Empowering Pandemic Resilience in Medical Students: A Groundbreaking Investigation into Progressive Muscle Relaxation and the Integrative Psychological Resilience Model

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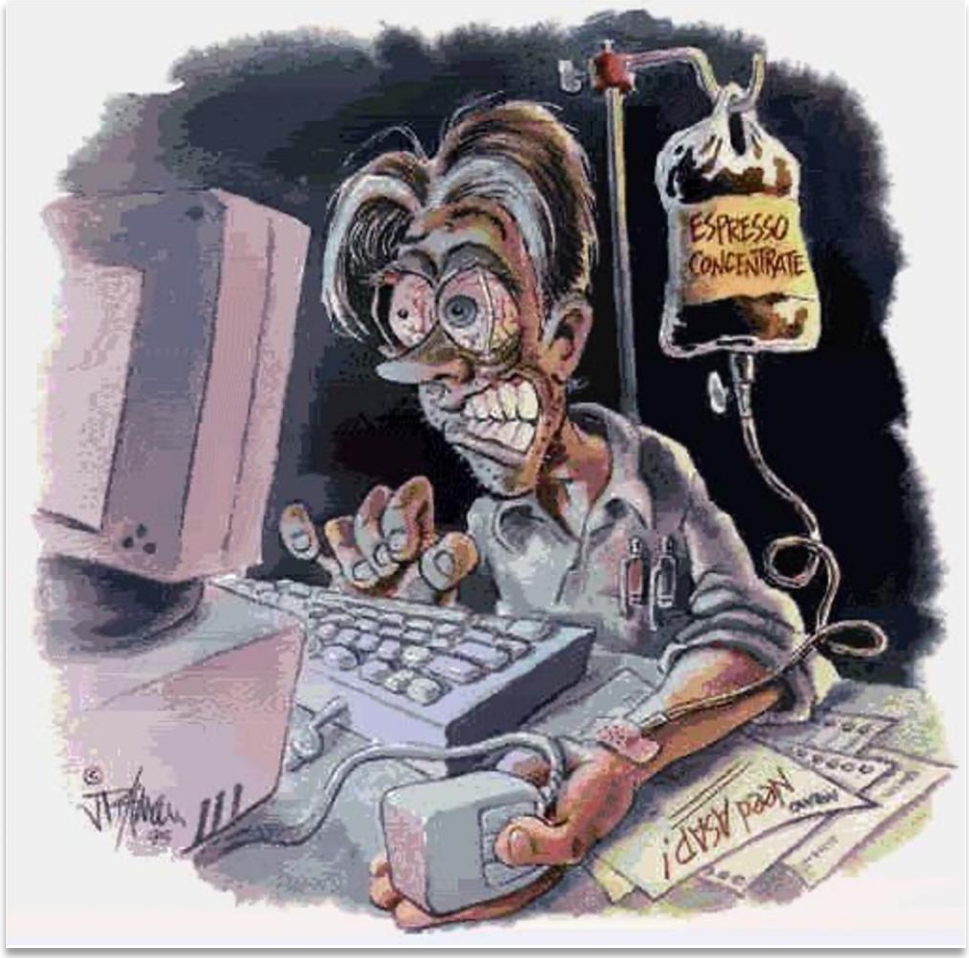
TRIALS OF MEDICAL EDUCATION: RESILIENCE, STRESS, AND COVID-19 IMPACT

- Medical education requires intense dedication and resilience to meet diverse healthcare needs.
- Medical students experience significantly higher stress due to rigorous curriculum and extended clinical practice.
- COVID-19 amplified this stress, forcing a shift to distance learning and reassessment of teaching methods.



Naidoo, N., Azar, A. J., Khamis, A. H., Gholami, M., Lindsbro, M., Alsheikh-Ali, A., & Banerjee, Y. (2021). Design, Implementation, and Evaluation of a Distance Learning Framework to Adapt to the Changing Landscape of Anatomy Instruction in Medical Education During COVID-19 Pandemic: A Proof-of-Concept Study. *Frontiers in public health*, *9*, 726814. https://doi.org/10.3389/fpubh.2021.726814

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Medical School Dropout Rates

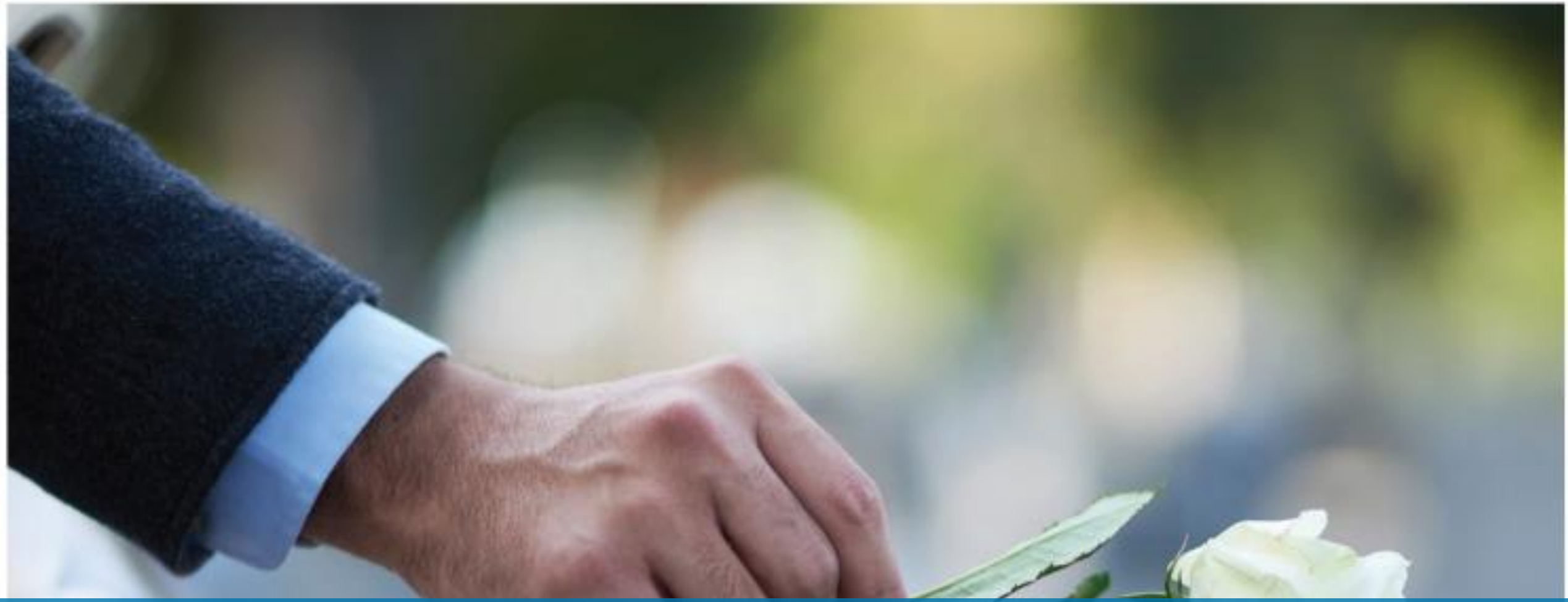
- Four-year medical programs experience attrition rates between 15.7% and 18.4%, according to the Association of American Medical Colleges.
- The attrition rate notably decreases to 4.1% for students who commit to five and six-year medical programs.

