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Physical and mental health in the oldest-old: a mixed-methods study on a southern Italy sample

Rosa Angela Fabio[1] · Roberta Gallo[1] · Barbara Colombo[2]

Abstract
Background The world's aging population has been constantly increasing in the last decades, causing the number oldest-old individuals to increase.
Aims The present study aims to explore the different variables that contribute to the oldest-old wellbeing using a mixed-methods approach, including self-reports, standardized measures, and semi-structured interviews.
Methods Thirty-nine oldest-old (90–103) from southern Italy were involved in the study, together with a control sample of younger individuals (51–71) from the same families.
Results Data suggest that the oldest-old have better mental health, higher resilience, and more optimism than younger individuals. High resilience seems to be the key variable that promotes the overall wellbeing.
Discussion The oldest-old tend to have better mental health, higher resilience and more optimism than younger individuals.
Conclusions Wellbeing in the oldest-old appeared to be promoted by the sense of belonging and life purpose.

Keywords Oldest-old · Wellbeing · Resilience · Mental health · Mixed-methods

Introduction

The world's aging population has been constantly increasing in the last decades, causing not only the overall aging population to become more prevalent, but also the number of oldest-old individuals (nonagenarians and centenarians) to increase [1] to the extent that that the number of centenarians has been predicted to increase by eight times by 2050 [2]. Focusing on Europe alone, 30 years ago centenarians were estimated to be 1 in 10,000, while in the last years, the prevalence rate increased to 1 per 5,000 [3].

These data lead to a surge in the number of studies focusing on the oldest-old, trying to gain a better understanding of the characteristics that are peculiar to this specific population. Apart from some demographic reports [4–6], many studies focus mainly on clinical aspects, like, for example, cognitive decline and dementia [7], or specific types of cancer [8–10].

Other studies focus on psychological variables and the role they play in predicting the wellbeing of the oldest-old. Positive attitudes and emotions have been reported as protective factors for mental health in the oldest-old [11]. To be more specific, good resilience and optimism seem to play a crucial role in promoting longevity, across cultures [12–14]. For example, a study run in Sweden [15], showed that a large sample of oldest-old, with the inclusion of a subsample of octogenarians, had higher resilience and purpose in life as younger persons. Similar results were reported by a recent study conducted on oldest-old New York city residents [16], which highlighted how the oldest-old had good mental health, most likely promoted by high resilience and the ability to adapt to life challenges.

Using a qualitative approach based on interviews, a recent study [17] reported how the oldest-old narratives demonstrated a continuous self-identity, integrating past, present and future. This successful integration often resulted from successfully coping with adverse events, which lead to more

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positive self-awareness and higher resilience, as confirmed also by previous qualitative studies [18, 19]. A common resource used to support this effective coping is social engagement, which helps by providing meaningful purpose and connectedness [20]. Another qualitative study [21] adds a new factor, by reporting how religiosity in the oldest-old is positively related to high levels of life satisfaction and better coping strategies.

Studies discussed above tend to have a specific focus, while researches that try to examine the combined effect of biomedical, psychological and social variables are still less common [22, 23], even if they all support the importance of a multidimensional and integrated assessment to explore the factors that contribute to longevity [24]. Multi-perspectives studies could offer a better and more nuanced possibility to dive into the reasons and identify predictors for successful aging. Since the Nineties, when Rowe and Kahn [25] presented their model for successful aging, which included three factors (physical health, high functioning, and social and life engagement), this multicomponent approach has been actively discussed and applied in the field of healthy aging [26, 27]. Yet, not so many studies have applied this perspective to the study of the oldest-old, something that this paper is trying to address.

Another issue that emerges clearly from our review, is that the majority of the studies used a quantitative approach, with a few ones using a qualitative approach. Adopting a mixed method approach—like the study conducted by Scelzo et al. [12]—would allow to collect a more exhaustive corpus of data, merging standardized measures with more subjective perspectives.

Aims

The main aim of this study was to explore mental and physical wellbeing in a sample of oldest-old, compared to a control sample of younger adults, using a mixed methods approach.

From a quantitative standpoint, starting from what has been previously reported in the literature, we hypothesized that the oldest-old would have higher scores related to mental wellbeing and lower scores linked to physical wellbeing when compared to the younger sample. We were also expecting a positive correlation between the overall mental wellbeing scores and both resilience and optimism and a negative correlation among mental wellbeing, perceived stress, anxiety and depression.

