own preferences by proxy informants.

Frequency of social contact was high and similar for PLC (3.4) and PC (3.6). Average financial resources were lower for PC than for PLC (1,944€ vs. 2,581€, respectively). As Fig. 2 illustrates, monthly costs of receiving full inpatient care were higher

**Table 1** QoL chances and results in very old adults with and without limited capacity to answer interview questions themselves

M (SD) or %	PC (self-report)	PLC (no self-report)
QoL chances of the individual		
Functional health (0–2) <sup>a</sup>	1.6 (0.4)	0.5 (0.5)
Cognitive status		
- MCI	16.4%	7.4%
- Beginning (suspected) AD	9.8%	73.5%
Depressive symptoms (0–4)	0.28 (1.32)	1.55 (1.36)
QoL chances of the environment		
Social contact (1–5)	3.6 (0.9)	3.4 (1.1)
Financial resources (in Euro)	1,944 (1,282)	2,581 (1,821)
Digital resources (internet use)	21.1%	1.6%
Societal values (anomie, 1–4) <sup>a,b</sup>	2.5 (0.5)	2.4 (0.9)
QoL results		
Appraisal of own life (positive affect, 1–5) <sup>a,b</sup>	3.3 (0.8)	2.6 (0.8)
Appraisal by others (burden to society)		
- Not at all/rather not	87.1%	75.1%
- Very much/quite a bit	12.9%	24.9%
Successful life conduct (autonomy)		
- Not at all/rather not	8.5%	60.2%
- Very much/quite a bit	91.5%	39.8%

Note. Weighted data. PC=persons able to conduct the interview themselves (self-report), PLC=persons with limited ability to conduct the interview (proxy report). <sup>a</sup>Estimated latent means given in original response scale. <sup>b</sup>Valid comparison of figures for PC and PLC possible because measurement equivalence was established



**Fig. 2** Monthly cost for full stationary care in LTC facilities and net equivalence household income in private dwellings or care settings other than full stationary care. In the group LTC – 80 to 84 years - Male, there was only a single individual (4,842€)

than the net equivalence income reported for community-dwelling people or people in other care settings (e.g., assisted living). In PC, more than one in five participants have been actively using the internet in the past 12 months. In contrast, this rate was considerably lower (1.6%) in PLC. Participants reported average scores of 2.5 (PC) and 2.4 (PLC) with regards to anomic feelings, representing values in the middle area of the scale. MI of the latent variable “anomie” has been established across PC and PLC groups (Supplementary Table S2), allowing for direct group comparison. Average anomie scores in both groups were not statistically different from one another.

Functional health was high in PC (1.6 on the 0–2-point scale) but well beyond scale midpoint in PLC (0.5). With respect to cognitive status, the overall prevalence of beginning dementia was 9.8% in PC. In contrast, 73.5% of PLC showed symptoms of at least beginning dementia. The overall prevalence of MCI in PC was 16.4%. In PLC, the overall prevalence of MCI was 7.4%. Latent estimates of depressive symptoms were higher in PLC (1.6) than in PC (0.3). Tests for MI indicated that information from PC and PLC groups could validly be compared and combined to estimate levels of depressive symptoms in the very old population (Supplementary Table S3). With respect to the system of values held by older adults, no factor score means are presented in Table 1 because these have been fixed at zero in the exploratory structural equations model. However, details of modelling value factors based on the Schwartz scale and value priorities in this sample have been described elsewhere (Reissmann et al., 2021).

### Validity of the CHAPO Model

Associations between different facets of QoL results in very old age (Table 2) were found to be of medium to large effect size according to the classification suggested by Brydges (2019) for gerontological research ( $r = .2$  and  $0.3$ , respectively). The strongest link was observed between positive affect and perceived autonomy (PC:  $r = .41$ , PLC:  $r = .47$ ). Older individuals who felt being treated as a burden to society, however, showed lower levels of autonomy and vice versa. While this moderate effect was apparent irrespective of study group, a negative association of feelings of burdensomeness with positive affect was only found in PC ( $r = -.18$ ).

