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Editorial

(to accompany Lovell N, Etkind S, Davies J, Prentice W, Higginson I, Sleeman K. *Effect of listening to breathing recordings on self-reported breathlessness: a public experiment. Eur Respir J* 2023).

From the sound of breathing to the sound of distress: implications for dyspneic patients and their caregivers

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Picture yourself in a seat at the movies. The room is dark. The screen is also dark or shows a benign scene. There is no music, or a gentle melody. Before you see anybody on the screen, you hear someone breathing. Depending on the sound of this respiration, you might feel relaxed, aroused, or threatened. You might identify breathlessness. You might worry for the person who breathes. You might feel breathless yourself. You would then have experienced vicarious dyspnea, a breathlessness induced not by exercise, not by disease, but by the breathlessness of someone else. This phenomenon, analogous to vicarious pain, has been described in response to the observation of dyspneic persons by healthy people [1, 2]. In this issue of the *European Respiratory Journal*, Lovell et al. [3] provide the first documentation of vicarious dyspnea induced by exposure to breathing sounds rather than visual breathlessness cues. To achieve this, they conducted a citizen science experiment during which 268 visitors who attended a scientific exhibition were exposed, after informed consent, to four 6-second audio recordings of breathing activities in various contexts (post-exercise; anxiety; chronic respiratory disease; end-of-life). In line with the authors' hypotheses, listening to these audio clips was associated with breathlessness, the intensity of which varied according to the nature of the recorded situation. The reported effect size is limited, but suffices to establish the reality of an audio-induced vicarious dyspnea.

Some of the observations made by Lovell et al. [3] are intriguing. Seventy percent of the participants indicated having experienced breathlessness in the past. Given the nature of the study population, it is likely that the participants' responses mostly pertained to "healthy breathlessness" (exercise-induced) rather than "dyspnea" (disease-related). This should, however, not have interfered with the study results. More surprising is that, at baseline, the average rating of breathlessness was not zero. Fifty-one percent of the participants (n=139) rated a breathlessness of 1 or more (four or above in 28 persons, three or above in 50 persons, with a maximum of nine –1 person-). The participants might have been breathless because the study took place at the top of a steep flight of stairs (which we do not know) or because the exhibition's beauty was breathtaking. It is, however, more likely that this non-zero rating resulted from some form of Hawthorne effect, the participants reporting breathlessness because they knew they were participating in a breathlessness study. Such an observer bias could only, if anything, have blunted the effect described by Lovell et al. [3].

Vicarious dyspnea, induced by seeing or hearing the sound of breathing and interpreting it as the sound of distress, is an understudied but important phenomenon. Its neurophysiological and sociocultural determinants are not known, nor are its psychological impact on caregivers and its role in patient-caregiver interactions. Gozal and Johnson remarkably delineated these questions in a previous editorial [4]. But vicarious dyspnea, as dyspnea itself, is only a symptom. The symptom of what? Because of the practical difficulties involved, Lovell et al. [3] had to keep their study design as simple and effective as possible: they restricted the questioning of their participants to dyspnea itself. Yet it would have been fascinating to make explicit something that we all implicitly know: listening to breathing sounds induces emotions. No doubt about that. Just let us return to the movie theater where we started this editorial and listen to Darth Vader's menacing respiration or Sandra Bullock panting as she tries to reach the International Space Station in Alfonso Cuarón's 2013 "Gravity." Frightening. Anxiogenic. Let us listen to the deepening and slowing breathing of a child falling asleep. Reassuring. Appeasing. We do not know if the persons who participated in the experiment set up by Lovell et al. [3] felt negative emotions in addition to feeling breathless. This is, however, likely. In a study where healthy participants watched photos or videos depicting breathing difficulties, vicarious dyspnea occurred in the context of a negative shift in affective valence [1]. In the latter study, the impact of the videos was more marked than that of the still pictures: from the study of Lovell et al. [3], we may infer that the soundtracked nature of the videos played a role in their effect. The emergence of an emotion at the sight –or the sound– of another person's suffering defines empathetic resonance. So, vicarious dyspnea is the symptom of empathetic resonance to someone else's dyspnea, as would vicarious pain be the symptom of empathetic resonance to someone else's pain.

