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Trajectories of Depressive Symptoms in Late Life: Integrating Age-, Pathology-, and Mortality-Related Changes

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Depressive symptoms in late life

- Late life involves many challenges with consequences for changes in well-being (Kunzmann, 2008; Schilling, Wahl, & Wiegering, 2012).

- In contrast to age-normative declines in physical health and cognitive functioning, several studies provide empirical evidence of a relative stability or even improvement in emotional well-being in old age (Charles & Carstensen, 2010; Charles, Reynolds, & Gatz, 2001; Mather, 2012).

- The maintenance of emotional well-being despite age-related losses is termed the "Paradox of emotional well-being in ageing" (Kunzmann et al., 2000).

Paradox of emotional well-being in ageing

- Age-related changes in 23 years: Positive and negative affect (Charles et al., 2001).

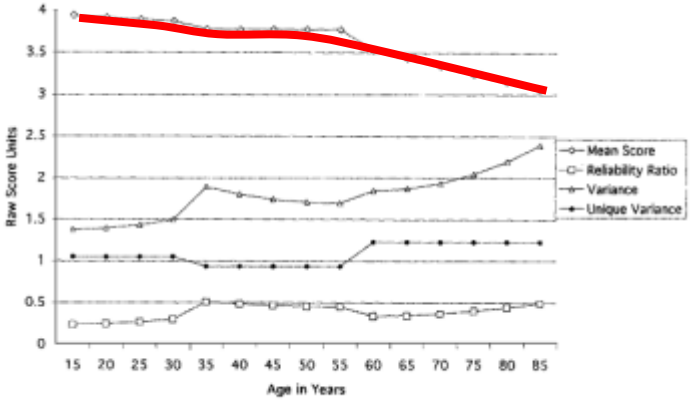


Figure 3. Estimated positive affect values from the latent growth model for three age groups.

- PA remained stable until old age (Charles et al., 2001).

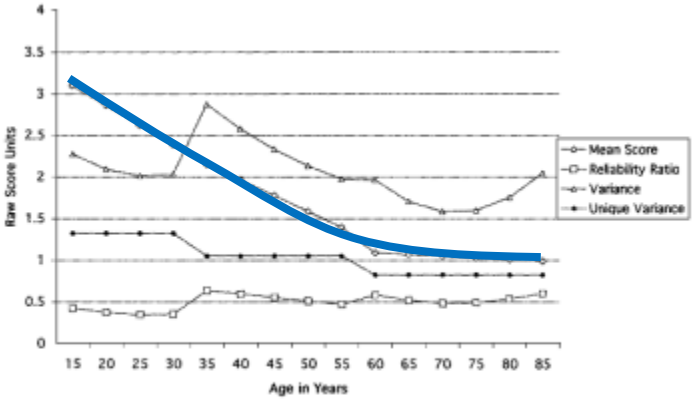


Figure 2. Estimated negative affect values from the latent growth model for three age groups.

- NA first decreased and the change attenuated.

Paradox of emotional well-being in ageing

- Three limitations:

1. Evidence mostly concerns age-related changes in the cognitive components of subjective well-being (Diener, Suh, Lucas, & Smith, 1999), instead of the affective components.

2. The paradox may hold only until early old age. Less is known about old-old and oldest-old, during which major loss experiences tend to increase in frequency (Baltes & Smith, 2003).

3. The trajectory of developmental changes is an interplay between age-, pathology-, and mortality-related processes (Baltes, Lindenberger, & Staudinger, 2006).

Paradox of emotional well-being in ageing

- Conventional approaches to examine age-related changes, such as multilevel modeling, cannot take into account the pathology- and mortality-related processes.

- This can lead to biased estimates in age-related changes, such as underestimation of depressive symptoms in advanced old age (Mirowsky & Reynolds, 2000).