Approximately 32% of variance in self-reported *burdensomeness* could be explained by QoL chances, whereas individual background characteristics of PC such as gender or age had no predictive value (Table 3). The risk of negative apprais-

**Table 2** Associations between facets of QoL results in very old age

Correlation	Group	Appreciation of own life (positive affect)	Successful life conduct (autonomy)
Successful life conduct (autonomy) <sup>a</sup>	PC	.41***	1
	PLC	.47***	1
Appreciation by others (burden to society) <sup>a</sup>	PC	-.18***	-.33***
	PLC	.01 <i>n.s.</i>	-.25**

Note. Weighted data. <sup>a</sup>Bivariate correlations for categorical observed variables are based on underlying continuous latent response variables. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , *n.s.*  $p \geq .05$

**Table 3** Prediction of QoL results by QoL chances

Standardized regression parameter estimate or odds ratio (95% confidence limits)	Appreciation by others (burden to society <sup>a</sup> )		Appreciation of own life (positive affect <sup>b</sup> )		Successful life conduct (autonomy)	
	PC	PLC	PC	PLC	PC	PLC
<i>Life-ability of the person</i>						
Functional health	<b>0.44 (0.23–0.70)</b>	0.84 (0.09–5.91)	-0.06	0.29**	<b>3.98 (2.31–7.40)</b>	<b>9.29 (2.67–58.1)</b>
Cognitive status (ref: age-adequate)						
- MCI	0.82 (0.48–1.48)	3.16 (0.0–14.2)	-0.02	-0.11	1.20 (0.63–1.79)	0.89 (0.06–4.39)
- Beginning (suspected) AD	0.90 (0.56–1.35)	3.11 (0.2–40.8)	-0.06	-0.24 (*)	1.04 (0.48–2.09)	0.66 (0.16–1.79)
Depressive symptoms	1.18 (0.96–1.43)	1.35 (0.56–2.75)	-0.17*	-0.38**	<b>0.73 (0.61–0.84)</b>	0.75 (0.52–1.08)
Personal values						
- Generic value orientation	-	1.28 (0.42–3.94)	-	0.36**	-	1.34 (0.61–2.66)
- Self-transcendence	<b>0.59 (0.07–0.80)</b>	-	-0.19*	-	1.13 (0.86–1.54)	-
- Conservation	1.00 (0.62–1.70)	-	-0.01	-	0.94 (0.40–1.29)	-
- Self-enhancement	0.70 (0.48–1.16)	-	0.51***	-	<b>1.74 (1.28–2.38)</b>	-
<i>Livable environment</i>						
Social contact	0.89 (0.72–1.21)	1.17 (0.44–2.71)	0.26***	0.26**	1.19 (0.98–1.41)	1.34 (0.75–2.51)
Financial resources <sup>c</sup>	<b>1.01 (1.00–1.02)</b>	1.03 (0.97–1.06)	-0.01	0.15	<b>0.99 (0.97 – &lt;1.0)</b>	0.98 (0.95–1.03)
Digital resources (ref: no internet use)	0.90 (0.56–1.35)	-	0.09**	-	<b>1.98 (1.28–3.32)</b>	-
Societal values (anomie)	<b>3.26 (1.69–6.16)</b>	3.86 (0.71–18.8)	-0.06	0.25*	0.98 (0.64–1.50)	1.00 (0.21–3.07)
<i>Socio-demographic characteristics</i>						
Gender (ref: male)						
Age group (ref: 80–84 yrs)	1.02 (0.58–1.70)	0.44 (0.02–5.60)	0.01	-0.12	0.67 (0.34–1.18)	0.56 (0.20–2.36)
- 85–89 yrs	1.43 (0.96–2.29)	0.22 (0.0–2.40)	-0.06	-0.17	0.69 (0.35–1.06)	0.48 (0.05–7.86)
- 90 yrs or older	0.79 (0.47–1.39)	0.24 (0.01–13.5)	-0.05	-0.14	0.89 (0.46–1.58)	1.65 (0.18–10.5)
Interaction						
- Female 85–89 yrs	0.81 (0.39–1.43)	2.07 (0.03–166.9)	0.05	0.34	2.13 (0.94–4.22)	1.74 (0.08–51.8)