Why is this important? Firstly, because empathetic resonance, a complex and most discussed notion, is key to the care of dyspneic patients. Taking the study of Lovell et al. [3] as a pretext, we propose to discuss this issue from a simplified and hypothetical model of what may happen when a person is exposed to the dyspnea of another person (Figure 1A). This model, mostly intended as heuristic in nature, assumes that empathetic resonance to someone's respiratory suffering can produce a mixture of solicitude and distress [5] in relation to the activation of distinct neural networks [6]. The composition of this mixture most likely depends on a variety of "modulators" that may include personality traits [e.g., about pain, Quiao-Tasserit et al. 7], innate biological characteristics, ingrained cultural elements –derived from education, religion, professional training, etc.–, prior respiratory experiences, and contextual factors –like mood, sleep deprivation, social ambiance, etc.–. Ultimately, the balance between empathetic solicitude and empathetic distress determines the ensuing behavior (or how one will live a socially driven mandatory behavior). At one extremity of the model (the light side of empathetic resonance, Figure 1B), solicitude drives to care, and care-associated relief provides reward (possibly stemming from "positive" empathetic resonance with the visible and audible expression of dyspnea relief [8]*), opening the possibility of a solicitude-reward virtuous circle. Failure to achieve relief (ineffective therapeutic actions, impossibility to provide care –e.g., at the movies–, or ignorance of how to act and behave, all responsible for deprivation of control) can negate solicitude in favor of distress and therefore impair care. Healthcare professionals identifying moderate to severe dyspnea are less likely to take action than after having identified moderate to severe pain [9, 10]. This probably reflects ignorance or impuissance rather than indifference: whether or not this is associated with distress has not been documented, but this should obviously be studied. At the other extremity of the model (the dark side of empathetic resonance), distress leads to avoidance and hence to care deprivation or, in a less extreme manner, to a deterioration of the quality of care. A qualitative study of patients requiring mask ventilation for acute respiratory failure in the intensive care unit provided hints to this mechanism, describing healthcare professionals avoiding entering patients' rooms during ventilation sessions [11]. But if avoidance is impossible –e.g., because one lives with the

* it would be fascinating to determine if observing dyspnea relief activates the specific "dyspnea relief network" described by Peifer et al. [9]

suffering person or because one's profession is to provide the suffering person with care—counterproductive behaviors ranging from denial to aggressiveness may emerge and trigger a nefarious process bound to worsen dyspnea invisibility [12, 13], through distress-related avoidance.

The second reason why it is important to think of vicarious dyspnea as the symptom of empathetic resonance lies in the long-term impact that seeing or hearing someone being dyspneic can have on the observer. Again, there are few data in the literature about this impact, but there are interesting clues. Kentish-Barnes et al. [14], working with family members of patients who died in the intensive care unit, observed that having witnessed loved ones experience end-of-life breathing difficulties appeared among statistically independent predictors of abnormally prolonged bereavement. Living with someone treated for a dyspnea-associated chronic condition improves the ability to identify the dyspnea of this person [better agreement between family caregivers and patients than between healthcare professionals and patients, see 15]. It also modifies how a personal experience of dyspnea is perceived [16]. These observations suggest that exposure to dyspnea, the concomitant emotions, and the accompanying vicarious dyspnea constitute priors that will shape the reaction to subsequent occurrences and affect the exposed person in the long term through anticipation and expectation mechanisms [17-19]. The reality, extent, determinants, and neurophysiological basis of vicarious dyspnea-induced brain changes and their behavioral consequences remain to be elucidated, but this should really be done. Indeed, peritraumatic stress is a reality for several categories of caregivers [e.g., 20], and it is important to characterize how it is contributed to by exposure to respiratory distress.

Indeed, many healthcare professionals are repeatedly exposed to dyspnea and have an ethical and moral duty to do their maximum to relieve it in their patients [21]. To meet this obligation, they must learn to identify dyspnea, train to manage it, and understand what it represents for their patients [22]. They must also learn to harness their dyspnea-induced empathetic resonance. This entails cultivating empathetic solicitude, for which effective approaches exist [regarding conditions other than dyspnea, see some examples in 23, 24-26]([regarding dyspnea, see preliminary data in 22]). This also entails being offered means to protect themselves against dyspnea-induced empathetic distress for the sake of their well-being and the sake of the care of their patients. Addressing this issue is a challenging endeavor and one that will require overcoming certain taboos. In this perspective, we should thank Lovell et al. [3] for explicating the implicit notion that the sound of breathing is a strong interhuman communication tool and certainly not a neutral one.