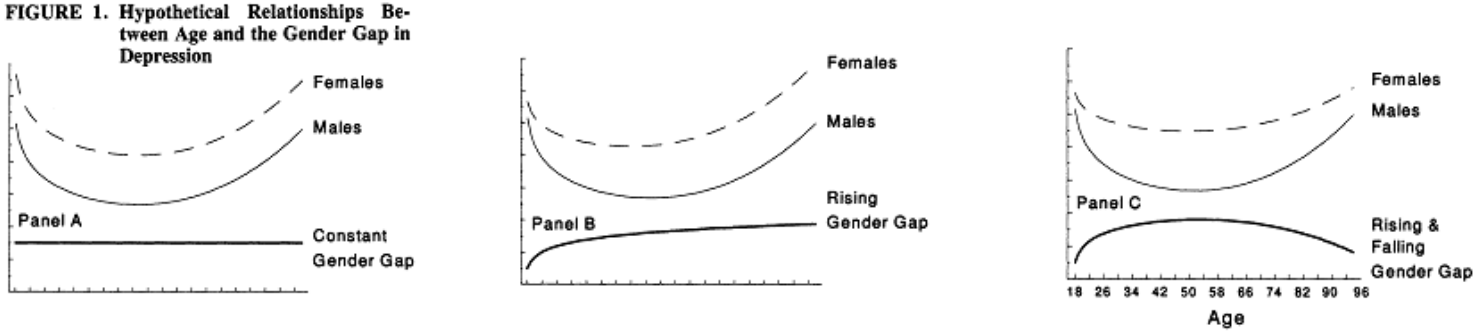
Gender differences in mortality and depressive symptoms in ageing

- In terms of mortality, women and men differ in their genetic makeup and may engage in different lifestyles with implications for longevity, which is reflected in the lower mortality risk in women than men across all age groups (Franceschi et al., 2000).

- The gender gap in depressive symptoms is expected to vary with age because of gender differences in the exposure to risk factors in old age (Mirowsky, 1996), e.g. health conditions and widowhood.

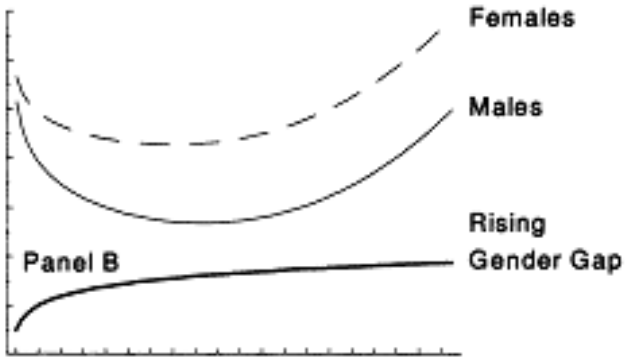
Gender differences in mortality and depressive symptoms in ageing

- Mirowsky (1996) proposed three hypothetical gender gap patterns in depressive symptoms in ageing.



Conflicting results

- Using cross-sectional data from three US samples, depressive symptoms decreased in successive age groups from young adulthood to early old age, then increased from early old age to oldest-old for both men and women, with an increasing gender gap from young adulthood to oldest-old (Mirowsky, 1996).



Conflicting results

- Using longitudinal data from Denmark, findings revealed a decreasing gender gap in depressive symptoms between age 60 to 80 (Barefoot et al., 2001), such that men showed increases in nonsomatic depressive symptoms but women did not.

Conflicting results

- Significant age x gender interaction in nonsomatic symptoms: Mood, feelings of well-being, and self-esteem (Barefoot et al.. 2001).

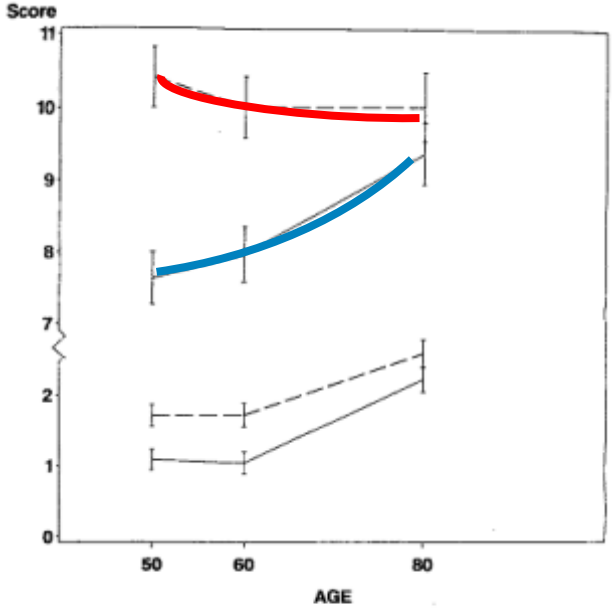


Figure 1. Mean somatic and nonsomatic symptoms by age and gender. The bottom curves are for the somatic items. Trends for men are depicted with solid lines. Vertical bars represent standard errors.

