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Sensory Loss and Suicide Ideation in Older Adults: Findings from the Three-City cohort study

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Objectives: To examine the longitudinal risk of vision or hearing loss for experiencing suicidal ideation in older adults.

Design: The Three-City study, examining data from three waves of follow-up (2006-2008; 2008-2010; 2010-2012).

Setting: Community dwelling older French adults.

Participants: N=5438 adults aged 73 and over.

Measurements: Suicidality was assessed by the Mini International Neuropsychiatric Interview, Major Depressive Disorder module. Mild vision loss was defined as Parinaud of 3 or 4 and severe vision loss as Parinaud > 4. Mild hearing loss was self-reported difficulty understanding a conversation and severe hearing loss as inability to understand a conversation.

Results: Severe vision loss was also associated with increased risk of suicidal ideation at baseline (OR = 1.74, 95% CIs = 1.17-2.59) and over five years (OR = 1.99, 95% CIs = 1.27-3.12). Mild and severe hearing loss were associated with increased risk of suicidal ideation, both at baseline (OR = 1.31, 95% CIs = 1.05-1.64; OR = 1.85, 95% CIs = 1.39-2.48) and over five years (OR = 1.43, 95% CIs = 1.13-1.80; OR = 1.95, 95% CIs = 1.42-2.67).

Conclusion: Sensory losses in late life pose a risk for suicidal ideation. Suicidality requires better assessment and intervention in this population.

Key words: suicidal, elderly, vision impairment, dual sensory loss, hearing impairment, mental health

Running head: Sensory loss and suicide ideation in the elderly

Introduction

Sensory losses are common amongst the elderly (WHO, 2012) leading to poorer mental health and reduced quality of life (Chia *et al.*, 2006; Heine and Browning, 2014). Despite high rates of comorbid depression, aspects of suicide in sensory loss have rarely been examined. Suicide in the elderly remains under-researched, despite comparatively high suicide rates (O'Connell *et al.*, 2004).

Research examining suicide and suicidal behaviour in sensory loss is scant. An increased risk of suicide was reported in older adults with vision loss (Waern *et al.*, 2002). Deaf adolescents have higher rates of suicidal behaviour (ideation, attempts) than the general population (Landsberger *et al.*, 2014) and deaf adults commonly reported experiencing suicidal thoughts (Sheppard and Badger, 2010). However, only one population-based study to date has explored sensory loss and suicidal ideation. This cross-sectional analysis showed that older adults with sensory losses reported more suicidal ideation, although only vision loss (VL) significantly increased the risk (Kim *et al.*, 2015).

Research examining aspects of suicide in sensory loss remain limited, especially in older adults, with the majority of evidence relying on small samples, and longitudinal studies are lacking (Kim *et al.*, 2015). The aim of the present study was to explore the risk of suicidal ideation in older adults with VL or hearing loss (HL) over 5 years.

Methods

This study forms part of the SENSE-Cog research programme, funded by European Union Horizon 2020 programme (http://www.sense-cog.eu/), which aims to promote mental well-being in older adults with sensory and cognitive impairments.

Study sample

Thus study exampled a subsample of participants from the Three-City (The 3C Study Group, 2003), a population-based cohort study of 9294 community-dwelling French adults aged 65 and over from three French cities (Bordeaux, Dijon and Montpellier). This study analysed data from participants who completed the 4th wave of follow-up (2006-2008). The study protocol was approved by the Ethical Committees of the University–Hospitals of Bicêtre and Nîmes (France) and informed consent was obtained from participants.

Measures

Suicide ideation: Suicide ideation was assessed via the suicidality item of the Major Depressive Disorder module of the Mini International Neuropsychiatric Interview (MINI) (Sheehan *et al.*, 1998). Suicidal ideation was reassessed at 3 and 5 years (5th and 6th Waves of follow-up; 2008-2010 and 2010-2012: reassessed at 3 years only in Bordeaux).