Data Source: AAMC

DISTURBING DEPTHS OF DESPAIR: THE HIDDEN CRISIS OF SUICIDAL IDEATION IN MEDICAL STUDENTS

In 2019, up to 35.6% of medical students across 13 countries reported struggles with suicidal ideation.

Hofmeister M. Suicides among medical trainees. CMAJ. 2019 May 6;191(18):E510. doi: 10.1503/cmaj.71916.



Vogel L. (2019). US doctors call for tracking of suicides among medical trainees. *CMAJ : Canadian Medical Association journal, 191*(1), E26. https://doi.org/10.1503/cmaj.109-5694

POST-PANDEMIC LANDSCAPE OF MEDICAL EDUCATION: FOSTERING RESILIENCE AND EMOTIONAL INTELLIGENCE IN THE HEALTHCARE WORKFORCE

- The post-pandemic landscape has highlighted the urgent need for resilience and emotional intelligence within the healthcare workforce.

- Medical educators bear the responsibility to incorporate effective stress reduction interventions and resilience-building strategies into medical curricula to enhance the psychological well-being of students.

Blake, H., Brewer, A., & Chouliara, N. (2023). "We're Not Going to Be as Prepared": A Qualitative Study of Healthcare Trainees' Experiences after One Year of the COVID-19 Pandemic. *International journal of environmental research and public health*, *20*(5), 4255.

Edmonds, V. S., Chatterjee, K., Girardo, M. E., Butterfield, R. J., 3rd, & Stonnington, C. M. (2023). Evaluation of a Novel Wellness Curriculum on Medical Student Wellbeing and Engagement Demonstrates a Need for Student-Driven Wellness Programming. *Teaching and learning in medicine*, *35*(1), 52–64.

MENTAL HEALTH STRATEGIES: FOSTERING RESILIENCE IN MEDICAL STUDENTS

- Efficacious stress-reduction techniques, such as mindfulness practices, can help develop coping mechanisms among medical students. (Chmielewski, J., Łoś, K., & Łuczyński, W. (2021). Mindfulness in healthcare professionals and medical education. *International journal of occupational medicine and environmental health*, 34(1), 1–14.)

- Physical activity and art therapy have shown to preserve mental health in medical education settings. (Hachenberger, J., Teuber, Z., Li, Y. M., Abkai, L., Wild, E., & Lemola, S. (2023). Investigating associations between physical activity, stress experience, and affective wellbeing during an examination period using experience sampling and accelerometry. *Scientific reports*, *13*(1), 8808.)

- Access to counseling services can further fortify psychological wellbeing and foster self-awareness, self-regulation, and interpersonal skills. (Callus, E., Bassola, B., Fiolo, V., Bertoldo, E. G., Pagliuca, S., & Lusignani, M. (2020). Stress Reduction Techniques for Health Care Providers Dealing With Severe Coronavirus Infections (SARS, MERS, and COVID-19): A Rapid Review. *Frontiers in psychology*, *11*, 589698.)

INTEGRATING STRESS-REDUCTION STRATEGIES INTO CORE MEDICAL CURRICULUM FOR OPTIMAL IMPACT

- Elective stress-management programs often face low attendance and high dropout rates.

- Elective programs tend to attract a self-selected cohort of like-minded participants.

For more effective stress management among medical students, these strategies need to be part of the core curriculum, not optional extras.

Identify an efficient stress-reduction strategy for mandatory inclusion within a time-constrained medical curriculum.

NEEDS ASSESSMENT

Nominal Group Technique (NGT): A structured brainstorming process promoting equal contribution and includes the following steps:

- Idea generation
- Round-robin recording
- Group discussion
- Individual ranking
- Results compilation for collective decision-making.

Our inquiry identified Mindfulness-Based Stress Reduction (MBSR) as the most effective technique for reducing stress.

Banerjee, Y., Tambi, R., Gholami, M., Alsheikh-Ali, A., Bayoumi, R., & Lansberg, P. (2019). Augmenting Flexnerism Via Twitterism: Need for Integrating Social Media Application in Blueprinting Pedagogical Strategies for Undergraduate Medical Education. *JMIR medical education*, *5*(1), e12403.

