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Coping with age-related hearing loss: patient-caregiver dyad effects on quality of life

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Abstract

Background and aims: Patients with age-related hearing loss (ARHL) and their natural caregivers have to confront a disability that produces progressive lifestyle changes. There is an interest in studying the ability of patients and their caregivers to cope with the difficulties that affect quality of life (QoL). In a sample of patient-caregiver dyads in the specific context of ARHL, we examine whether the QoL of patients and caregivers is influenced by the coping processes they use from a specific actor-partner interdependence model (APIM).

Methods: This cross-sectional study involved dyads with patients having a diagnosis of ARHL. The self-reported data included QoL (WHOQoL-BREF) and coping strategies (BriefCope). The APIM was used to test the dyadic effects of coping strategies on QoL.

Results: A total of 448 dyads were included; the patients and caregivers were love partners for 59% of the dyads. Coping strategies, such as social support, avoidance, problem solving, and positive thinking, exhibited evidence of actor effects (degree to which the individual's coping strategies are associated with their own QoL). Effects on the partner (degree to which the individual's coping strategies are associated with the QoL of the other member of the dyad) were found, i.e., when the patients mobilized their coping strategy based on social support and problem-solving, their caregivers reported higher environmental QoL.

Conclusion: This study emphasizes that the QoL for patients and their caregivers was directly related to the coping strategies they used. This finding suggests that targeted interventions should be offered to help patients and their relatives to implement more effective coping strategies.

Keywords: Age-related hearing loss, Caregivers, Dyads, Interactions, Quality of life, Coping, Emotional status

Background

Hearing impairment is one of the most common disabilities in humans, affecting more than 250 million people worldwide [1, 2]. In developed countries, aging is the most common cause of hearing impairment and is referred to as age-related hearing loss (ARHL) or presbycusis. The consequences of ARHL in daily life include difficulty of interpreting speech sounds, which often results in a reduced ability to communicate, impaired

physical and social functions, and an altered quality of life (QoL) [3–7]. Some authors have also reported that ARHL affects relatives' functioning in everyday life, specifically the main family caregiver [8–10].

The impact on self-reported QoL may differ according to the individuals' sociodemographic and clinical characteristics and other psycho-behavioral factors. In particular, the personal ability to cope, defined as the cognitive and behavioral efforts that the individuals implement to solve problems and reduce the stress that may result [11–13], has previously been shown as having a direct impact on the QoL of the individuals. More interesting, the nature of individuals' coping strategies may have a direct impact on the QoL [14] of their natural caregivers

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as shown in various contexts, such as cancer [15, 16] or severe mental disease [17]. These different studies showed that positive thinking or problem solving seem to be preferentially associated with better QoL, and the use of strategies based on avoidance or social support appear to be a risk factor for lower QoL [15–18].

In the specific context of ARHL, we previously emphasized [19] that quality of life of individuals and their natural caregivers was related to the coping strategies that they use. However, the previous study was performed on a small sample size ($N=44$) and did not use specific dyadic analyses that integrate a conceptual view of interdependence in two-person relationships. Therefore, to consider the reciprocal influences and congruence between the patients and their caregivers, studies should be conducted at the ‘dyadic level’. Thus, among a large sample of patient-caregiver dyads, we examined whether the QoL of patients and caregivers is influenced by the coping strategies implemented by either themselves or their relatives, using the actor–partner interdependence model (APIM) [20]. This approach, as an appropriate method to assess the dyadic effects, is based on the hypothesis that the scores within the same dyad are not independent but instead are more similar than the scores of two individuals who are not in the same dyad.

Methods

Design and settings

We conducted a cross-sectional study with a descriptive, correlational design. Patient-caregiver dyads were recruited in the 17 French preventive health centers for the beneficiaries of complementary pension schemes for employees of the private sector (Association Générale des Institutions de Retraite Complémentaire des cadres and l'Association pour le Régime de Retraite Complémentaire des salariés, AGIRC-ARRCO, <http://www.agirc-arrco.fr>). These centers perform 25,000 annual health checkups for beneficiaries and/or partners of these beneficiaries, including medical, psychosocial, and cognitive prevention. The visits last a half day. Regulatory monitoring was performed in accordance with the French law requiring the approval of the French ethics committee (Comité d'éthique, Aix Marseille University, February 4th 2015, Number 2014 – 02 – 04 – 04). All records and subjects' identities remained confidential in accordance with French regulations: the French National Committee of Informatics and Liberties (Commission nationale de l'informatique et des libertés, 20/03/2014, reference number DR-2014 – 097). Consent was obtained from each participant.