Sensory measures: Near visual acuity (presenting vision) was assessed with the Parinaud scale. Standardized cards were used at a reading distance of 33 cm. Mild vision loss was classified as Parinaud of 3 or 4 (Snellen equivalent 20/30-20/60)

and severe vision loss as Parinaud > 4 (Snellen equivalent <20/60). Mild hearing loss was classified as self-reported difficulty understanding a conversation, and severe hearing loss was self-reported inability understanding a conversation.

Covariates: Socio-demographic and health-related information was collected during interview; including education level (elementary schooling, secondary school, higher education), monthly income (<€760, €760-2280, >€2280), marital status, alcohol consumption (<10, 10-40, >40 grams per day) and tobacco use (current-, past -, non-smoker). A composite score of functional ability was calculated based on scores from the Rosow-Breslau scale, the Lawton-Brody Instrumental Activities of Daily Living (IADL) scale and the Katz Index of basic ADL (autonomous, dependent in 2 or more areas of functioning; Barberger-Gateau *et al.*, 2000).

History of stroke, myocardial infarction, diabetes, and psychotropic medication use (ATC codes: N05A-C, N06A-B) was obtained during medical interview. Blood pressure was measured using a digital electronic tensiometer OMRON M4. Hypertension was defined as 140/90 mmHg or treatment with blood-pressure lowering drugs (ATC codes: C02, C03, C07, C08).

Statistical Analysis

Socio-demographic and health characteristics were compared according to sensory loss using chi-squares and one-way ANOVAs. The relationship between vision or hearing loss and suicidal ideation at baseline was examined using multivariate logistic regressions. The association between baseline sensory loss and presence of suicidal ideation over follow-up was examined using mixed logistic models, which take into account within-subject response correlation and model the

individual repeated probabilities of the outcome during follow-up. Potential interactions between vision and hearing, as well as between sensory loss and sex, income and education were examined. For each analysis, two models were undertaken; Model 1 adjusted for sex, study center, and age; Model 2 further adjusted for education level, income, marital status, use of psychotropic medication, functional ability, hypertension, diabetes, smoking, alcohol consumption, and history of stroke and myocardial infarction. Analyses were conducted using SAS 9.4 (SAS Institute, Inc., Cary, NC).

Results

5710 participants attended the 4th follow-up, of whom 5438 (95.2%) had sensory and MINI data. Mean age was 80.1 (SD=4.8) and the majority were female (62.9%). 905 (16.6%) had vision loss (mild=634; severe=271), while 2953 (54.3%) reported hearing loss (mild=2019; severe=844). Those with sensory losses were older and in poorer physical health (Table 1). At baseline, 530 (9.7%) participants reported presence of suicidal ideation and an additional 233 participants reported suicidal ideation over follow-up.

At baseline, mild and severe HL were associated with increased risk of suicide ideation, even after adjustment for potential confounders (OR = 1.31, 95% CIs = 1.05-1.64, p =.02; OR = 1.85, 95% CIs = 1.39-2.48, p <.001 respectively; Table 2). Mild VL was associated with increased risk in model 1, and this association remained close to significance after further adjustment (OR = 1.32, 95% CIs = 0.99-1.76, p = .06). Severe VL was also significantly associated with increased risk of suicide ideation in both models (OR = 1.74, 95% CIs = 1.17-2.59, p = .01).

Longitudinal analyses indicated that mild and severe HL predicted suicide ideation over 5 years (OR = 1.43, 95% CIs = 1.13-1.80, p =.003; OR = 1.95, 95% CIs = 1.42-2.67, p <.001, respectively). Mild and severe VL were also associated with increased risk of suicidal ideation (OR = 1.37, 95% CIs = 1.00-1.88, p = .05; OR = 1.99, 95% CIs = 1.27-3.12, p = .003, respectively). Odds ratios for HL and VL remained almost unchanged by adjustment for covariates. All examined interactions were non-significant.

Discussion

This study contributes to the limited literature examining aspects of suicide in sensory loss in older adults and highlighted that VL and HL were associated with increased risk of suicidal ideation cross-sectionally and over 5 years.