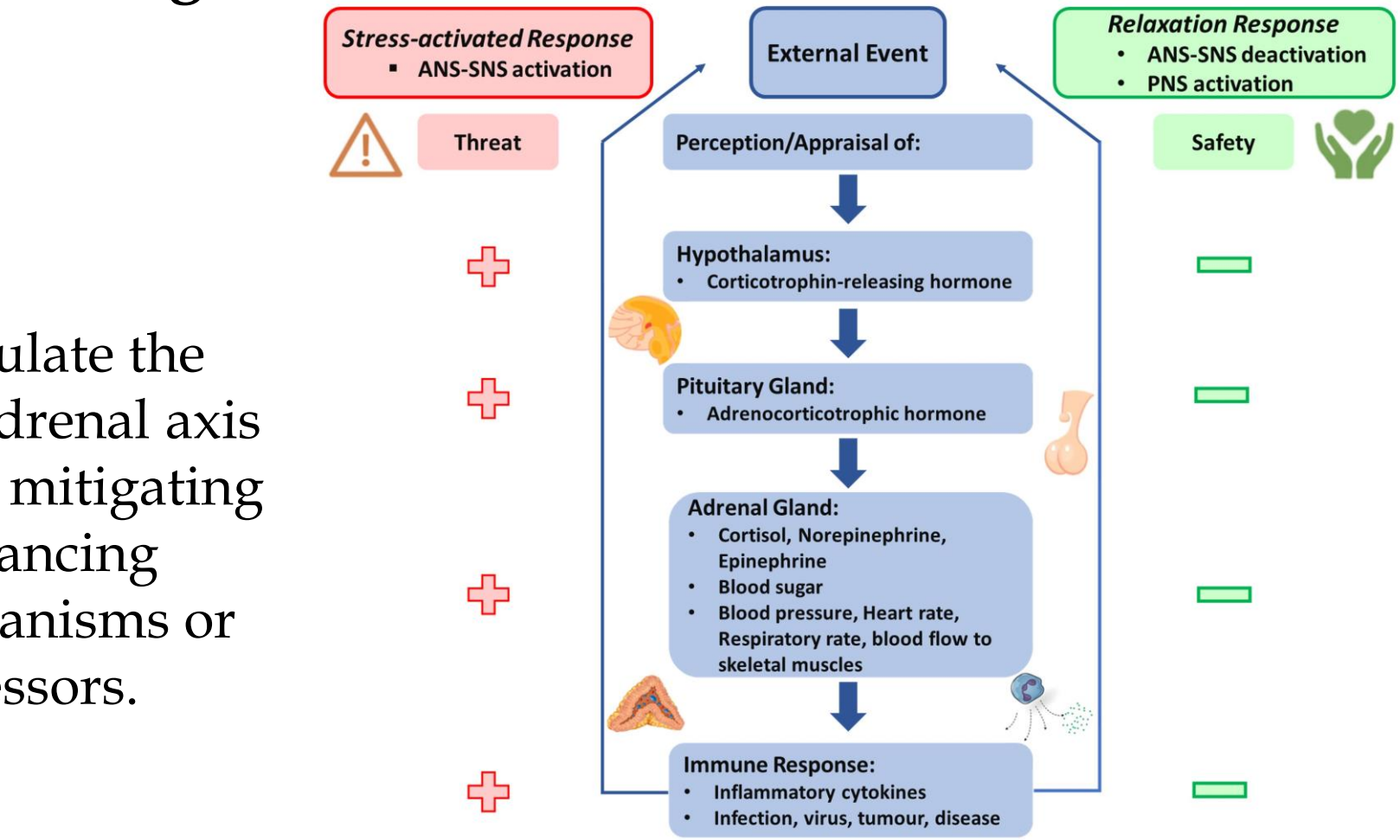
ISSUES WITH MBSR

- To integrate a course on MBSR within our curriculum we encountered several challenges: scarce skilled instructors, financial constraints, and time limitations.

- Given the intricate blend of cultural, social, and epistemological factors in the Middle East, implementing MBSR, a technique with roots in Buddhist philosophy, may not suit undergraduate medical education in this context due to its potential misalignment with sociocultural norms and values.

PMR: A Time-tested Technique for Holistic Stress Reduction and Resilience Enhancement in Medical Education

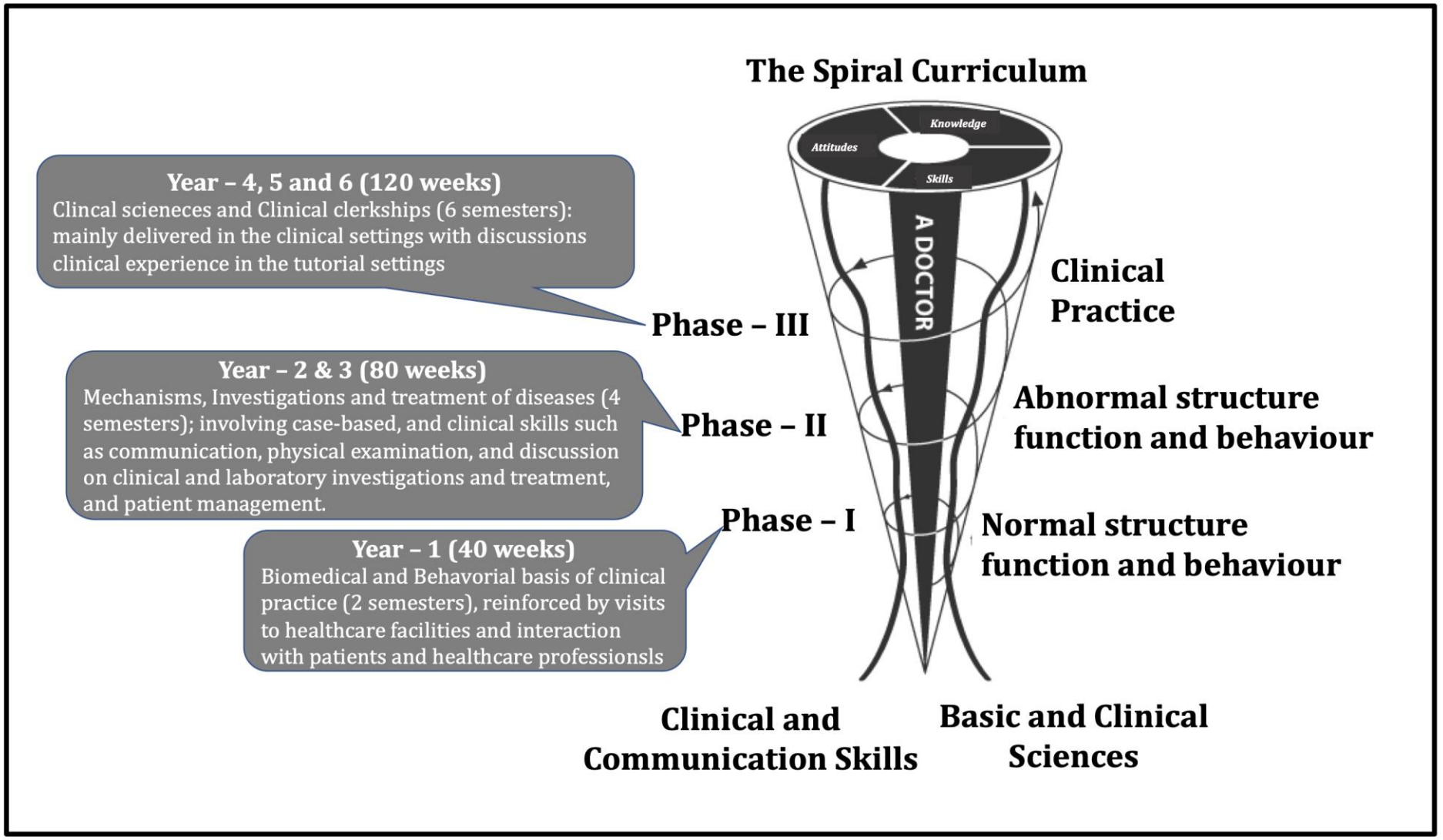
PMR and MBSR: Regulating Stress Responses