**Table 3** (continued)

Standardized regression parameter estimate or odds ratio (95% confidence limits)	Appreciation by others (burden to society <sup>a</sup> )		Appreciation of own life (positive affect <sup>b</sup> )		Successful life conduct (autonomy)	
	PC	PLC	PC	PLC	PC	PLC
- Female 90+ yrs	1.50 (0.46–3.43)	1.18 (0.0–1.54.7)	0.07	0.31	1.36 (0.62–3.39)	0.62 (0.09–7.64)
Model <i>R</i> <sup>2</sup>	0.318	0.448	0.461	0.486	0.328	0.366

**Notes.** PC = persons able to conduct the interview themselves (self-report), PLC = persons with limited ability to conduct the interview (proxy report). <sup>a</sup>Generalized logistic regression of categorical dependent variable. <sup>b</sup>MI has been established across PC and PLC groups. <sup>c</sup>Square root transformation was used to normalize net household equivalence income. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , (\*)  $p < .10$  (power restriction in PLC)

als by others was significantly reduced with higher functional health and more self-transcending values. In contrast, higher feelings of anomie strongly increased the risk of experiencing negative appraisal by others. Interestingly, higher financial resources were slightly but significantly related to higher risk of being treated like a burden. In PLC, the set of predictors was limited in its potential to systematically explain differences in feelings of being treated like a burden to society, as none of the estimated Odds Ratios indicated statistical significance.

Model determination for *positive affect* was above 0.46 in both study groups, indicating a strong contingency of subjective positive experiences upon individual and environmental life chances. Self-enhancement values were strong positive predictors of SWB, while higher self-transcendence values were weakly and negatively associated with positive affect. Depressive symptoms were also weakly and negatively related to positive affect. Social contact as an environmental resource showed a positive and moderate effect on well-being. A small but significant contribution to well-being in very old age was also found for internet use. In the PLC subgroup, a similar pattern emerged. Global value orientation was strongly related to positive affect. Depressive symptoms exhibited a stronger effect on well-being in PLC. Moreover, functional health, cognitive impairment and societal values (i.e., anomie) played a more critical role in explaining variance in positive affect in this more vulnerable subpopulation.

The set of predictors was able to explain 33% of variance in *autonomy* in PC and 37% in the more vulnerable (and less autonomous) subgroup of PLC. In the latter, autonomy appeared to be solely and strongly dependent on functional health. The pattern of predictive relationships was more differentiated in the PC subpopulation. Here, in addition to strong effects for functional health and moderate effects for depressive symptoms, self-enhancement values and internet use moderately contributed to higher perceived autonomy. More financial resources (or financial turnaround in persons living in nursing homes) were associated with less perceived autonomy.

In summary, the set of QoL chances considered here were able to explain up to nearly half of the variance observed in QoL results in very old adults. However, personal and environmental life chances contributed differently to distinct aspects of QoL results. Moreover, QoL results in the subpopulation of PLC appeared to be influenced by specific (additional) determinants.

## Discussion

This paper gives a comprehensive and multidimensional account of QoL in the population aged 80 years or older. By including persons in long-term care facilities and persons with limited ability to communicate in this population-based assessment, the results decisively expand the state of research.

The core findings showed that – in line with the CHAPO-Model – a multidimensional discussion of QoL in very old age needs to also consider QoL results beyond appreciation of own life and include both appreciation by others and successful life conduct as interrelated, yet distinct QoL facets.

Findings support the conclusion that reservation to address what Veenhoven (2000) named the “utility quadrant” of QoL especially in more vulnerable populations or those no longer participating in the workforce might have restrained aging societies to better prepare for demographic change by failure to communicate realistic and transparent expectations regarding the role of the oldest-old in society and not offering post-retirement opportunities to retain or acquire such capabilities. Substantial overlap between external appraisal, retained autonomy and subjective well-being indicates that successful life conduct in very old age is defined in part by the co-existence of values and priorities imposed by others and the motives and value systems of the individual. Moreover, the finding that proxy informants would report values of very old target persons that were less differentiated than that obtained from self-reports and unrelated to our indicator of successful life conduct indicates a need to define multiple roles for the oldest-old, and to do so in a timely manner and with substantively limited functional capabilities in mind (Tesch-Römer & Wahl, 2017).

