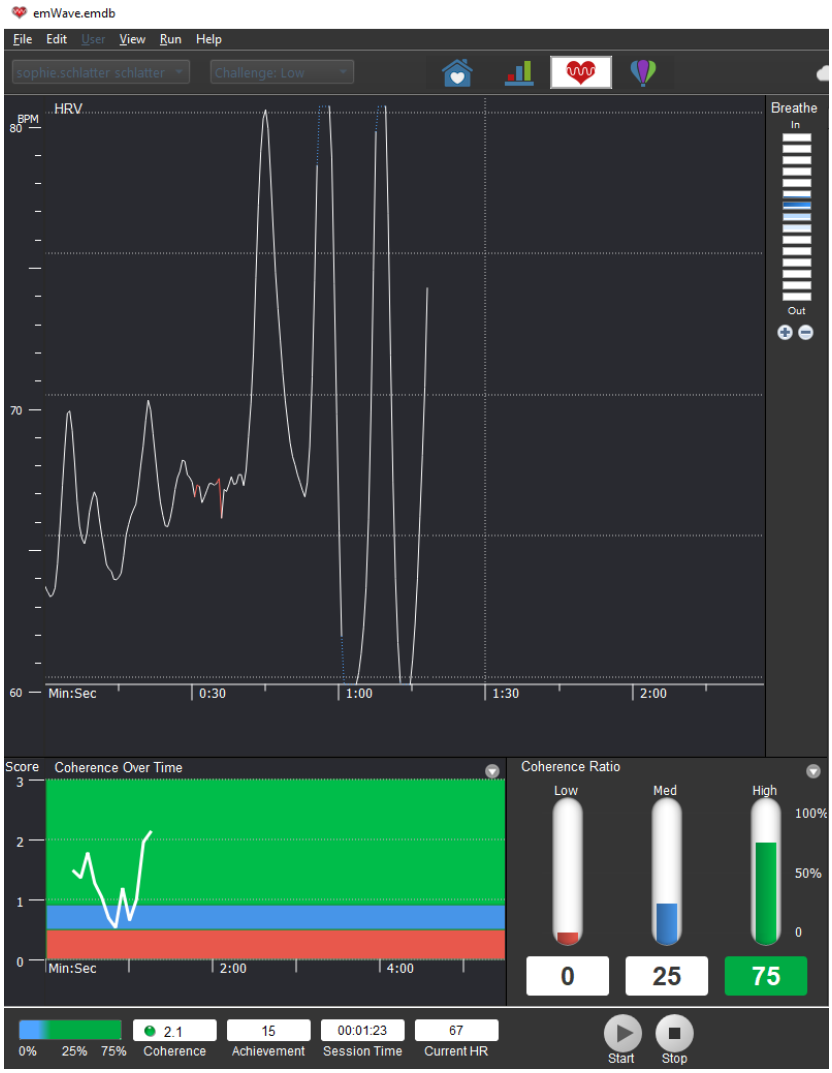
Supplemental digital content for Le Saux O, Canada B, Debarnot U, et al. Association of personality traits with the efficacy of stress management interventions for medical students taking objective structured clinical examinations. Acad Med.

Supplemental Digital Appendix 1

The emWave Pro Visual Interface Used for the Cardiac Biofeedback Intervention, From a Randomized Controlled Trial to Assess the Association of Personality Traits With the Efficacy of Stress Management Interventions in Medical Students When Faced With Real-Life Stressors, Claude Bernard University Lyon 1, December 2021

The biofeedback intervention requires viewing the heart rate in real-time (left) during a standardized breathing exercise guided by a visual cursor (right). The curve draws the continuous variations in the real-time heart rate. HRV: heart rate variability. BPM: beats per minute. Immediate coherence and cumulative coherence (achievement) were displayed (heart rate coherence is a particular pattern of heart rate variation, where the heart rate changes synchronously with the breath rate, speeding up on inhalation and slowing down on exhalation). Participants had to breathe in and out concurrently with the cursor leading the inspiration and expiration at a rate of 6 breaths/min (5 sec inspiration/5 sec expiration).



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Supplemental Digital Appendix 2

English Scripts for the 3 Interventions, From a Randomized Controlled Trial to Assess the Association of Personality Traits With the Efficacy of Stress Management Interventions in Medical Students When Faced With Real-Life Stressors, Claude Bernard University Lyon 1, December 2021

A. Script for the cardiac biofeedback intervention (45 sec long)

French video:
https://www.youtube.com/watch?v=gWrvbwZzoRg&ab_channel=SciencesStress

1- Instructions

Now that both the headphones and sensor are in place on your ears, I am going to ask you to do a breathing exercise using the slider that you have. When the cursor goes down, you must exhale very slowly, and, when the cursor rises, you must inhale.