Focusing on the qualitative data, we were expecting to confirmed results reported by Scelzo et al. [12], who using semi-structured interviews reported how the most common themes in the oldest-old conversations were positivity, resilience, optimism, the importance of hard working, family

bonds, self-efficacy and a strong will to persevere against life hardships.

Methods

Participants

The study involved 39 individuals (26 females and 13 males), age between 90 and 103 years old. The researchers confirmed the age of the oldest-old by checking their ID.

Thirty-nine younger members from the same families (offspring or other relatives), age between 51 and 75, were interviewed as well (see Table 1 for the demographic information of the sample).

Data were collected in South Italy (Calabria region, mainly in the city of Reggio Calabria and surrounding areas). All participants signed an informed consent form. The interviewers conducted the interviews in the residence (or assisted living communities) where the interviewees were living.

Materials

Quantitative measures

We selected short surveys, that would have been easy enough for the oldest-old to fill out with the researchers' support.

- Physical and mental health has been evaluated using the Short Form-12 (SF-12) from the Medical Outcome Study [28]. This survey consists of 12 questions that measure 8 health domains related to both physical and mental health. Physical health-related domains include General Health (GH), Physical Functioning (PF), Role Physical (RP), and Body Pain (BP). Mental health-related scales include Vitality (VT), Social Functioning (SF), Role Emotional (RE), and Mental Health (MH).
- Wellbeing-related variables have been assessed using the Connor-Davidson resilience scale, CD-RISC [29, 30] and the Life Orientation Test, LOT-R [31, 32]. The CD-RISC aims at assessing resilience conceptualized as the ability to "thrive in the face of adversity" [29]. It consists of 25 items, which are evaluated on a 5-point Likert scale. A

Table 1 Sample demographic information

Variables	Experimental group	Control group
Age (mean scores)	94.66	58.17
Standard Deviation	3.43	6.34
Males	13	15
Females	26	24

factor analysis highlighted 5 factors: (1) personal competence, high standards, and tenacity, (2) trust in one's instincts, tolerance of negative affect, and strengthening effects of stress, (3) positive acceptance of change and secure relationships,(4) control and (5) spiritual influences. The LOT-R is used to assess individual differences in generalized optimism versus pessimism (on a single continuum), and it includes six items to be evaluated on a five-point Likert scale.

- Mental-health and perceived stress have also been assessed using the Perceived Stress Scale, PSS [33], and the Patient Health Questionnaire, PHQ-9 [34]. The PSS assesses the degree to which situations in one's life are appraised as stressful. The ten items that compose this scale, which focuses on the last month, are rated on a five-point Likert scale. The PHQ-9 is a short questionnaire commonly used in clinical practice to screen for depression and assess its severity. It includes nine items that have to be scored on a four-point Likert scale.
- The Mini Mental State Examination, MMSE [35], was used to assess cognitive functions and cognitive impairment. The MMSE assesses orientation, attention, calculation, recall, language and motor skills. Each section of the test involves a related series of questions or commands. The individual receives one point for each correct answer. The maximum score is 30, a score below 20 can be considered an indication of cognitive impairment [36] in the Italian elderly population. The cut point was obtained by first applying the coefficient to adjust the score to our sample. The adjustment for a population aged between 85 and 89, with 4 years of education on average is 2.2, which has to be added to the total uncorrected score (in our case: $18.83 + 2.2 = 21.02$). Our sample was older than 89, and no normative adjustment score is available, so being more conservative is suggested. Our raw mean score of 18.8 could hence be adjusted to 22.

Qualitative measures

Using semi-structured interviews, researchers collected information about the oldest-old's life stories—which were transcribed and analyzed focusing on personality, traditions, culture, values, traumatic events and drastic life changes. The interviews were conducted while other family members where present, so that the oldest-old would feel more conformable and could also rely on the family members if they needed any help during the interview (e.g., in case of hearing losses). This collaborative approach, where the oldest-old, their relatives and the researchers built a shared and co-constructed narration, mirrors the methodology inspired by participatory action research (PAR), as described by Hutnik et al. [19] and Kralik et al. [37] in their qualitative work with centenarians. A conversational approach to

interviewing was adopted although several semi-structured questions were included to encourage story telling such as: "what has been important to you through your life?", "what are your values?", "can you tell us something about your story?",and "can you tell us something about your family?".