Sample selection

The samples included patient-caregiver dyads. The selection criteria of the patients were as follows: aged above

65 years; having a bilateral sensorineural ARHL and having a degree of hearing loss from mild (≥ 21 dB, dB HL) to moderately severe (< 70 dB HL) according to the Clark's classification [21] and to the International Bureau for Audiophonology Classification (<https://www.biap.org/fr/archives/65-ct-2-classification-des-surdites>) (hearing loss was defined from the mean hearing loss of the 4 following frequencies: 500, 1000, 2000, and 4000 Hz); being beneficiaries of complementary pension schemes for employees of the private sector (AGIRC-ARRCO); able to speak/read French; and agreeing to participate. The selection criteria of the caregivers were as follows: aged above 18 years; designated by the patient as the most involved person in his/her life; able to speak/read French; and agreeing to participate. In this context, ‘caregiver’ is close to ‘significant other’ as defined by the World Health Organization's International Classification of Functioning [22]. Written consent forms to participate were collected from every patient and caregiver.

Data collection

Inclusions were performed during a 4-month period. For the patient, the clinical data were gathered using the medical records and the examination by a geriatric doctor of the center. The nature of the relationship between the patient and the caregiver was recorded (love partner, child, or other). The age, gender, educational level, marital status, professional status, and health status (chronic disease, cancer, and stroke) were recorded for both the patient and his/her caregiver using self-report questions. The hearing severity was recorded for the patients (two levels of hearing severity: $<$ or ≥ 35 dB HL).

Quality of life and coping strategies were collected by means of self-reported questionnaires that were completed by the patients and caregivers. On average, it took participants 25 min to complete all study assessments.

- Quality of life was assessed using the French version of the World Health Organization Quality of Life (WHOQoL-BREF) questionnaire, which is a generic, 26-item questionnaire used worldwide to assess the effects of physical health, psychological health, social health, and environmental factors on QoL [23, 24]. All scores range from 0 (worst QoL) to 100 (best QoL).
- Coping strategies were assessed using the Brief Coping Orientation to Problems Experienced Scale (BriefCope) [25, 26]. This questionnaire includes 28 items that explore the following 14 strategies: self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. A four-factor structure has shown

satisfactory properties [27]: social support, problem solving, avoidance, and positive thinking (Additional file 1: Dimensions and items of the French four-factor structure of the Brief COPE inventory). Scores range from 0 to 100. Higher scores in the 4 dimensions reflect a high tendency to implement the corresponding coping strategies.

Statistical analyses

After descriptive analyses of the characteristics of patients and caregivers, QoL scores were computed using the algorithms provided by the respective developers of the tools. The WHOQoL scores of patients and caregivers were compared to those obtained from French age- and sex-matched controls from a normal sample of 16,392 subjects [24]. To assess the relationships between the QoL scores and coping processes for patients and caregivers, two analyses were performed: i) Paired t-tests were used to compare various scores between patients and caregivers (multiple comparison corrections, false discovery rate); and ii) an analysis based on the actor-partner interdependence model (APIM) to assess the dyadic effects of coping strategies on QoL (WHOQoL scores). The APIM was assessed using structural equation modeling [20]. This model is based on the fact that the scores within the same dyad are not independent but instead are more similar than the scores of two individuals who are not in the same dyad. The APIM is useful to determine how parameters (QoL and coping strategies) among each participant (namely, patients and caregivers) are influenced by not only internal factors but also factors related to the other member of the dyad. Structural equation modeling simultaneously examines both paths in the APIM: two actor effects (i.e., each person's QoL regressed on his or her own coping strategies) and two partner effects (i.e., each person's QoL regressed on the other person's coping strategies). Using the same procedure, the APIM analyses were performed on the subsample of dyads with a love partner relationship.

Results

Sample

Between November 2015 and February 2016, 497 patients were identified as eligible to be included in the cohort. Of the 497 patients, 483 were able to nominate a caregiver who agreed to participate. The final sample was composed of 448 patients and 448 caregivers. The relationships between the patients and the caregivers were as follows: 262 were love partners and 51 were children/parents (41 dyads had other kinds of relationships, such as siblings, friends, or parent/stepchild, and the information was lacking for 94 dyads). None of the individuals had a diagnosis of dementia at the time of

the evaluation. The main characteristics are presented in Table 1.