2- Breathing exercise

Start the breathing exercise, and I will explain the remainder of the exercise. Tend towards the highest possible cardiac coherence scores shown here in green for instantaneous coherence, or in the scales below with the different degrees of the areas that you are in. Try to aim as much as possible for the highest possible cardiac coherence score, not towards the low or middle, using this visual interface and this breathing exercise. You can now perform the exercise.

B. Script for the mindfulness-based intervention (6 min long)

French video:
https://www.youtube.com/watch?v=94wogGSZ9P0&ab_channel=SciencesStress

1- Installation (Time: 30 seconds)

This short 6-minute meditation is offered to you as an opportunity to take care of yourself and to rejuvenate. To begin, make yourself comfortable in your chair. We invite you to close your eyes if you want to.

2- Awareness of body and mind (Time: 3 minutes)

Take time to readjust your posture so that your back is relatively straight. Your shoulders are open, relaxed, and released.

Feel the alignment of it like a tree that is well-anchored in the earth. On the next inhalation, inhale more deeply, then exhale deeply, relaxing all the muscles in your body. Let your breathing unfold naturally, simply breathe, resting on the back and forth of your breathing...Simply recognize that you are breathing, let your breathing be, without wanting to modify it...Just be aware of your breathing as it flows in and out. If emotions or thoughts arise, this is completely normal, and just let them come and go naturally; let them unfold

and dissolve, without becoming attached to them… In the same way, try to remain relaxed to the sensations of the breathing.

3- Rest and relaxation (Time: 30 seconds)

Be aware of your body as a whole. Relax and stay present in the sensations that you can perceive right now...whether they are comfortable or not. Just be present to whatever arises without judgment, by welcoming whatever comes.

4- Cognitive stimulation (Time: 2 minutes)

Recall a moment of radiance that you felt within yourself during an experience where you demonstrated your talent and felt proud. Now, bring your attention back to your breath…imagine that, as you exhale, your whole body radiates with clear, radiant light, giving you well-being, certainty, and confidence in your inner potential. Take the time to think about the meaning you attach to your future career as a caregiver and your motivations to succeed today in helping others. Remember that you have within you all the skills expected for this test and that you will be able to demonstrate your talent because you have all the resources within you. Now open your eyes slowly... and leave your mind as is, set in the present moment...

C. Script for the control intervention (6 min long)

French video: https://www.youtube.com/watch?v=r_7EYfyfbbE

As this exam can be stressful and being distracted and not thinking about what is on our minds is a coping strategy, we offer you this short 6-min video as an opportunity to disconnect while learning something new.

Motor imagery consists of mentally representing a movement without the concomitant physical execution. The mental representation of movement is built on sensory modalities, the two main ones being visual (visualizing one's movement) and kinesthetic (perceiving one's movement).

Motor imagery, being a mental activity of simulating movement, is considered a cognitive-motor task. Motor imagery training helps to promote learning, improve gestures, and even modulates the speed of execution of the real movement.

Motor imagery will activate many brain regions analogous to those involved in the actual execution of the movement and induce comparable brain plasticity. This neurofunctional equivalence would explain, at least in part, the effectiveness of motor imagery.

Motor imagery is used in many situations of daily life and, more specifically, in sports or medical contexts. In sports, motor imagery is often used before, during, or just after the execution of one or a sequence of movements.

The realization of motor imagery immediately prior to the movement allows preparation and facilitates the correct execution. When the mental work is done in training, its proximity to

the real movement makes it possible to use a form of integrated mental preparation aimed at targeting the technical elements of the gesture.

When imagery is performed in competition, just before the actual performance, it is integrated into a pre-performance routine, the objective of which is to increase confidence and put the athlete in the best possible state of mind. In this case, the work of mental visualization is mainly oriented towards success. Before the execution of the movement, the imagery can facilitate the anchoring of a correctly executed movement, allow the identification of the causes of the failure, or even mentally recreate a corrected movement.

In the medical field, imagery is used in repeated sessions, adjunctively or in addition to rehabilitation programs. It is used to help the recovery of a movement affected by a central or peripheral lesion or to limit the loss of strength after a surgical procedure.

Motor imagery is practiced implicitly or explicitly. Implicit imagery involves processes of automatically creating mental movements. The most used paradigm for testing implicit/involuntary motor imagery capacity is laterality judgment. In these tasks, a stimulus such as a hand will be presented on the screen in different orientations, to define the laterality of the stimulus. Although the instruction is to respond and leaves the possibility of finding any strategy leading them to respond to the individual, it is common for the participant to spontaneously form a mental image of a hand and then turn the image.