The descriptive results on the three outcome measures of *life results* showed that respondents did not fully negate *feelings of being treated as a burden to society*. This is all the more concerning against the background that lacking appreciation was also associated with lower well-being and less perceived autonomy in this study. An “acceptance problem” of very old age becomes evident even if maybe not as pronounced as described by Fürstenberg (2013). According to van Dyk (2009), the programmatic “discovery” of potentials of old age in response to lopsided deficit models of ageing has led to societal pressure on individuals to preserve and use those potentials for the benefits of society, while those who do not live up to such normative expectations are subject to devaluation and marginalization. Results on the prevalence of autonomy and positive affect run contrary to the deficit-oriented model of ageing. Participants reported frequent positive affect as a marker of *appreciation of own life*. In PLC, positive affect was less frequent. A high degree of autonomy was observed in PC, signaling *successful life-conduct* in very old age. In all three examined life results, PLC scored lower than PC, underscoring dampened prospects for retaining QoL in very old age with disability even with the broader conceptual perspective suggested by the CHAPO model (Bröckerhoff et al., 2020).

Findings from multiple regression modelling underscore that better life chances were systematically associated with better late-life QoL results. Hence, the CHAPO model proves useful to identify potential avenues for late-life QoL intervention. Interestingly, chronological age no longer predicted QoL results when the proposed QoL chances were simultaneously considered, suggesting that the conceptual framework adequately covers the heterogeneity of determinants of late-life QoL across a phase of the life course that may span several decades (He et al., 2016). However, unique contributions were observed for different indicators with respect to different life results and between PCs and PLCs.

In line with existing evidence (Netuveli et al., 2006; Pinquart & Sörensen, 2000), frequency of *social contact* was a significant predictor of positive affect. However, social support or type of relationship may be more relevant than the frequency of contact for autonomy or perceived burdensomeness (Cimarolli et al., 2006; Warner et al., 2011).

*Financial resources* were found to signal a risk factor for autonomy in PC, but also for burdensomeness in PLC. These findings might appear contradictory to existing evidence, but they can be traced back to the higher financial turnover in individuals residing in LTC compared to individuals in private households in this study.

With respect to *digital resources*, findings that only 21% of those 80 years or older are online shows a wide digital gap between generations (Initiative D21, 2020). While the growth of the online population is expected to continue (e.g., today's ageing generation being more experienced in the use of technology; Erickson & Johnson, 2011; van Eimeren & Frees, 2014), the gap in very old age is expected to persist, as age-related losses in (e.g., sensory, cognitive) abilities impede use of (new) technology (Seifert & Schelling, 2015). The small share of onliners (1.6%) in PLC is in line with previous findings that good physical health and cognitive functioning are predictors of internet use (Erickson & Johnson, 2011). Internet use contributed to the prediction of positive affect and autonomy in this sample. In addition, recent findings of Rennoch et al. (2023) suggest substantive effects of internet use on well-being also in the oldest old. However, Huang (2010) reported small but negative associations between internet use and well-being in her meta-analysis. Detailed examination of sources for this contradictory evidence is beyond the scope of this paper and readers are referred to a more thorough discussion of antecedents and consequences of ICT use in this sample (Schlomann et al., 2020a, b).

This study drew on the concept of *anomie* as an important marker of life chances. Our results indicate that anomic feelings may not be considerably higher in very old age than in a younger sample (mean age 73; Schmidt, 2017) and suggest that the subjective relationship with society may remain stable after a shift of personal priorities that occurs already before the age of 80. Anomie was a significant predictor of burdensomeness and positive affect. Hence, our findings do not support Schmidt's (2017) claim that anomie as perceived distance from the outside world may itself be adaptive in the sense of disengagement theory (Cumming & Henry, 1961). Structural gaps in the recognition of priorities of today's very old population or lack of opportunity for societal engagement do not create a "privileged" space for coping with developmental tasks in late life.

Differences in the predictive power of *functional health* across study groups were observed. Functional health predicted positive affect only in PLC, for which adaptation of well-being despite health impairments assumed by theories of psychological coping and self-regulation (Schilling et al., 2013) might no longer be possible. However, functional health was unrelated to feelings of burdensomeness in this subgroup. We speculate that with pronounced functional impairment and elevated levels of perceived burdensomeness, negative external appraisal may be more strongly related to specific support or care constellations (e.g., no caregiving relative) than to functional status itself. Not surprisingly, functional health was the strongest predictor of autonomy in all participants. Similar effects have been reported for community-dwelling (Henchoz et al., 2019; Sánchez-García et al., 2019) and institutionalized individuals (Liu et al., 2020). Hence, our findings are in line with expectations from self-determination theory (Hertz, 1996) that low ADL impairment results in high perceived ability to act autonomously in meeting needs and goals.



