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Original Contribution

WELLNESS LIFESTYLE, MULTIMODAL EMOTIONS, AND OXYGEN SATURATION - AN INTEGRATED APPROACH TO HOLISTIC HEALTH

B. Dimitrova*

Faculty of Public Health, Health Care and Tourism, National Sports Academy "Vassil Levski", Sofia, Bulgaria

ABSTRACT

Introduction: Emotions and physiological health are deeply interconnected, influencing overall well-being through complex biological and psychological mechanisms. This study explores the relationship between multimodal emotional states and oxygen saturation (SpO_2) as an integrated approach to holistic health. Methods: By analysing the physiological responses associated with different emotional states, we aim to determine how emotions impact oxygenation levels and overall cardiovascular and respiratory function. Results: The research incorporates biophysical monitoring, psychological assessment, and interdisciplinary methodologies to establish correlations between emotional regulation, stress management, and optimal oxygen saturation. One critical physiological indicator is SpO_2, which plays a vital role in cognitive function, stress regulation, and overall physical performance. Discussion: Findings suggest that positive emotional states enhance oxygen transport efficiency, while negative emotions may contribute to hypoxia-related health risks. Conclusion: This study underscores the importance of integrating emotional well-being into health assessments and therapeutic practices, advocating for a comprehensive, multimodal strategy to improve both mental and physical health outcomes.

Keywords: wellness lifestyle, well-being, respiration technics, holistic approach

INTRODUCTION

In contemporary health science, the paradigm is shifting from disease treatment to holistic well-being. A wellness lifestyle—characterised by deliberate health-promoting behaviours—has been correlated with enhanced emotional states and improved biomarkers, such as oxygen saturation (SpO_2), which is critical for cellular metabolism and neurological function. Emotions and physiological responses are deeply interconnected, influencing overall well-being and health outcomes (1-3). Multimodal emotion analysis—integrating facial expressions, voice tone, body language, and physiological signals—provides a comprehensive understanding of how emotions manifest in the body (4-6). One critical physiological indicator is oxygen saturation SpO_2), which plays a vital role in cognitive function, stress regulation, and overall physical (performance (7-10). This paper explores the relationship between multimodal emotional states and oxygen saturation levels, emphasising their role in holistic health (11, 12). By integrating insights from neuroscience, psychophysiology, and sports science, we aim to establish how emotional regulation and oxygenation interact to influence mental clarity, stress resilience, and physical re-energising (13-15). Recent advancements in wearable technology and biofeedback systems now enable real-time monitoring of oxygen levels across various targets. (16-18). The emotional states, enabling more effective interventions in stress management, athletic training, and mental health therapy (19-22). Through an integrated approach, we highlight the potential of personalised health strategies that harmonise emotional well-being, physiological balance, and optimised oxygenation for a more sustainable and holistic lifestyle (23-27).

***Correspondence to:** *Prof. Bistra Dimitrova, D. Sc., Expert evaluator at the EC, DG "Research", Faculty of Public health, Health care and Tourism, Email: dimitrova.bistra@yahoo.com, National Sports Academy "Vassil Levski", 21, Acad. Stefan Mladenov str. 1700 Sofia, Bulgaria*

METHODOLOGY

We utilise the following methods for recording indicators in our study:

The Santa Medical Fingertip Pulse Oximeter is a clinically validated device designed for the non-invasive measurement of arterial blood oxygen saturation (SpO_2), pulse rate, and pulse intensity. Data are presented via a high-contrast digital LED display, allowing for rapid visualisation **(Figure 1).**

Figure 1. Fingertip Pulse Oximeter

Figure 2. Oscillometric Non-Invasive Blood Pressure

The device delivers accurate and reproducible measurements within an 8 to 10-second interval. It incorporates a dynamic pulse bar graph, which facilitates real-time hemodynamic monitoring. In addition, we employed the A&D Medical Oscillometric Non-Invasive Blood Pressure and Pulse (NIBP) Monitor, a highly reliable device designed for precise measurement of systolic and diastolic blood pressure, as well as heart rate (beats per minute). This model demonstrated the highest measurement fidelity, with deviations limited to ±1 mmHg from reference standards **(Figure 2).** The system is equipped with advanced functionalities including irregular heartbeat detection, three-reading averaging, and Bluetooth connectivity, enabling seamless integration with multiple health monitoring applications. To assess and analyse Mental and Spiritual Wellness by emotional states, we recorded changes in oxygen saturation levels, body and room temperature, blood pressure (systolic and diastolic), pulse rate, and indicators of physical and psychological self-perception. Correlation analysis was conducted to reveal the interdependencies among these variables. The *study aim* was by analysing the physiological responses associated with different emotional states, to determine how emotions impact oxygenation levels and overall cardiovascular and respiratory function.