Quality of life and coping strategies of the patients and caregivers

The QoL scores of patients and caregivers are provided in Fig. 1 (a and b, respectively). Of the 3 dimensions of the WHOQoL for which French norms are available, the scores of the physical dimension did not differ from the age- and sex-matched controls. For both the patients and the caregivers, the scores of the psychological dimension were statistically higher than norms, and the scores of the social dimension were statistically lower than norms.

Patients and caregivers used the four types of coping strategies at the same level. The strategies that were based on social support and avoidance were lesser used (from 23 to 33) than strategies based on problem solving and positive thinking (from 44 to 58) among patients and caregivers.

Relationships between coping strategies and quality of life within the dyads

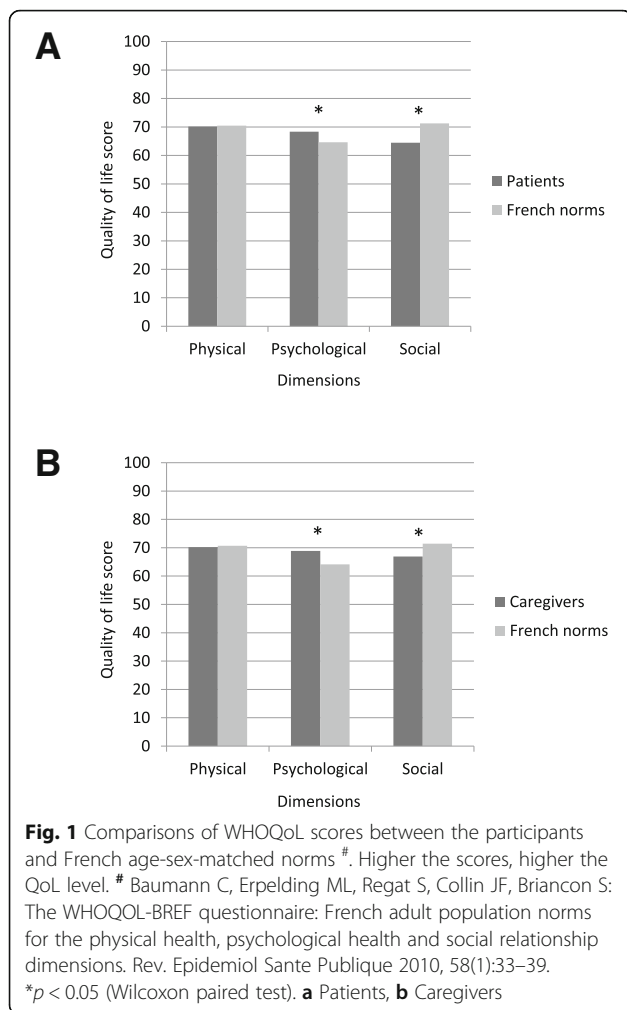
- Assessment of relationships between patients' and caregivers' scores

Table 1 Characteristics of the 448 patient-caregiver dyads

		Patients N (%)	Caregivers N (%)
Age, years	$M \pm SD$	71.4 \pm 6.8	67.9 \pm 11.4
	m [IQR]	70 [66–77]	69 [63–76]
Gender	Woman	204 (46)	276 (62)
	Man	242 (54)	170 (38)
Education level	< 12 years	200 (45)	196 (44)
	\geq 12 years	240 (55)	247 (56)
Marital status	Single	67 (15)	48 (11)
	Couple	379 (85)	399 (89)
Professional status	Worker	67 (15)	84 (21)
	Not worker	372 (85)	360 (79)
Chronic disease ^a	No	223 (51)	202 (46)
	Yes	214 (49)	236 (54)
Cancer	No	374 (84)	428 (97)
	Yes	69 (16)	72 (12)
Stroke	No	425 (96)	428 (97)
	Yes	18 (4)	14 (3)
Hearing severity	< 35 dB HL	283 (70)	
	\geq 35 dB HL	119 (30)	

N (%) effective (percents), *M* \pm *SD* mean \pm standard deviation, *m* [IQR] median [interquartile range]