Present study

- We examined the age-related trajectory of depressive symptoms, an affective component of subject well-being, across an age spectrum ranging from young-old (65-75 years) to the oldest-old (85 years and above; Neugarten, 1996).

- We used longitudinal data on depressive symptoms from (baseline n = 2,087) older adults who participated for up to 15 years (1992-2007) in the Australian Longitudinal Study of Ageing (ALSA; Luszcz, 1998).

Two objectives

1. We examined the pattern of age-related changes in depressive symptoms from young-old to oldest-old, taking into account morality, and changes in cognitive abilities, functional health, and major medical conditions, such as arthritis (Alberta Health, 2003; Murray et al., 2012) that are known risk factors for impaired well-being in old age (Marks, 2013).

2. Considering gender differences in the level of, and age-related changes in depressive symptoms (Anstey & Luszcz, 2002; Barefoot et al., 2001), we examined how findings regarding the so-called paradox of emotional well-being may differ between men and women.

Hypotheses

- H1: Depressive symptoms would increase from young-old to oldest-old age.
- H2: Age-related increases in depressive symptoms would be associated with the presence of arthritis.
- H3: Age-related changes in depressive symptoms would be significant predictors of death. Specifically, we hypothesized that age-related increase in the level and slope of depressive symptoms would each be associated with increased risks of mortality.
- H4: Women would show a higher level of depressive symptoms than men. However, gender differences in depressive symptoms would be attenuated in oldest-old compared to young-old.

Method

- **Participants**
  - Australian Longitudinal Study of Ageing (ALSA)
  - Started in 1992, 13 waves
  - Baseline: n = 2,087, M age = 78.2 years (SD = 6.7)

Method

- **Measures**

1. **Depressive symptoms**
   - 20-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977).
   - 4-point scale (0 = *Rarely or none of the time*; 3 = *Most or all of the time*).
   - Mean substitution was performed when less than 20 percent of responses were missing.
   - Cronbach's alpha ranged from .78 in Wave 1 to .84 in Wave 3, suggesting satisfactory internal consistency across waves.

Method

	Wave 1 (1992) N=2051	Wave 3 (1994) N=1156	Wave 6 (2000) N=649	Wave 7 (2003) N=404	Wave 9 (2007) N=190
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
CESD	8.32 (7.46)	8.35 (7.31)	9.07 (6.67)	8.53 (7.42)	9.88 (7.15)

- **Measures**

2. **Arthritis diagnosis**
   - Participants reported whether or not they received a current arthritis diagnosis from their doctors.
   - Percentage of participants reporting a current arthritis diagnosis ranged from 45% in Wave 3 to 55% in Wave 7.

Method

- **Measures**

3. **Survival status**
   - We obtained participants' exact dates of death, from the Births, Deaths, and Marriages Registration Office, South Australia.
   - M age of death = 87.80 years (SD = 6.33, range = 68.9–109.2)
   - Gender difference: Men = 87.30 years, Women = 88.41 years, $t(1604) = -3.58$, $p < .001$.

Method

- **Measures**

4. Covariates: education, marital status, living arrangements, cognitive function, and physical health.

Method

- **Statistical analysis**
  - We used joint modeling of longitudinal change and survival, which allows the simultaneous estimation of longitudinal and survival information (Rizopoulos, 2012)

  - The joint model is specified by treating the longitudinal and the survival models as two sub-models, with an association parameter, α, to link up the two sub-models.