Statistical analyses

Independent-samples t tests have been used to compare scores on the quantitative scales of the oldest-old's sample to the scores of the younger control sample. Spearman's correlations have been used to explore correlations among scores. Cohen's d has been used as an effect size statistic for independent t tests and correlation. Bonferroni correction was applied to control for Type-I errors.

A post hoc power analysis has been computer using the G*Power software. Focusing on the independent-samples two-tailed t test and setting alpha = 0.05, a sample of 39 oldest-old individuals and 39 younger individuals, had a power of 0.59 to detect a medium effect size ($d = 0.5$) between oldest-old and younger individuals means. Focusing on the correlation, setting alpha = 0.05 and considering a two-tailed test, a sample of 39 individuals had a power of 0.48 to detect a medium effect size (rho = 0.3).

Results

Quantitative data

Focusing on the answers to the SF-12, significant differences between younger and older participants emerged on several subscales: General Health (GH), Physical Functioning (PF), Vitality (VT) and Role Physical (RF).

Concerning GH, the oldest-old, reported a worse perception of their health when compared to the younger sample (t (76) = 4.401, $p < 0.0001$, $d = 1.162$), and they also reported worse physical functioning (t (76) = 7.117, $p < 0.0001$, $d = 1.561$). If these first results are not surprising, it is interesting that the oldest-old scored reported to be more energetic (V) (t (76) = 3.762, $p < 0.0001$, $d = 0.994$), and reported less emotional discomfort (RF) (t (56) = 2.702, $p < 0.04$, $d = 0.449$). When evaluating the other subscales (BP, SF, RE and MH), no significant difference emerged between the two samples (See Table 2).

Focusing on the wellbeing scales, no significant differences emerged between the oldest-old and the younger individuals on the CD-RISC.

On the other hand, even if not significant, there is evidence for a potential association between the oldest-old that reported to be more optimistic than the rest of the sample (t (56) = 2.064, $p < 0.04$, $d = 0.25$). Focusing on Mental-health and perceived stress, the oldest-old scored lower than the

younger individuals both on the PPS and the PHQ, but these latter were not statistically significant. Finally, the oldest-old scored worse in the MMSE (t (56) = 8.282, $p < 0.0001$, $d = 2.177$). (Table 3).

As a second step, we run correlations among the tests used to gather our quantitative data—considering the oldest-old and the younger sample separately (Table 4). A Bonferroni corrected threshold of $p < 0.0017$ (0.05/28) was

Table 2 t test statistics for the SF-12 subscales for the two samples

SF-12	Oldest-Old 90–103 yo $n = 29$		Younger adults 51–75 yo $n = 29$				
	Mean scores	SD	Mean scores	SD	t	df	p
GH	2.34	.81	3,27	.79	4.401	76	.0001
PF	3.72	1.44	1.48	.88	7.1177	76	.0001
RF	1.68	1.44	2.44	1.91	1.702	76	.094
BP	2.21	.90	2.03	1.18	.625	76	.534
RE	3.38	.97	3.24	1.24	.496	76	.641
VT	3.90	.97	2.90	1.04	3.762	76	.0001
ME	4.38	.90	4.24	1.02	.544	76	.588
SF	3.59	.73	3.62	.82	.169	76	.867

Table 3 t test statistics for the quantitative measures for the two samples

Test	Oldest-Old 90–103 yo $n = 29$		Younger adults 51–75 yo $n = 29$				
	Mean scores	SD	Mean scores	SD	t	df	p
CD-RISC	55.86	6.75	56.65	6.65	1.430	76	.158
LOT-R	21.41	2.92	19.17	5.06	2.064	76	.044
PPS	11.41	6.91	18.97	10.54	.451	76	.654
PHQ	3.41	2.84	4.66	3.70	3.342	76	.001
MMSE	18.83	4.95	27.17	2.20	8.282	76	.0001

Table 4 Correlations among quantitative measures—oldest-old sample

	LOT-R	CD-RISC	PHQ-9	PSP	GH	PF	RP	MMSE
LOT-R		.730** .0001	− .257 .178	− .510** .005	.769** .001	− .567** .001	− .511** .005	.331 .080
CD-RISC			− .153 .428	− .564** .001	.464* .011	− .571** .001	− .430* .020	.470* .010
PHQ-9				.218 .255	− .233 .223	− .036 .852	.363 .052	− .202 .293
PSP					− .224 .242	.335 .075	.649** .0001	− .294 − .122
GH						− .719** .0001	− .332 .079	.387* .038
PF							.214 .265	− .405* .029
RP								− .213 .268
MMSE								

*< .05

** < .01

*** < .001

considered to be significant and $p < 0.05$ was considered suggestive of evidence for a potential association.