^aexcluding cancer



The correlations between patients' and caregivers' scores are given in Table 2. When patients used coping strategies such as social support, problem solving and positive thinking, they reported significantly higher QoL scores in almost all dimensions, and when they used strategies based on avoidance, they reported significantly

lower QoL scores. For the caregivers, using problem-solving and positive-thinking strategies was linked to higher QoL levels, but being avoidant was linked to lower physical and psychological QoL. We found some interrelations between coping strategies of patients and their caregivers' QoL. The caregiver reported significantly better QoL in all dimensions when the patient used positive-thinking strategies, better environmental QoL when the patient used strategies based on social support and problem-solving, and better psychological QoL when the patient implemented problem-solving. We found some interrelations between coping strategies used by the caregivers and their patients' QoL. The patients reported higher QoL when the caregivers used social support and problem-solving strategies in some dimensions.

- Actor–partner interdependence model to assess the dyadic effects

Figure 2 presents the results of the APIM analysis conducted to establish any associations between coping strategies (4 dimensions of BriefCope) and QoL (4 dimensions of WHOQoL), considering the dyadic effects, based on the fact that the scores within the same dyad are not independent but instead are more similar than the scores of two individuals who are not in the same dyad. The following actors' effects were found: the use of problem-solving (Fig. 2b) and positive-thinking (Fig. 2d) strategies was systematically associated with an increase in their own QoL scores, for both patients and caregivers; the use of avoidance strategies (Fig. 2c) by patients and caregivers was associated with a decrease of their own QoL scores; and the patient's coping strategy to seek social support (Fig. 2a) was associated with a decrease in their own QoL social and environmental scores. Two partner effects were observed: the use of social support (Fig. 2a) and the use of problem-solving (Fig. 2d) by the patient were linked to a

Table 2 Paired t test correlations between QoL and coping strategies

		Patients' QoL (WHOQoL scores)				Caregivers' QoL (WHOQoL scores)			
		Physical	Psychol.	Social	Environ.	Physical	Psychol.	Social	Environ.
Patients' coping (BriefCope)	Social support	-0,035	0,000	0,138**	0,105*	0,040	0,059	0,002	0,149**
	Problem-solving	0,263**	0,343**	0,182**	0,293**	0,076	0,107*	0,071	0,121*
	Avoidance	-0,227**	-0,342**	-0,221**	-0,166**	0,012	-0,043	-0,058	-0,076
	Positive-thinking	0,271**	0,384**	0,296**	0,327**	0,112*	0,114*	0,128**	0,130**
Caregivers' coping (BriefCope)	Social support	0,100*	0,113*	-0,012	0,098*	0,021	0,012	0,060	0,087
	Problem-solving	0,021	0,040	0,098*	0,078	0,304**	0,386**	0,223**	0,290**
	Avoidance	-0,065	-0,021	-0,056	-0,059	-0,134**	-0,239**	-0,079	-0,093
	Positive-thinking	-0,039	-0,015	0,004	0,030	0,287**	0,458**	0,254**	0,300**

BriefCope higher the scores, higher use of the strategy, WHOQoL higher the scores, higher the QoL, Bold values significant correlation; **p* < 0.05, ***p* < 0.01