Joint model

1. Basic longitudinal sub-model

- Level-1 model: $D_{it} = b_{0i} + b_{1i} age_{it} + e_{it}$

- Level-2 model: $b_{0i} = a_{00} + u_{0i}$

$b_{1i} = a_{10} + u_{1i}$

- D_{it} is depressive symptom for individual *i* at time *t*. Following previous studies (Ghisletta, 2008; Ghisletta et al., 2006), age is grand-mean centered at 64.90 years, the age of the youngest participant at Wave 1. a_{00} and a_{10} are fixed effects, which respectively represent the mean intercept and the mean effect of age on depressive symptoms. u_{0i} and u_{1i} are random effects, which respectively represent the individual-specific variations from the means.

Joint model

2. Basic Weibull survival sub-model

$$\lambda_i(t) = (\mathrm{r}\cdot \mathrm{t}^{r-1})\exp(\gamma_0)$$

- $\mathrm{r}\cdot \mathrm{t}^{r-1}$ is the Weibull hazard function, and r > 0. r is the shape parameter. When r = 1, the Weibull model reduces to the exponential model. In the exponential model, the risk that the event occurs is constant across time. When r > 1, the risk of the event occurring increases with time. In contrast, When 0 < r < 1, the risk of the event occurring decreases with time. $\lambda_i(t)$ is the relative risk at time *t*, for individual *i*. γ_0 is the intercept. Chronological age was used as the time metric, *t*, which is grand-mean centered at 64.90 years, the age of the youngest participant at Wave 1.

Joint model

- Basic joint model

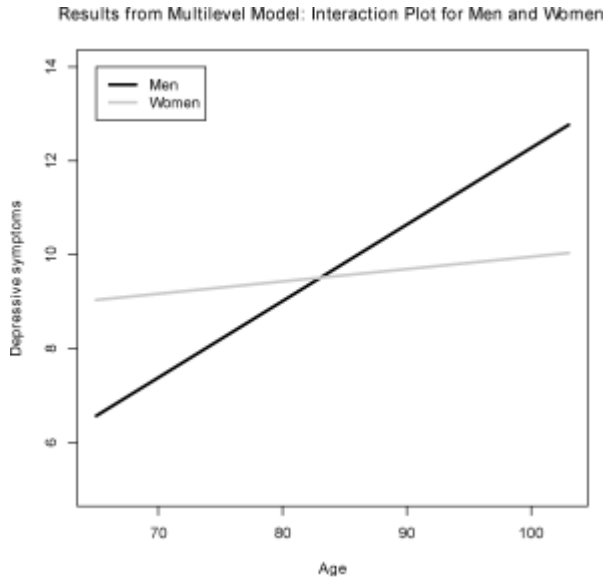
$$\lambda_i(t) = (\mathrm{r}\cdot \mathrm{t}^{r-1})\exp\{\gamma_0 + \alpha m_i(\mathrm{t})\}$$

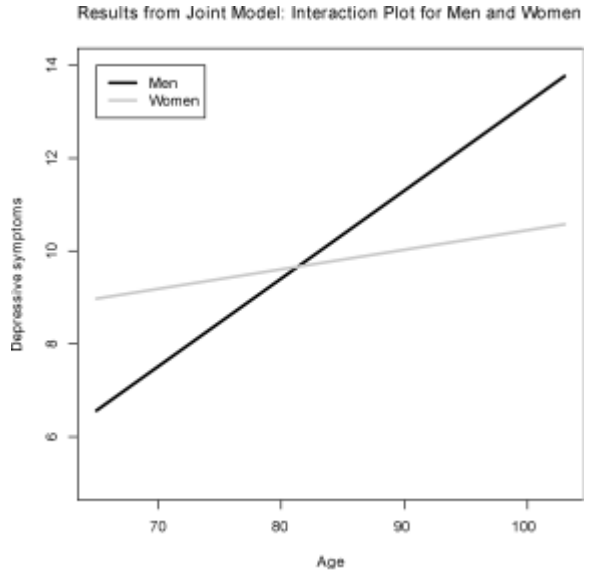
- where $m_i(\mathrm{t}) = a_{00} + u_{0i} + (a_{10} + u_{1i})\,\mathrm{age}_{it}$