Both PMR and MBSR regulate the hypothalamic-pituitary-adrenal axis hyperactivity, potentially mitigating adverse outcomes by enhancing inhibitory feedback mechanisms or fostering resilience to stressors.

Leistner, C., & Menke, A. (2020). Hypothalamic-pituitary-adrenal axis and stress. *Handbook of clinical neurology*, *175*, 55–64. https://doi.org/10.1016/B978-0-444-64123-6.00004-7

The MBRU Curriculum



Banerjee, Y., Azar, A. J., Tuffnell, C., Lansberg, P. J., Bayoumi, R., & Davis, D. (2018). A novel 6D-approach to radically transform undergraduate medical education: preliminary reflections from MBRU. *BMC medical education*, *18*(1), 304. https://doi.org/10.1186/s12909-018-1402-0

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Steps of PMR Program Steps aligned to Gagne's Model

Step	Key event (allocated time)	PMR Program Steps
1	**Gain attention (5 min)**	Participants will be provided with an audio cue (i.e. relaxing music) to gather around the PMR facilitator.
2	**Inform participant of the objective (10 min)**	The participants will be provided with a handout of supplementary information describing the objective of the PMR session, along with the step-by-step guide plan.
3	**Stimulate recall of prior learning (25 min)**	A YouTube video, circulated earlier to the participants, will be rescreened during which the facilitator will elaborate on the benefits of PMR and the rationale behind individual steps. YouTube video: (https://www.youtube.com/watch?v=86HUcX8ZtAk)
4	**Present content material (40 min)**	Using the handout circulated to the participants in Step 2, the facilitator will demonstrate the individual steps of PMR. In this step, participants will be invited by the facilitator to clarify any doubts/questions regarding the individual steps of PMR.
5	**Provide learning guidance (10 min)**	The PMR facilitator will elaborate on the rationale behind each step; however, the focus will also be directed to the specific dos and don'ts pertaining to each step of the program. Case in point, the participant will be informed that if she/he experiences any pain or discomfort at any of the targeted muscle groups, the participant should feel free to omit that step.
6	**Elicit performance (30 min)**	Participants, with cues from the PMR facilitator, will perform the individual steps of the activity, details of which were circulated earlier in step 2 (Supplementary Material).
7	**Provide informative feedback (15 min)**	The PMR facilitator will informally collect reflections from the participants using a framework in line with that of Pendleton's feedback model that is: a) Check that the participants want and are ready for feedback. b) Invite the participants to comment on the supplementary material. c) Allow participants to state what was done well. d) Allow the observer/s to state what was done well. e) Encourage participants to state what could be improved. f) Encourage participants to state how it could be improved. g) Ensure that an action plan for improvement is devised.
8	**Assess performance (15 min)**	In the presence of the PMR facilitator, the participants will review the PMR video, introduced earlier in Step 3, to evaluate their performance against what was shown in the video.
9	**Enhance retention and transfer (5 min)**	The PMR facilitator will provide the participants with additional resources on the benefits of PMR, will urge them to practice PMR at home and workplace at their convenience, and attend the PMR programs that are organized in the University. Additionally, the participants will be encouraged to reflect on the effect of PMR on their professional and social domains and record their reflections through journaling.

Tambi, R., Bayoumi, R., Lansberg, P., & Banerjee, Y. (2018). Blending Gagne's Instructional Model with Peyton's Approach to Design an Introductory Bioinformatics Lesson Plan for Medical Students: Proof-of-Concept Study. *JMIR medical education*, *4*(2), e11122. https://doi.org/10.2196/11122

Steps of Progressive Muscle Relaxation

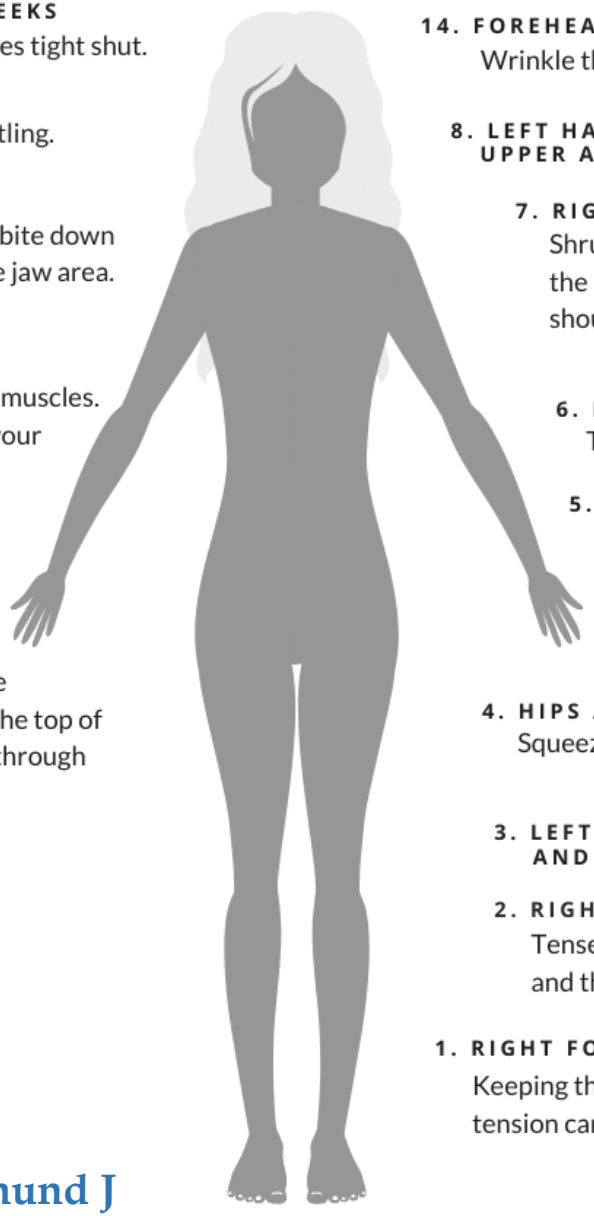
13. EYES AND CHEEKS
Squeeze your eyes tight shut.