During explicit motor imagery, the individual consciously generates, in response to specific instructions, mental images of movement, according to the visual and kinesthetic sensory modalities. The experimenter provides detailed instructions on how to perform the mental work. For example, during pointing motion sequence tasks with the upper limb, the participant is asked to mentally visualize their finger and/or perceive movements in their fingers or wrist. Access to mental work, however, remains a real challenge for experimenters.

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Supplemental Digital Appendix 3

Details of the Statistical Analysis, From a Randomized Controlled Trial to Assess the Association of Personality Traits With the Efficacy of Stress Management Interventions in Medical Students When Faced With Real-Life Stressors, Claude Bernard University Lyon 1, December 2021

To describe participants included in each group, qualitative data were described by percentage and quantitative data were described by mean values and standard deviations. First, the homogeneity of the groups in demographical parameters and in personality traits were compared adjusting for multiple comparisons (Bonferroni method; package compareGroup v4.6.0). As three groups were compared, a post hoc pairwise comparison of p-values, corrected for multiple comparisons was calculated. Second, two different multivariable linear regression models were used in the analyses. The first model assessed the association between each of the five personality traits and the baseline psychological stress levels (VAS stress pre-intervention) (*step 1*). The second model assessed the overall efficacy of the stress management interventions compared to the control group (*step 2*) and the interaction between personality traits and the efficacy of the stress management interventions *(step 3)* by adding an interaction term between each personality trait and intervention. Efficacy was evaluated on the psychological (VAS difference) and physiological stress markers (1/SDNN scores). All the multivariable models were controlled for gender, age, body mass index, number of hours of sport played per week, OSCE training (yes *vs* no), and self-use of stress reduction interventions (yes *vs* no). Independent variables were mean-centered. The β coefficient (i.e., the degree of change in the outcome variable for every 1 unit of change in the predictor variable) and the adjusted coefficients R^2 (i.e., percentage of variance explained) were provided for all regression models. Normality of the residuals of the models were checked. All hypotheses were tested using a statistical significance level of 0.05. Data were analyzed using the R software (version 4.1.2, R Foundation for Statistical Computing, Vienna, Austria).

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Supplemental Digital Appendix 4

Participants' Demographic and Psychometric Characteristics, From a Randomized Controlled Trial to Assess the Association of Personality Traits With the Efficacy of Stress Management Interventions in Medical Students When Faced With Real-Life Stressors, Claude Bernard University Lyon 1, December 2021

	Control	**Biofeedback**	**Mindfulness**	**Adjusted *p* value**	**Adjusted *p* value**		
	N=240	N=117	N=124	Overall	Control *vs* biofeedback	Control *vs* mindfulness	Biofeedback *vs* mindfulness
Demographic characteristics							
Age, years	21.9 (2.17)	21.9 (1.56)	21.8 (1.82)	.97	.99	.91	.89
Gender				.39	.25	.72	.43
Female	164 (68.6%)	68 (58.6%)	82 (66.1%)				
Male	75 (31.4%)	48 (41.4%)	42 (33.9%)				
Number of hours of sport per week	3.60 (2.18)	4.26 (2.58)	3.62 (2.39)	.21	.08	>.99	.15
Body mass index, kg/m²	21.9 (3.00)	21.6 (2.95)	21.6 (2.53)	.95	.64	.60	>.99
OSCE training				.97	.83	.83	.98
Yes	106 (44.2%)	46 (39.3%)	50 (40.3%)				
No	134 (55.8%)	71 (60.7%)	74 (59.7%)				
Self-use of stress management interventions				.97	>.99	>.99	>.99
Yes	73 (30.5%)	35 (29.9%)	34 (27.4%)				
No	166 (69.5%)	82 (70.1%)	90 (72.6%)				
Psychometric characteristics							
Openness	3.49 (0.66)	3.49 (0.67)	3.53 (0.68)	.97	>.99	.87	.93
Conscientiousness	3.52 (0.72)	3.36 (0.83)	3.67 (0.71)	.03	.13	.19	.004
Extraversion	3.19 (0.86)	3.17 (0.84)	3.40 (0.80)	.15	.97	.06	.08
Agreeableness	3.93 (0.61)	3.95 (0.57)	3.94 (0.56)	.97	.98	.98	>.99
Neuroticism	3.27 (0.96)	3.20 (0.94)	2.82 (0.84)	.001	.82	<.001	.004

Values reported are mean (standard deviation) or n (%). Table showing post-hoc adjusted pairwise comparison between control, biofeedback, and mindfulness interventions.