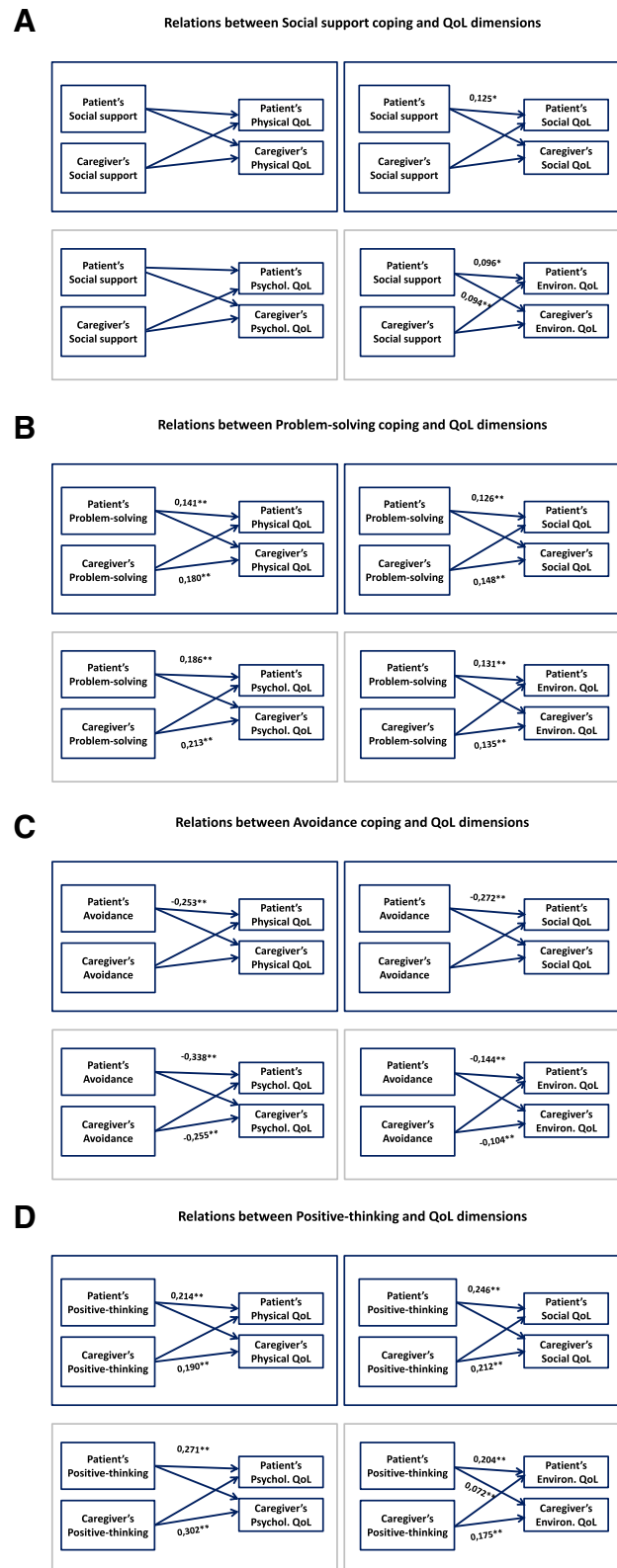


Fig. 2 Illustration of relations between coping and QoL using the actor–partner interdependence model. Numbers are standardized β coefficients: * $p < .05$; ** $p < .01$

higher environmental QoL of the caregiver. Similar findings were found on the subsample of dyads with a love partner relationship (data not shown).

Discussion

This study is one of the few that have used a large sample of ARHL patient-caregiver dyads to describe the relationship between individuals' coping strategies and their self-reported QoL. We used specific dyadic analyses based on the APIM, which was specifically developed to evaluate two-person relationships that integrate a conceptual view of independence in such relationships. The results lead to the reassessment of previous results from patient-only evaluations.

The first finding of this study indicates that ARHL patients and their caregivers similarly presented a significant negative impact on the social dimension of the QoL. Indeed, the hearing disability may lead to communicative disability, relative isolation, and reduced social activity [3]. This progressive social deprivation that the ARHL individual imposes on him/herself may entrain a broader social deprivation of one's closest relatives [28, 29]. These findings indicate the importance of early identification of hearing loss and offers of rehabilitative support [30]. Less expected, both for patients and caregivers, we found better QoL scores for the physical and psychological dimensions in comparison with age- and sex-matched controls. This result was in opposition with most studies that have reported negative psychological consequences of the hearing disability as feelings of being excluded, mood disorders, and depression [31]. This assumption was recently moderated through studies indicating that the relationships between hearing impairment and depressive symptoms differ according to the availability of social resources [32]. We may hypothesize that the people involved in this study, who voluntarily underwent a health checkup, indicating that they were concerned about prevention and health promotion, have the highest level of resources. In contrast, many non-participants in this study, including those living in isolation, those in denial about their impairment, and those who are reluctant to seek help from the health care system, are likely to have lower levels of support resources than our study participants.

The second interesting result of this study is that patients and their caregivers were found to implement similar coping strategies, using strategies based on problem solving and positive thinking more than the strategies based on seeking social support or avoidance. While the coping strategies employed depend on the cognitive, behavioral and social resources that the patients and caregivers are able to mobilize, this result suggests that people who know each other very well and

who are faced with the same difficult event tend to cope with it similarly. This phenomenon was already described in the context of ARHL [19], but has also been described in other contexts, such as cancer [15, 16] and mental illnesses [17].