12. MOUTH
Purse the lips as if whistling.

11. JAW AREA
Without damaging the teeth, bite down until tension can be felt in the jaw area.

10. NECK
Be careful as you tense these muscles. Face forward and then push your head gently into the floor.

9. CHEST
Beginning with the abdominal area, fill the lungs with air while feeling the tension in the chest area. Breathe out from the top of the lungs (upper chest) down through a contracted abdomen.



14. FOREHEAD
Wrinkle the brow.

8. LEFT HAND & FOREARM, UPPER ARM AND SHOULDER

7. RIGHT SHOULDER
Shrug the shoulder toward the ear and roll the head toward the shoulder so that shoulder & ear are touching.

6. RIGHT UPPER ARM
Tense the bicep and tricep.

5. RIGHT HAND & FOREARM
With the palm down, lift the hand until tension can be felt in the top of the hand, the wrist and the forearm.

4. HIPS AND BUTTOCKS
Squeeze your buttock muscles

3. LEFT FOOT, LOWER LEG AND UPPER LEG

2. RIGHT UPPER LEG
Tense the top of the upper leg (quadraceps) and the bottom of the upper leg (hamstring).

1. RIGHT FOOT & LOWER LEG
Keeping the heel down, curl the toes back until tension can be felt in the ankle and calf muscle.

Adapted from The Anxiety & Phobia Workbook, by Edmund J

Paticipant Recruitment and Focus Group Sessions

- Twenty participants were recruited on a 'first-come, first-serve' basis, distributed equally across the curriculum phases.
- Participants arrived early at the study site, greeted by a trained instructor with over a decade of PMR practice experience.
- Following informed consent, participants attended morning sessions held between 9:00 and 11:00 a.m
- The program included five sessions over five weeks.
- Two focus group dialogues were held post-program, chosen for their potential to yield in-depth qualitative data and enable interactive exchange.
- Voluntary participation facilitated by an external moderator, the focus groups sought to understand participants' experiences, attitudes, and perceptions regarding the PMR program.

Data Analysis and Quality Appraisal Process

- Participant perceptions were transcribed and analyzed via grounded theory, a methodology that emphasizes inductive reasoning and theory generation from data.
- Two independent coders identified key themes and concepts from the transcribed perceptions, following iterative discussions to refine these emerging themes.
- The Braun and Clarke thematic analysis framework was used, facilitating a detailed understanding of participant experiences with the PMR program.
- O'Brien's SRQR was used for quality appraisal, ensuring rigor, trustworthiness, and comprehensibility of our findings, enhancing the study's credibility, validity, and potential for replication.

Five emergent themes obtained through Qualitative data Analysis

- **Self-control**: Participants experienced enhanced self-regulation, exemplified by better management of cognitive functions, emotional states, and behavioral responses, which was reflected in improved sleep patterns, reduced anger, and increased mindfulness.

- **Self-realization**: PMR exercise led to increased self-awareness among participants regarding their physical and mental states, fostering psychosomatic cognizance, understanding of stress manifestations, and realization of cognitive barriers.

- **Liberation**: Participants experienced psychological liberation, marked by cognitive flexibility and adaptability. The PMR exercise liberated participants from preconceived cognitive constructs and fostered resilience within the stringent academic environment.

Five emergent themes obtained through Qualitative data Analysis

- **Awareness**: The PMR intervention heightened participants' conscious perception and cognitive appraisal of their physical and emotional states. Participants reported being able to recognize, modulate bodily sensations, and deploy learned self-regulation techniques effectively.

- **Interpersonal Relationships**: Participants reported improvements in relational dynamics, emotional empathy, and perspective-taking abilities in interpersonal interactions as a result of the PMR exercise. Enhanced emotional intelligence, interpersonal sensitivity, and improved relationships were significant outcomes.

In summary, the PMR program led to enhanced self-regulation, increased self-awareness, psychological liberation, heightened awareness of psychosomatic states, and improved interpersonal relationships, thereby contributing to the holistic development within the challenging context of medical education.

PROGRESSIVE MUSCLE RELAXATION

Analyzing the Traits through “Bourdieu's theory of practice”

Bourdieu's theory – habitus, field, and capital

- **Habitus**: In Bourdieu's theory, habitus refers to the dispositions and tendencies that individuals develop over time due to their social conditioning. Within medical education, the concept of habitus pertains to the mindset, attitudes, and behaviors that medical students acquire throughout their training.