Expertise and tools: the relationship between multimodal emotional states and oxygen saturation (SpO_2) as an integrated approach to holistic health. The study involved 87 participants, including people who practise swimming (students in our programs for wellness & spa culture, former athletes, and wellness lifestyle practitioners) from private recreational clubs, universities, and NGOs specialising in recreational practices. The participants were primarily Bulgarian, a balanced gender distribution, in two groups (experimental and control) and with an average age of 31,4 years.

Study limits: As this study is under the objectives of the Scientific Centre of Excellence "Heritage BG", all experts were recruited through a public announcement. The participants gave informed consent for the publication of their data. The study was conducted between May 2023 and February 2025.

Specific wellness influences applied: Video interventions for emotional state changes (positivises & sadness), wellness respiratory therapy (Eastern practices technics), meditation and positive ideo-motor guided modelling training, face registration of the emotional states with emotional scale test.

RESULTS

The analysis of the data collected before and after the intervention was carried out to evaluate the impact of the wellness influence on the experimental group, comparing it with the control group. The analysed results include pre- and post-intervention measurements for both groups and are presented below **(Table 1).** The analysed results show that there are no statistically significant differences between the experimental group and the control group. The importance of oxygen saturation (SpO_2) for human health is an integral health indicator. Oxygen saturation refers to the percentage of oxygen bound to haemoglobin in the blood and serves as a key indicator of the efficiency of oxygen transport in the body. Normal values

typically range between 96% and 100%, and any significant deviation shows a health issue.

Why is oxygen saturation important? The factor "Ensures proper organ function" refers to the essential role of oxygen for the brain, heart, and muscles. Its deficiency can lead to fatigue, confusion, and even organ failure. The indicator "Regulates energy levels" refers to cells which use oxygen to produce energy. Low saturation can cause hypoxia, leading to weakness and reduced endurance. With "Supports the immune system" we signify optimal oxygenation which improves the body's ability to fight infections and inflammation.

What do different SpO_2 levels indicate?

- ✓ 96–100% – Normal saturation, indicating sufficient oxygen supply.
- ✓ 91–95% – Mild hypoxemia, possibly linked to respiratory conditions such as asthma or chronic obstructive pulmonary disease (COPD).
- ✓ Below 90% – Dangerously low levels, requiring medical attention. This may indicate severe lung or cardiovascular diseases.

Table 1. *Summary of the key metrics for the different wellness factors*

Wellness Factor	Impact on Emotions (1–10)	Change in Sp O_2 (%)
Physical Activity	8	2.0
Meditation	9	3.0
Nutrition	7	1.5
Sleep	8	2.5
Social Interaction	6	1.0

These findings are graphically illustrated in the figure bellow, showing a dual-axis view of psychological and physiological impacts.