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Legend to the figure

A. Proposal for a simplified and hypothetical representation of what can happen in reaction to the exposure of a person to the dyspnea of another person. The model derives from available evidence about vicarious dyspnea [1-3] and from data pertaining to empathic resonance in situations other than dyspnea. It is intended to propose research directions, particularly about dyspnea-induced empathetic distress in the caregivers of patients suffering from respiratory conditions (be them informal or professional caregivers).

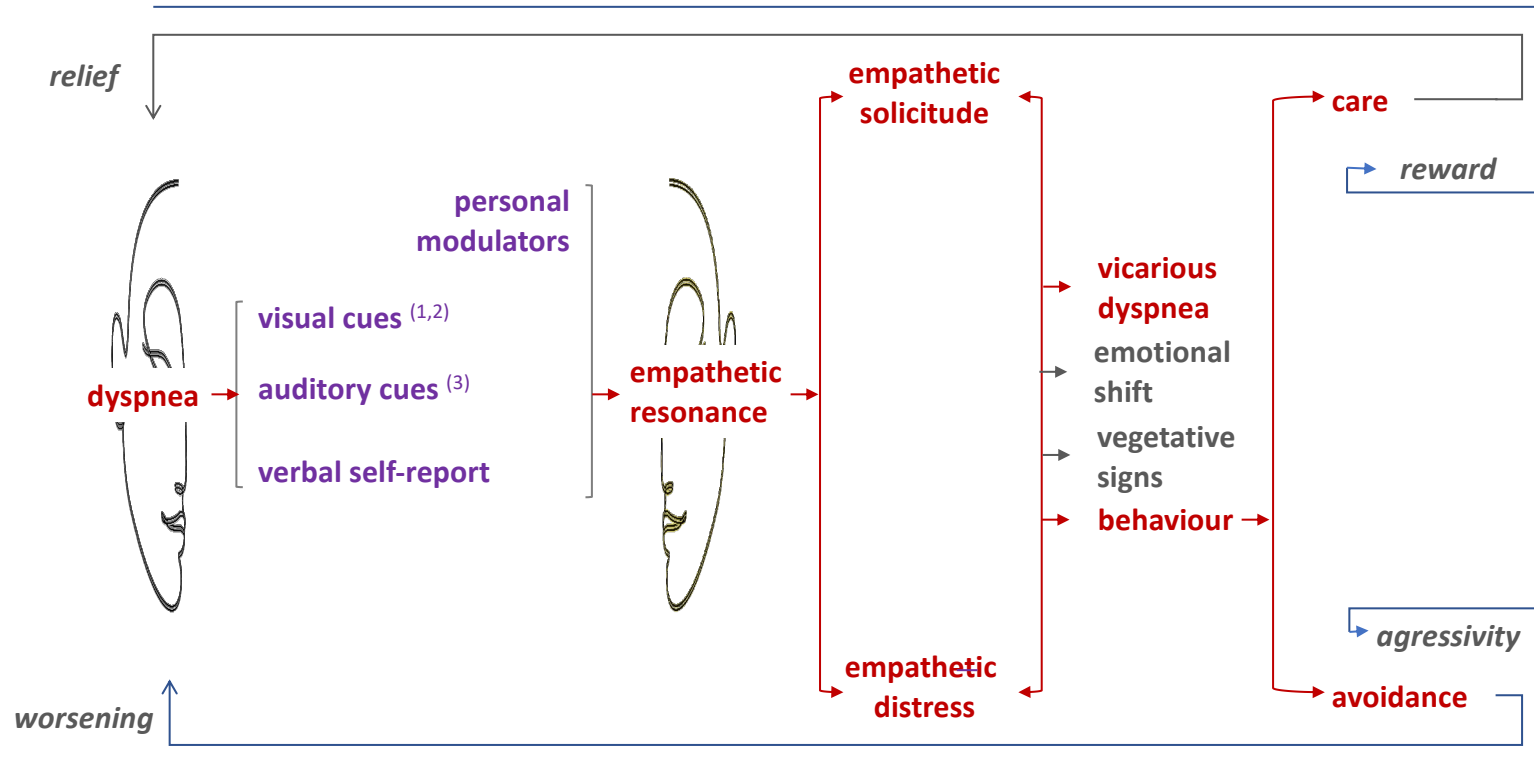
B. Illustration of the "light side" of dyspnea-induced empathetic resonance according to the above model, with vicarious dyspnea being associated to empathic solicitude, care, relief and reward (artwork Jérémie Dres).

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