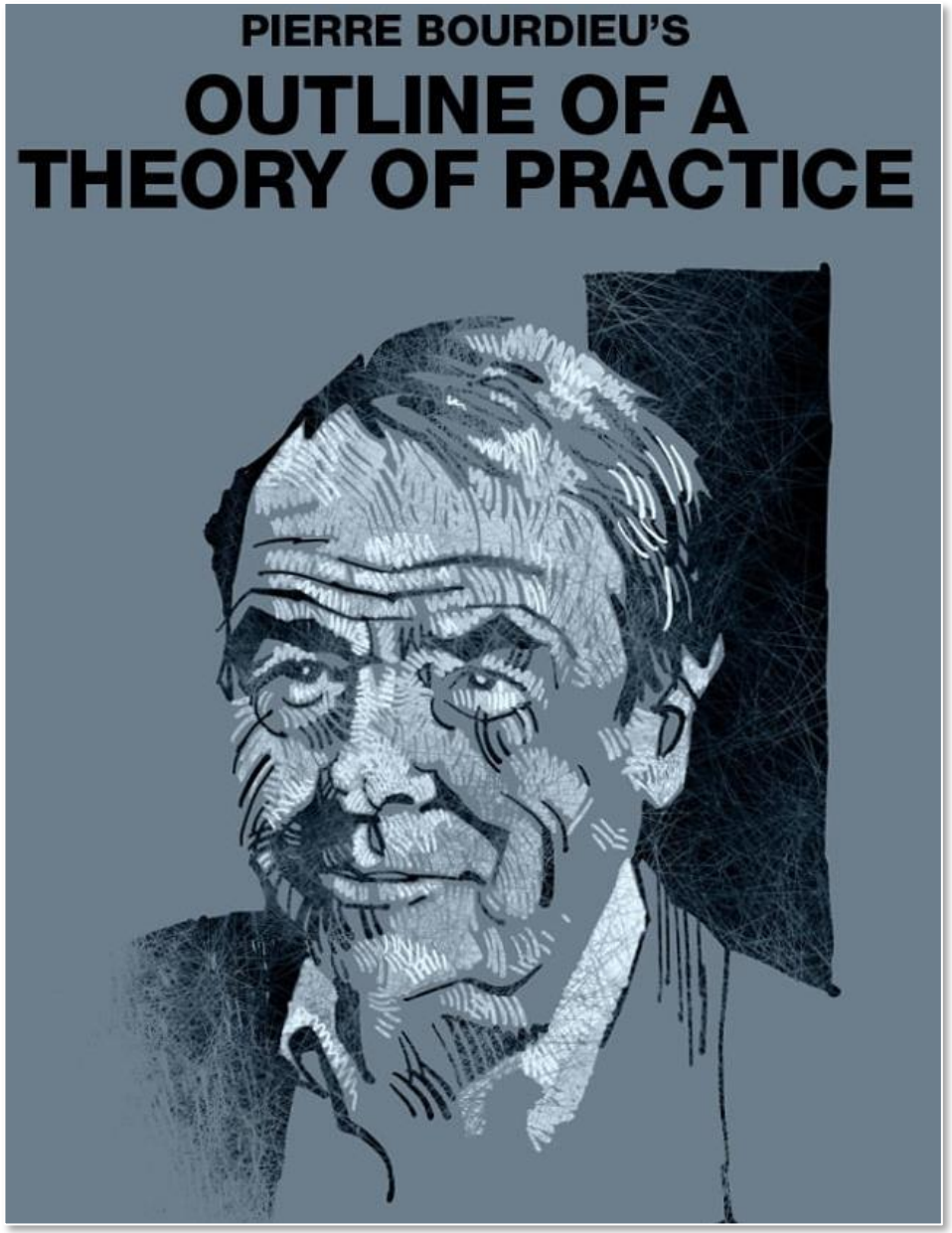
- **Field**: Bourdieu defined fields as the social arenas within which struggles or maneuvers take place over specific resources or stakes. In the context of medical education, the field would be the medical school environment or the broader healthcare system.

- **Capital**: refers to resources individuals accumulate to gain field advantages. In medical education, these can be economic (such as research funding or scholarships), cultural (like medical knowledge or degrees), social (professional networks or relationships), or symbolic (prestige or recognition within the medical community).

Analyzing the Traits through “Bourdieu's theory of practice”

Bourdieu's theory of practice, when applied to medical education, provides insights into how social structures and power dynamics shape students' experiences and outcomes.

It helps in understanding how students' backgrounds and social contexts influence their education, how medical institution structures affect teaching and learning, and how resources are allocated and used within the field of medical education.



Analyzing the Traits through “Bourdieu's theory of practice”

- **Bourdieu's Habitus and Self-Control**: Participants' increased self-control is similar to Bourdieu's habitus idea, which is how people develop habits that guide their actions. It means that the participants were learning how to better manage their thoughts and emotions.

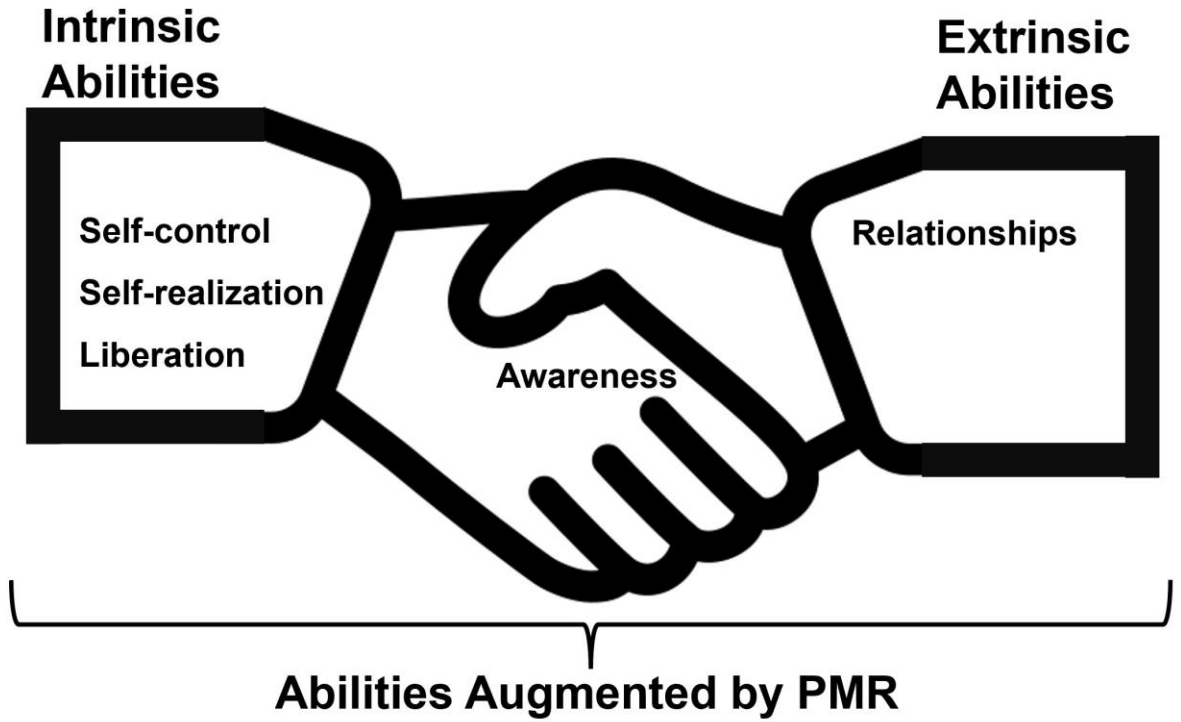
- **Fields, Capital and Self-Realization**: Participants understanding their own strengths and weaknesses relates to Bourdieu's ideas of fields and capital. It means that they were getting better at working within their field (medicine) by knowing what they're good at and what they need to improve.