Interestingly, we observed that the nature of the individuals' coping strategies may have a direct impact on their QoL and their relatives' QoL. First, individuals (the ARHL patients and the caregivers) who used problem-solving or positive-thinking strategies systematically reported higher QoL. These strategies are known to be better methods to address stressful events. In the same way, individuals who mobilized avoidant coping strategies, known as incorrect responses to stressful life events [33–35], had lower QoL levels. A systematic assessment of patient and caregiver coping styles may identify individuals who do not adopt healthy coping strategies. Targeted psychological interventions based on psychoeducation and cognitive behavioral therapy may be offered to them [36, 37] to maintain a stable QoL level [38]. Interventions based on optimism or positive thinking have revealed satisfactory well-being predictors on not only the individuals themselves [39–41] but also their relatives [42].

Lastly, the APIM approach described partner effects related to the use of social support coping strategies. As previously reported [43], the use of social support by the caregiver or the patient may positively impact the QoL of the second member of the dyad. Some hypotheses may be proposed: i) individuals may feel relieved when they realize that the second member of the dyad implemented social support and sought external help; and ii) individuals may be more able to pay attention, to understand and to support their relatives when they themselves are helped by an external process. Social support may be a relevant factor on which to focus in auditory rehabilitation programs [44]. The involvement of significant others in counseling seems to improve the everyday life for both older adults with age-related hearing loss and their significant others [45]. The approaches based on family-centered care are hopeful strategies for improving QoL [46].

Strengths and limitations

The generalization of our findings should be done cautiously. It is known that some individuals deny the existence of hearing impairment and do not wish to be managed [47]. Replication of our findings in these groups is required.

The study employed an observational and cross-sectional design, which did not allow for causality inferences to be made between coping strategies and QoL. Thus, it remains unknown whether an individual's

coping strategies actually influence QoL and that of his/her caregivers over time. Specific APIM-based dyadic analyses, which integrate a conceptual view of interdependence in two-person relationships [48–50], are best undertaken within longitudinal designs, as they allow for direct causality inferences to be made.

Some parameters were not analyzed, such as the use of hearing aids or the hearing status of the caregiver. Yet, these parameters may be factors influencing some of the actor-partner effects [51]. Future studies should specifically explore these cases.

Conclusion

This study emphasizes that the quality of life for patients and their natural caregivers is directly related to the coping strategies that they use. This finding suggests that targeted interventions should be offered to help patients and their caregivers who experience life difficulties to implement more efficient coping strategies.

Additional file

Additional file 1: Dimensions and items of the French four-factor structure of the Brief COPE inventory. (DOCX 30 kb)

Abbreviations

AGIRC-ARRCO: Association Générale des Institutions de Retraite Complémentaire des cadres and l'Association pour le Régime de Retraite Complémentaire des salariés; APIM: Actor-Partner Interdependence Model; ARHL: Age-Related Hearing Loss; QoL: Quality of Life

Acknowledgments

The authors are grateful to all of the patients and the caregivers for their participation in the study. The authors thank all of the National study's contributors (Bien vieillir – De l'importance de bien entendre – Tome I et II; <http://www.agircarro-actionsociale.fr/donner/les-etudes/>).

Funding

This work has been financially supported by the Association générale des institutions de retraite complémentaire des cadres and l'Association pour le régime de retraite complémentaire des salariés, <http://www.agirc-arcco.fr/>.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on request.

Authors' contributions

Conception and design: SL, PA, KB. Study coordination: SL. Acquisition of data: SL, FM, ASL. Analysis of data: KB, ZB. Interpretation of data: SL, VA, PA, KB. Drafting and writing of manuscript: SL, KB. Approval of final version of the manuscript: all authors.

Ethics approval and consent to participate

Regulatory monitoring was performed in accordance with the French law requiring the approval of the French ethics committee (Comité d'éthique, Aix Marseille University, February 4th 2015, Number 2014 – 02 – 04 – 04). All records and subject' identities remained confidential in accordance with French regulations: the French National Committee of Informatics and Liberties (Commission nationale de l'informatique et des libertés, 20/03/2014, reference number DR-2014 – 097). Consent was obtained from each participant.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Received: 21 December 2018 Accepted: 16 May 2019

Published online: 22 May 2019

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