LOT-R has a significant positive correlation with CD-RISC (r (76) = 0.73, $p < 0.0001$), and they both had a positive correlation with the SP-12 GH subscale (r (76) = 0.769, $p < 0.0010$) and show a trend of negative significant correlation with PPS and SP-12 PF and RP subscales. PSP is positively correlated with the SP-12 RP subscale (r (76) = 0.730, $p < 0.0001$) and negatively correlated with LOT-R and CD-RISC (r (76) = − 0.564, $p < 0.0010$ and r (76) = − 0.571, $p < 0.0010$). A Bonferroni corrected threshold of $p < 0.0017$ (0.05/28) was considered to be significant.

Table 5 reports the correlations for the group of the younger participants.

This second set of correlations highlighted a positive correlation between LOT-R and CD-RISC (r (76) = 0.708, $p < 0.0001$). LOT-R is also negatively correlated with PHQ-9, PSP and SP-12 RP subscale (r (76) = − 0.758, $p < 0.0001$) and (r (76) = − 0.688, $p < 0.0001$); PSP correlates positively with PHQ-9 (r (76) = 0.639, $p < 0.0001$) and SP-12 RP subscale (r (76) = 0.565, $p < 0.0010$).

Qualitative data

The semi-structured interviewed were first read by two independent researchers, who highlighted the main themes. Themes were discussed together to find an agreement on the mist relevant and recurring topics. The topics were (1) positivity (optimism and resilience), (2) hard work, (3) family ties, (4) religion, and (5) love for their roots and their land.

The younger relatives were included in the interviews and tended to confirm the main points discussed by the oldest-old.

Significant excerpts from the interviews are reported as supplementary materials, for each topic of interest.

Considering the different topics, everyone in the oldest-old sample told something about recovering after a loss (especially family loss) by balancing acceptance. Energy and optimism, while younger members of the family expressed admiration for the resilience and optimism of the oldest-old.

Every person in the oldest-old sample, also stressed their work ethics, and the fact they had to make sacrifices and commit to their jobs. Admiration for the oldest-old's work ethics and commitment was expressed by all the younger relatives.

Thirty participants (72% of the sample) stressed the importance and the strength of their family ties during the interviews. Nine individuals from the oldest-old group (24% of the sample) did not mention this topic. The difference appeared to be linked to the place of residence of the individuals. The oldest-old still living at their house expresses stronger ties with their family—those living in nursing homes less so. Younger family members often added remarks to support how much the oldest-old value family ties.

Within the sample of the oldest-old, 38 individuals (96%) said to have a strong faith in God, and give high value to religion, something that was always confirmed with specific examples by the younger relatives. Only one individual reported to be an atheist.

Another aspect that was common on 100% of the sample of the oldest-old, and always strongly confirmed by the

Table 5 Correlations among quantitative measures—Younger sample

	LOT-R	CD-RISC	PHQ-9	PSP	GH	PF	RP	MMSE
LOT-R		.708** .0001	− .758** .0001	− .688** .001	.342 .070	− .051 .791	− .563** .001	.109 .573
CD-RISC			− .673** .001	− .438* .018	.005 .979	.096 .619	− .396* .034	− .169 .382
PHQ-9				.638** .0001	− .075 .697	.097 .618	.565** .001	.213 .267
PSP					− .432* .019	.096 .620	.479** .009	− .106 .585
GH						− .425* .021	− .364 .052	.135 .487
PF							.248 .195	− .054 .783
RP								− .027 .888
MMSE								

* < .05

** < .01

*** < .001

younger sample, was their deep and unconditioned love for their land.

Discussion

Overall, results of our study confirmed results previously reported in the literature and well summarized by the data collected by Thomas et al. [38] reporting information about aging and mental health on a sample of more than 1500 individuals between the age of 21 and 100. Our specific focus on the oldest-old, allowed to confirm similar results reported by quantitative studies focusing on similar samples in different cultures, especially supporting the idea that the oldest-old tend to have better mental health, higher resilience and more optimism than younger individuals [12–16].