Associations between HL and suicide risk have been varied in prior studies, with VL but not HL associated with increased risk of suicidal ideation in a previous population-based study (Kim *et al.*, 2015). Differences in findings may be explained by variations in HL assessment or by differences in populations studied, such as the older age of our population given that suicide rates increase with age in the elderly (O'Connell *et al.*, 2004). Our findings further highlight that VL and HL increase risk for suicidal ideation over time, and risk increases with worsening severity of the loss. Moreover, although severe VL has previously been shown to increase risk of suicide ideation (Waern *et al.*, 2002), our findings demonstrate that a lower severity of VL may also pose a longitudinal risk.

Our results contribute to the currently limited literature regarding HL and mental health. Whether HL increases depression risk remains equivocal and

longitudinal studies of mental wellbeing in HL are scant (Pronk *et al.*, 2013). Importantly, our findings suggest that HL may have a long-term impact on mental wellbeing.

The association between sensory losses and suicidal ideation might be explained by a number of pathways. Impaired functional ability resulting from the sensory loss increases reliance on others, which may increase perceptions of the self as a burden. Perceived burdensomeness is associated with greater suicidal ideation in the elderly (Cukrowicz *et al.*, 2011). Loneliness is another strong predictor of suicidal behaviour (Stickley and Koyanagi, 2016) and is especially prominent in HL due to communication difficulties (Pronk *et al.*, 2013). Whether the mechanisms underlying the relationship with suicide ideation are the same for HL and VL remains unclear and further study of the risk and mediating factors in each sensory loss is warranted.

These findings underscore the ongoing need to provide targeted intervention for older adults with sensory loss. Given that suicide ideation is not assessed in a range of commonly used depression screening tools, a specific focus on assessing suicide may be warranted. Older adults with VL typically underutilise mental health care (van der Aa *et al.*, 2015) and communication barriers impinge upon people with HL accessing mental health support (Sheppard and Badger, 2010); thus a renewed focus on assessment and targeted intervention for older adults with sensory loss appears needed.

Strengths of the present study included the sample size and longitudinal design. Weaknesses include that HL was self-reported. Additionally, suicide ideation was assessed by a single item, thus we were unable to explore the severity of

suicidality or the association of sensory loss with other suicidal behaviours including suicide attempts.

Sensory losses increased the risk for suicidal ideation in older adults in both the short and long term. Given the increased rate of suicide in late life (O'Connell *et al.*, 2004), suicidality amongst older adults with sensory loss requires better assessment, especially given the barriers to accessing mental health care worldwide for this population.

Conflict of interest: none

Description of authors' roles: S Cosh was responsible for data analysis and manuscript preparation, I Carrière assisted with data analysis and interpretation of results, V Daien assisted with interpretation of results and writing the paper, C Tzourio was responsible for study design and overseeing data collection C Delcourt assisted in designing the study, overseeing data collection and interpreting results, and C Helmer assisted with data analysis, interpretation and writing the paper.

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Table 1: Characteristics of the study population by sensory loss at 4th Wave. Three-City Study 2006-2008, N=5438