- **Liberation and Illusio**: Participants feeling free from old ways of thinking matches Bourdieu's concept of illusio, which is about being invested in a certain way of doing things. This shows that the participants were becoming more flexible and adaptable.

Integrative Psychological Resilience Model in Medical Practice (IPRMP)

A proposed model that integrates psychological, learning, and social constructs - self-control, self-realization, liberation, awareness, and interpersonal relationships - utilizing PMR to improve medical practice and education.

- **Theoretical Basis**: The IPRMP model draws on Bandura's Social Cognitive Theory, Maslow's Humanistic Theory, Cognitive Liberation Theory, mindfulness theory, Social Interdependence Theory, and Bourdieu's theory of practice.
- **Interconnected Traits**: The traits within the IPRMP are not standalone, but interconnected. For example, enhanced self-control through PMR can lead to improved self-realization, resulting in liberation from negative mental states, which in turn cultivates awareness, positively impacting interpersonal relationships.
- **Potential Impacts**: The IPRMP provides an integrative approach to fostering resilience and overall wellbeing in medical practitioners, mitigating professional burnout, enhancing patient care quality, and preparing future medical professionals for the rigors of the profession.



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PMR's Alignment with Medical Competency Frameworks

Progressive Muscle Relaxation (PMR), through its impact on self-control, self-realization, liberation, awareness, and interpersonal relationships, aligns with several significant areas of various competency frameworks for medical practitioners. These include:

(A) the Scottish Doctor Framework

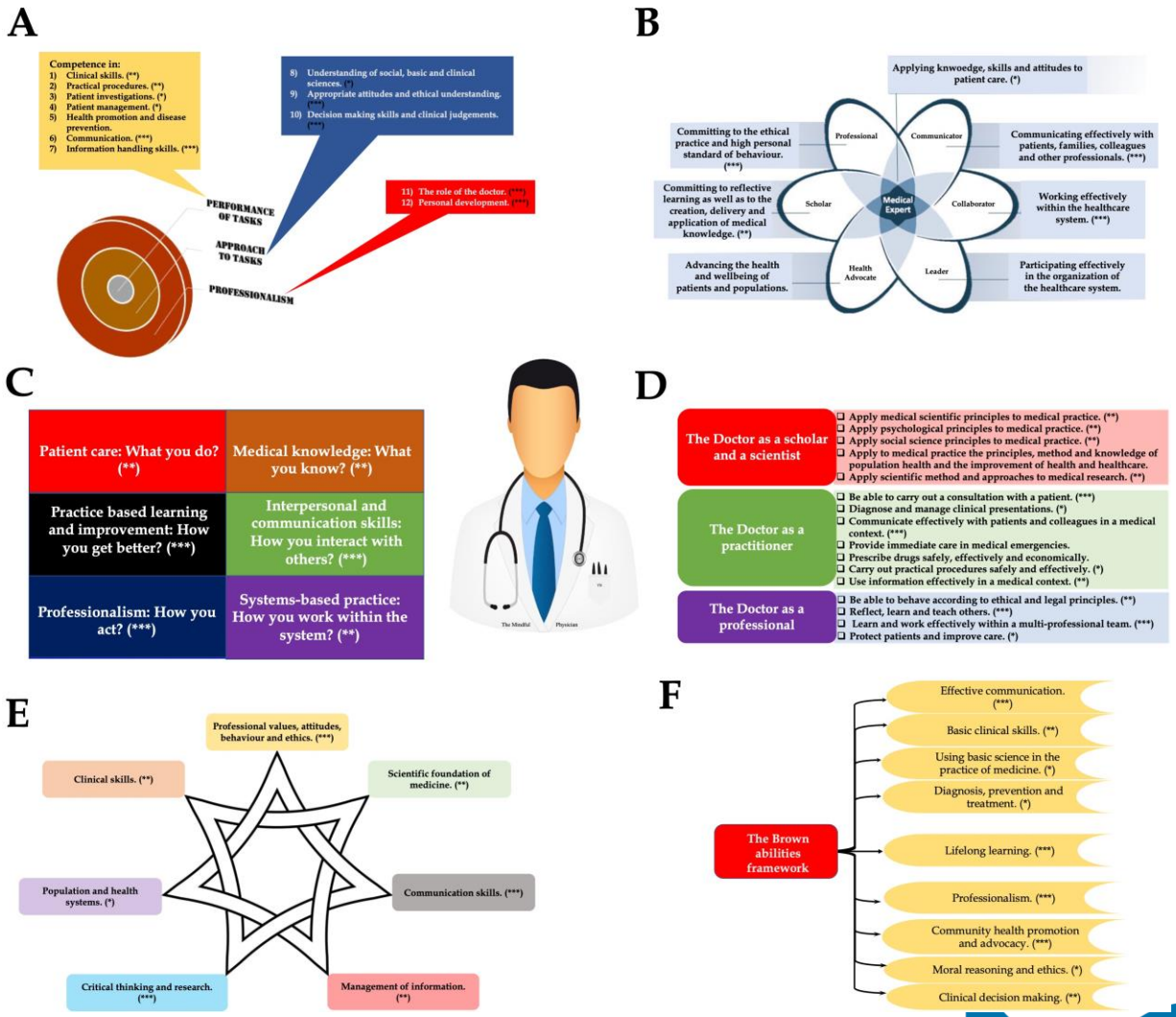
(B) the CanMEDS Physician Competency Framework

(C) the Accreditation Council for Graduate Medical Education (ACGME) Competency Framework

(D) the General Medical Council (GMC) UK Competency Framework

(E) the Global Minimum Essential Requirements (GMER) Competency Framework

(F) the Brown Abilities Competency Framework.