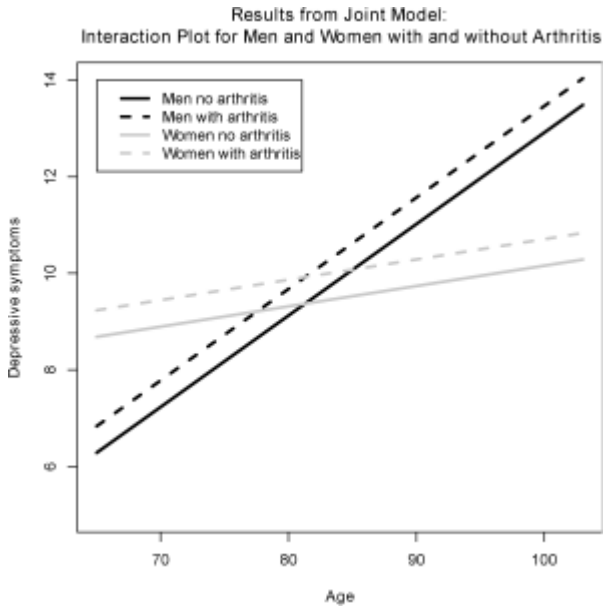
- In this basic joint model, the fitted longitudinal value, i.e., age-related trajectory of depressive symptoms, is associated with the hazard rate. The association parameter, α, represents the effect of the current values of the longitudinal measures of depressive symptoms on the risk of death.

Results

- Results of longitudinal sub-model, all control variables were entered.







Results

- In the survival sub-model, the effects of gender and number of medical conditions significantly predicted the risk of death. The effect of education was not significant.

- The association parameter $\alpha = .02$, $z = 5.14$, $p < .001$, indicated that the age-related changes in depressive symptoms were positively associated with mortality.

Results

- Specifically, a one-unit increase in the level (i.e., intercept) and an annual increase of one-unit (i.e., slope) in depressive symptoms were respectively associated with 1.17- and 1.002-fold increase in relative risk of death.

- The shape parameter, $\log(r) = 1.39$, $z = 70.88$, $p < .001$, indicates that the risk of death increases with increasing age.

- The significant effect of the association parameter, α, suggests that attrition due to mortality was nonrandom and was associated with the longitudinal trajectory of depressive symptoms.

Discussion

- The present study examined the age-related trajectory of depressive symptoms and its association with mortality in old age, taking into account pathology-related changes to extend and qualify previous findings regarding the so-called paradox of well-being in ageing.

- Four major findings emerged from this study. First, in contrast to propositions of the paradox of well-being, depressive symptoms increased from young-old to oldest-old age.

Discussion

- Second, the level of depressive symptoms was associated with arthritis diagnosis. Individuals with arthritis reported a higher level of depressive symptoms than those without arthritis.

- Third, both the level of, and change in depressive symptoms were associated with mortality hazards, suggesting poorer emotional functioning as death approaches.

- Fourth, the significant age by gender effect on depressive symptoms indicates that depressive symptoms increased with age but the increase was more pronounced in men than women.

Limitations

- The present study is limited by the lack of clinical assessments of depression, physical health, and cause of mortality.

- The study cannot tease apart the cause-and-effect associations between depressive symptoms and changes associated with age, pathology, and mortality.

Conclusion

- The present study complements and extends existing work by suggesting that depressive symptoms increase from young-old to oldest-old age and that an age-related increase in trajectory of depressive symptoms is associated with increased likelihood of mortality.

- These findings converge with results from the literature that old age and its increasingly higher proportion of losses-to-gains may challenge individuals in their efforts to maintain their emotional well-being (Baltes & Smith, 2003).

Conclusion

- Subgroups of oldest-old adults may even experience qualitatively different vulnerabilities, such that individuals of low functioning may be predisposed to a higher level and more rapid increase in depressive symptoms (Schilling et al., 2013).

- Social policies and ageing-friendly support structures are needed to target the oldest-old adults as a whole, but also subgroups of oldest-old adults who need support services most, in order to address the incompleteness of bio-cultural architecture in very late life (Baltes & Smith, 2003).

Q & A

Thank you very much