Although PLC showed lower levels of *cognitive functioning* than PC, relationships with respect to age and gender were comparable. Because PLC are often excluded from surveys, comparison of prevalence for MCI and dementia estimated in PLC in this study with existing studies is limited. Previous research has shown that cognition has a greater impact on QoL outcomes in proxy ratings than in self-ratings (Römhild et al., 2018). Our results for the prediction of positive affect are in line with these well-established results. While research emphasizes the importance of involving people with dementia in (supported) decision-making (Wied et al., 2019), we found no indication of an adverse effect of impaired cognition on perceived autonomy in our sample.

*Depressive symptoms* predicted positive affect and autonomy in both study groups. However, effect sizes were small in PC and moderate to large in PLC. Contrary to our expectation, depressive symptoms were not found to be related to the feeling of burdensomeness.

In respondents able to give detailed report on their *personal values*, a differentiated pattern of relationships with QoL results was observed. The finding that self-transcendence was negatively related to positive affect was unexpected, as palliative care patients with such “macro worries” have been found to show higher well-being (concerned with self-enhancement values; Fegg et al., 2005). In line with our finding of a positive predictive value of self-enhancement, we speculate that well-being for most individuals in their eighties and nineties is still contingent upon agency and priorities for engagement and self-enhancement. In contrast, self-transcendence values may signal concern for others (e.g., in caregiving relationships) that represent risks to one’s own well-being. This interpretation is also in line with our additional finding that self-transcendence values are protective against negative external appraisal. Although a shift of priorities towards conservation with ageing has been discussed as an adaptive process (Borg et al., 2017) and has been found to be positively related to QoL results (Fegg et al., 2005; Fung et al., 2016; Robinson, 2013), we found no evidence of associations with the range of QoL results considered here. In the PLC subgroup, the single generic value orientation factor was positively related to positive affect, highlighting the importance of explicating one’s priorities for successful life conduct with more pronounced health impairment.

In sum, the comprehensive CHAPO approach appears helpful to overcome deficit-oriented age stereotypes and acknowledge the full complexity of QoL in old age. This includes, of course, acknowledging the increasingly limited personal and environmental resources (e.g., functional health, social embeddedness) for successful life conduct in very old age. However, it also highlights constellations characterized by ongoing autonomy, diverse personal priorities, and resilience to adversity, be it personal (e.g., function, cognition) or structural (e.g., anomie, negative external appraisal).

### Limitations and Future Directions

First, smaller sample size effectively limited the potential to statistically substantiate small effects in PLC. We still consider including them in a population-based sample an important improvement as compared to excluding them completely. Explained

total variance was higher in PLC, suggesting vulnerable individuals to profit more from QoL monitoring using the CHAPO framework (Wagner et al., 2018). Second, whereas burdensomeness was negatively associated with positive affect in PC, no such effect was observed in the subpopulation of very old individuals represented in the survey by interviews with family members or close affiliates. We cautiously consider this a hint towards a protective effect of an engaged social network that buffers and compensates for negative external appraisal. However, this interpretation needs further substantiation as information bias (e.g., social desirability) in proxy interviews might have impacted the results. Third, actual costs for respondents residing in LTC facilities were used in this study as a useful marker for financial asset in the institutionalized population; nevertheless, correspondence with net household income in private settings is limited. Finally, although data represents adults 80+ in Germany's most populous Federal state, generalizability to other regions or less affluent societies with other demographic trajectories may be limited.

We conclude that findings from this cross-sectional population study lend ample support to the validity of using CHAPO as a framework to monitor QoL in the oldest-old. Nevertheless, further insights from longitudinal studies are clearly needed to fully develop its potential to inform policy aimed at improving prospects of successful life conduct in very old age.

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## Declarations

**Ethics approval and consent to participate** The study was advised by the ethical board of the medical faculty at University of Cologne (17–169). The observational study NRW80+ was preregistered at the German Clinical Trials Register (DRKS00011924).

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

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