	No sensory loss n= 2160		Mild VL only n=236		Severe VL only n= 89		Mild HL only n=1756		Severe HL only n=617		VL and HL n=580		p
Age M(SD)	78.9	(4.2)	81.0	(4.7)	81.4	(4.8)	79.7	(4.6)	82.0	(5.2)	83.3	(5.5)	<.001
Female N (%)	1481	(68.6)	175	(74.2)	61	(68.5)	1000	(57.0)	329	(53.3)	376	(64.8)	<.001
Suicide ideation (baseline)	164	(7.6)	31	(13.1)	13	(14.6)	167	(9.5)	70	(11.3)	85	(14.7)	<.001
Education (reference category: high)													
Low	442	(20.5)	72	(30.6)	29	(32.6)	359	(20.5)	146	(23.7)	172	(29.7)	<.001
Mid	1265	(58.7)	130	(55.3)	48	(53.9)	1000	(57.0)	339	(55.0)	322	(55.5)	.478
Income (reference category : high)													
Low (<€760)	82	(4.0)	12	(5.1)	11	(12.4)	58	(3.3)	32	(5.2)	52	(9.7)	<.001
Mid (€760-2280)	1172	(57.2)	154	(65.3)	52	(58.4)	964	(54.9)	315	(51.1)	351	(65.1)	<.001
Married	1322	(61.2)	127	(53.8)	45	(50.6)	1110	(63.3)	392	(63.5)	279	(48.2)	<.001
Smoking(reference category non-smoker)													
Current smoker	102	(4.7)	16	(6.8)	9	(10.1)	102	(5.8)	30	(4.9)	22	(3.8)	.066
Past smoker	629	(29.1)	67	(28.4)	23	(25.8)	615	(35.0)	231	(37.4)	186	(32.1)	<.001
Psychotropic medication use	482	(22.3)	78	(33.1)	30	(33.7)	400	(22.8)	175	(28.4)	198	(34.1)	<.001
Alcohol consumption (reference category: high)													
Low (>10 grams per/day)	1286	(59.6)	146	(61.9)	61	(68.5)	1012	(57.4)	329	(53.3)	357	61.55	.009
Moderate (10-40g per/day)	719	(34.9)	68	(29.4)	24	(28.2)	585	(34.6)	228	(38.5)	182	(32.3)	.088
Hypertension	1756	(82.1)	211	(89.4)	76	(86.4)	1417	(81.6)	512	(84.5)	496	(86.6)	.004
Functional ability (reference category: autonomous)													
Mild	666	(31.7)	94	(40.9)	35	(42.2)	590	(34.6)	232	(39.0)	269	(48.1)	<.001
Moderate	58	(2.8)	21	(9.1)	9	(10.1)	67	(3.9)	40	(6.7)	61	(10.9)	<.001
Severe	5	(0.1)	2	(0.9)	1	(1.2)	3	(0.2)	0	(0.0)	5	(0.9)	<.001
History of Myocardial infarction	69	(3.2)	17	(7.2)	7	(7.9)	71	(4.1)	31	(5.0)	26	(4.5)	.001
History of Stroke	58	(2.7)	7	(3.0)	6	(6.8)	51	(2.9)	25	(4.1)	27	(4.8)	.039
Diabetes	199	(9.2)	27	(11.4)	11	(12.4)	170	(9.7)	76	(12.4)	76	(13.2)	.079

VL: Visual loss; HL: Hearing Loss; SD: Standard deviation, [a] = determined by one-way ANOVA, all other p values determine by Chi square tests

Table 2: Association between sensory loss and suicidal ideation

	Model 1				Model 2			
	OR	**95% CI**		**p**	**OR**	**95% CI**		**p**
Baseline								
Mild Hearing Loss	1.43	1.17	1.75	.001	1.31	1.05	1.64	.019
Severe Hearing Loss	1.87	1.42	2.45	<.001	1.85	1.39	2.48	<.001
Mild Visual Loss	1.40	1.08	1.82	.011	1.32	0.99	1.76	.055
Severe Visual Loss	1.76	1.23	2.52	.002	1.74	1.17	2.59	.006
Over 5 years								
Mild Hearing Loss	1.50	1.20	1.87	<.001	1.43	1.13	1.80	.003
Severe Hearing Loss	2.18	1.61	2.96	<.001	1.95	1.42	2.67	<.001
Mild Visual Loss	1.38	1.03	1.85	.033	1.37	1.00	1.88	.049
Severe Visual Loss	1.86	1.22	2.83	.004	1.99	1.27	3.12	.003

Model 1: N =5438; adjusted for sex, age, center
Model 2: N =4608; adjusted for sex, age, center, education, income, marital status, psychotropic medication use, functional ability, hypertension, diabetes, smoking, alcohol consumption, and history of stroke and myocardial infarction
OR: odds ratio
CI: confidence interval

Table legends

Table 1: Characteristics of the study population by sensory loss at 4th Wave. Three-City Study 2006-2008, N=5438 – shows that those with sensory losses were older and in poorer physical health on all assessed health factors except for diabetes than those without sensory loss

Table 2: Association between sensory loss and suicidal ideation – highlights that both hearing and vision loss were associated with increased risk of experiencing suicidal ideation both at baseline and over years of follow-up

Supplementary material

1. Authorlist for Sense-Cog WP1 group