Our qualitative data also confirmed most of the results reported in the literature [12], stressing the prominence of psychological factors like resilience and optimism [17–19], hard work [12], religion [17] and family ties [20]. One original factor that was highlighted in our interviews was the importance for the oldest-old to be in control and autonomous as much as possible, especially with relation to the work they were able to do on their own land. This might be related to the fact the oldest-old tend to link their resilience to having a clear purpose in life [15], something that promotes and is promoted by being in control of something that they feel like their own, part of their identity, like their land. Scelzo et al. [12] reported similar aspects when analyzing their qualitative data, but in their case, younger members of the family complained about stubbornness of the older generation when they were asked to stop or slow-down some of their outdoor activities. In our case, the importance ascribed to being able to be responsible for their land was described as positive both by the oldest-old and the younger members of their families. Stubbornness used to describe personality traits of centenarian's relatives is reported also in a Brazilian study [39], where it is generally linked to the emotional burden that is associated for some relatives with the daily task of being caregivers for their old parents. Future studies could explore this aspect more in depth, by exploring the possible role of the caregivers' perceived stress in describing the oldest-old characteristics.

Something that emerged both from our quantitative and qualitative data is the importance of resilience. One of the reasons why the oldest-old can be used as a remarkable example of healthy aging is because despite the fact that from a medical standpoint they do not avoid the increased frailty that comes with aging (as also supported by our results), yet they are able to balance this thanks to their increased intrinsic capacity to respond to minor stresses of daily life (i.e., resilience) [40]. As suggested by Nygren et al. [15], it is also possible to read the increase in resilience

reported in the oldest-old population as a form of compensation for losses of functional capacity and physical health, in accordance with selective optimization or positivity effect [41, 42]. The oldest-old would be the ones that were the most successful in implementing this compensation [19]. As discussed before, when commenting qualitative results, according to our data, this implementation could also be related to the sense of belonging and life purpose given by the love for the land, family ties and religion expressed by the oldest-old in their interviews. This sense of purpose tends also to be related to perceived and actual health [43], supporting even more the importance of these aspects for the oldest-old population.

This study confirmed this perspective, with the added value of using both qualitative and quantitative data and multi-perspective approach. Yet, there are some limitations that should be taken into account. First of all, our qualitative data are based on retrospective, subjective narrations, that could be imprecise. Plus, we used semi-structured interviews that did not allowed for an in-depth text and content analysis. Following the methodological indications provided by Hutnik et al. [19], we tried to compensate for these limitations by using a participatory-action research approach, which involved both the oldest-old sample and their younger family members in the co-construction of their narrations, to obtain better data.

A second limitation was to focus only on a sample of oldest-old that was in relatively good cognitive health and able to talk. This could have lead to an over-emphasis of positive traits and experiences. Another limitation is the limited sample sized. Even if we could obtain a medium effect size for our quantitative analyses, further studies should try to replicate our findings. It could be hard to replicate the study with a much larger sample, given the relatively low percentage of oldest-old available among the overall population. Still, a joint effort from different research teams might help, in the future, to collect a larger sample. Finally, our data reflect a specific sub-culture that is typical of a rural area in southern Italy. Sample from urban or suburban areas, or from different cultures might report different leading variables in the explanation of the generation of resilience.

A strength of the study was the mixed method approach, which combined self-report measures, standardized assessment and semi-structured interviews (which used participatory action-research including younger members of the family). This allowed to collect a more in-depth and complete picture of the oldest-old, compared to what has been previously reported in the literature by studies that adopted only a qualitative or a quantitative approach. Data reported and discussed here can provide a better understanding of the unique characteristics of the oldest-old, and lead to new insights that could help promoting more successful aging to a larger part of the population. Our findings can also be

used to design interventions within pathological aging, trying to add some of the protective factors that the oldest-old have to individuals with cognitive decline or dementia. For example, a resilience training could be combined with non-invasive brain stimulation, to increase the positive effects of neuromodulation, already reported in literature [44, 45]. Future lines of research could also explore the relationship that other psychological factors, like personality traits, which have bene proved to be linked to the Cognitive reserve of the aging population [46], have with the other characteristics of the oldest-old.

Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest and no competing interests.

Ethics approval The project has been approved by the University of Messina IRB (dipmed-psi n. 12).

Consent to participate All participants gave written consent to participate in the study.

Consent for publication All the authors approved the submitted version of the manuscript.

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