Mento's Change Management Model to implement PMR in CBMC

- To implement the PMR program in the curriculum there is a need for change in teaching strategies.
- To facilitate this we used Mento's change management model, which combines aspects of Kotter's, Jick's, and GE's models.
- This model was chosen due to its comprehensive nature and compatibility with academic institutions.
- It guided the integration of a PMR program into the curriculum through a faculty development program

Step No.	Steps of Mento's Model of Change	Activity to facilitate/implement the change	Timeline
1	The idea and its context	Preliminary results from this pioneering investigation indicate that PMR augments student well-being and resilience. The idea is to integrate PMR in the phase-I of the MBBS curriculum at MBRU (Appendix 1)	N/A
2	Define the change initiative	Present to the concerned stakeholders (student volunteers from phases II and III who will work in collaboration with the PMR instructor and the associated team to disseminate PMR to the Phase – I students and ensure compliance): ⇒ What is PMR? ⇒ Benefits of PMR. ⇒ Successful case-studies of PMR. (Presentation of observations from this study and those from the literature)	ONE week prior to the commencement of Phase – I during the week of student orientation.
3	Evaluate the climate for change	Appraise the necessary resources, prior knowledge of stakeholders and technological know-how required to successfully implement PMR, through SWOT analysis.	ONE week prior to the commencement of Phase – I during the week of student orientation
4	Develop a change plan	Work with the PMR instructor and associated team at MBRU to develop a plan to train the stakeholders regarding strategies to implement PMR in phase – I.	ONE week prior to the commencement of Phase – I during the week of student orientation
5	Find and cultivate a sponsor	Schedule meetings with MBRU academic leadership (Dean/Associate Deans/ Departmental Chairs) to inform them about the benefits of PMR and the resources required.	SIX-weeks prior to commencement of Phase – I
6	Prepare your target audience	⇒ Organize workshops in collaboration with the PMR team to inform stakeholders about "how" to disseminate PMR. ⇒ Circulate nano-lectures on PMR to stakeholders over WhatsApp.	ONE week prior to the commencement of Phase – I during the week of student orientation
7	Create the cultural fit	Create linkage between approaches to augment resilience and PMR to inform stakeholders "why" there is a necessity to create a culture of augment resilience in medical students and how PMR can address this objective.	FOUR-weeks prior to commencement of Phase – I
8	Develop and choose a leader team	Create an informal "Leader Team" consisting of stakeholders who enthusiastic about implementing PMR in the MBBS curriculum, such that they can guide and encourage the stakeholders to implement PMR.	ONE–FIVE weeks into the semester following the commencement of Phase - I
9	Create small wins for motivation	Identify the stakeholders who successfully disseminated PMR and request them to present their experiences in this effort to the MBRU academic leadership and other concerned stakeholders.	FOUR-FIVE weeks into the semester following the commencement of Phase - I
10	Constantly and strategically communicate the change	During the whole transformation process: ⇒ Create a "Learning community" such that stakeholders can learn from each other about the benefits of PMR and the need to augment resilience in medical education. ⇒ Try to address hurdles that are faced by stakeholders in their endeavor, by communicating the change process to Sponsors	ONE–FIVE weeks into the semester following the commencement of Phase - I
11	Measure progress of the change effort	⇒ Evaluate the attitude of stakeholders towards PMR following the transformation initiative using ADKAR (Awareness, Desire, Knowledge, Ability, Reinforcement) framework. ⇒ Assess the performance of the students in Phase – I to identify if PMR was beneficial to cultivate and augment resilience and reduce stress. ⇒ Conduct student feedback to assess the perception of students towards PMR	TEN – TWELVE weeks into the semester prior to conclusion of the first semester of Phase - I
12	Integrate lessons learned	Using a reflective-framework conduct an After Action Review to: ⇒ Map the transformation process ⇒ Identify hurdles that further required to be tackled such that PMR can be successfully integrated the following semester.	FOURTEENTH week into the semester prior to conclusion of the first semester of Phase - I
	PREPARATORY TIME FOR IMPLEMENTING THE TRANSFORMATION		FOUR-WEEKS
	TIME REQUIRED FOR IMPLEMENTING/ASSESSING THE TRANSFORMATION		FIVE-WEEKS
	TOTAL STUDY DURATION (PREPARATION + IMPLEMENTATION + ASSESSMENT)		FOURTEEN-WEEKS

Banerjee, Y., Tuffnell, C., & Alkhadragy, R. (2019). Mento's change model in teaching competency-based medical education. *BMC medical education*, *19*(1), 472. https://doi.org/10.1186/s12909-019-1896-0

CONCLUDING REMARKS

The study showed substantial benefits of integrating PMR within CBMC, leading to positive outcomes in self-control, self-realization, liberation, awareness, and interpersonal relationships among medical students.

The PMR program, while being cost-effective and time-efficient, aligns with global learning outcomes frameworks, confirming its broad applicability in diverse medical education contexts.

Future Research Recommendations for Enhancing PMR Efficacy in Medical Education

- *Inclusion of a Diverse Sample*: To broaden the understanding of PMR's effectiveness across varied demographic and lifestyle profiles.

- *Consideration of Genetic and Epigenetic Factors*: To enable a more personalized approach to stress management in medical education. Our study did not consider the potential impact of genetic variations, such as those in the CRHR1 and 5-HTTLPR genes, which have been linked to differential stress responses. Similarly, epigenetic modifications like DNA methylation of the NR3C1 gene could influence stress resilience and the effectiveness of PMR.

- *Validation Across Multiple Institutions*: To enhance external validity and generalizability of the findings.

- *Examination of PMR's Effectiveness at Different Curriculum Phases*: To tailor interventions to the specific needs at each stage.

The PMR team

Acknowledgement

EXPLORANCE

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THANK YOU

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