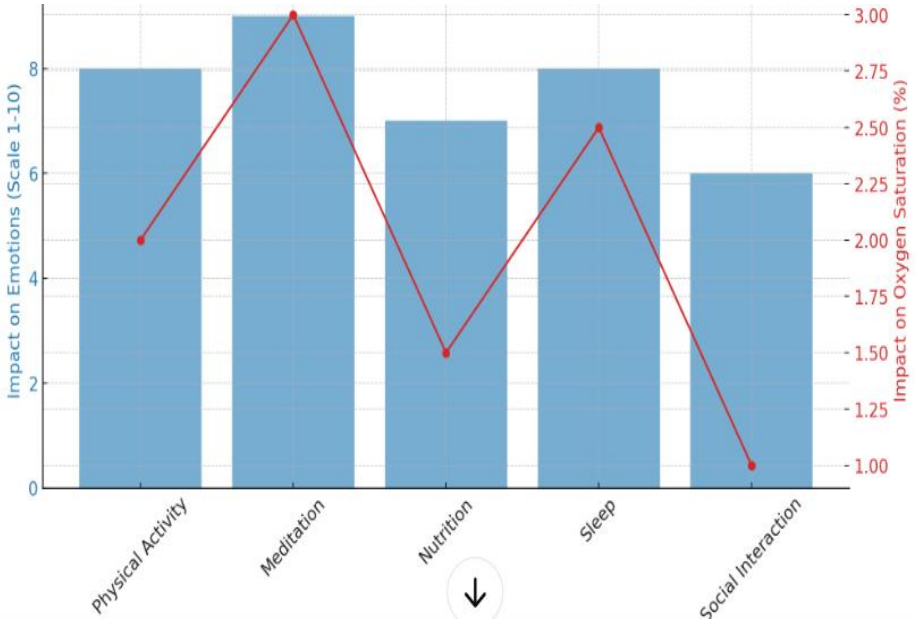

Figure 3. Impact of wellness factors on emotions and oxygen saturation

Here is a visual representation of how various wellness lifestyle factors impact both multimodal emotional states and oxygen saturation levels **(Figure 3).** The *blue bars* show the relative impact on emotional well-being (rated on a 1–10 scale), while the *red line* illustrates the associated changes in oxygen saturation (% increase), which reflect physiological wellness enhancements. This finding suggests that there is no statistically significant difference between the two groups regarding the study variables prior to the wellness influences, thereby confirming baseline equivalence. The data presented by the registered independent samples are shown in **Table 2.**

Table 2. *Test-before the influence measurements: independent samples*

Test	F	Sig. (Levene's Test)	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Pretest (Equal variances assumed)	2.931	0.097	1.374	55.00	0.308	2.543	1.961	-1.769	8.014
Pretest (Equal variances not assumed)	—		1.397	45.71	0.279	2.841	2.172	-1.498	7.724

To determine the effectiveness of a wellness procedure, we compared the states before and after its performance with registered scores within the experimental and the control group. Levene's test for equality of variances yielded a result of F = 2.931 with a significance level of p = 0.097, indicating that the assumption of equal variances has not been violated. Subsequently, the t-test for equality of means produced a p-value of 0.308. The results within groups (experimental and control) are presented in table 3 and provide insight into the impact after the wellness procedures / therapies. This finding suggests that there is statistically significant difference between the two groups regarding the study variables after the wellness interventions, thereby confirming the effect of the positive emotions to the pulse frequency. The results indicate a measurable difference between the before and after data values as consequences of the wellness interventions within the experimental group. However, the obtained p-value of 0.0521 marginally exceeds the conventional threshold of statistical significance ($p < 0.05$). **(Table 3):**

Table 3. *Wellness procedure effect analysis - paired samples test*

Paired Differences	Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
Before – After	72.611	5.692	1.34519	-0.0543	5.45123	2.007	29	0.0521

As such, while the data suggest a potential effect of the wellness procedure, the difference cannot be conclusively interpreted as statistically significant under strict criteria. It needs more substantial number of tests and studied cases foreseen in our future research.

Table 4. *Correlation coefficients representing the relationships between the recorded indicators.*

Index	Oxygen	t° 1	t° 2	Room t°	BPD	BPS	Pulse	Emotion	Physical
Oxygen	1								
t° 1	0,464	1							
t° 2	0,435	0,216	1						
Room t°	-0,762	-0,4681	-0,025	1					
BPD	-0,082	0,575	-0,468	-0,392	1				
BPS	-0,346	0,242	-0,617	-0,124	0,707	1			
Pulse	-0,746	-0,533	-0,495	0,436	0,261	0,365	1		
Emotion	0, 277	0, 395	0, 452	0, 077	0, 692	0, 623	0, 528	1	
Physical	0,629	0,607	0,403	-0,602	0,094	-0,069	-0,827	0, 078	1

The correlation analysis revealed meaningful relationships between physiological, emotional, and environmental variables **(Table 4).** Oxygen saturation was moderately positively correlated with physical activity levels (r = 0.629) and emotional well-being (r = 0.277), suggesting that better oxygenation supports both physical and psychological health. Notably, oxygen levels were strongly negatively correlated with room temperature (r = -0.762), indicating that higher ambient temperatures might adversely affect oxygen saturation. Pulse rate showed a

strong negative correlation with oxygen saturation (r = -0.746) and with physical condition (r = -0.827), implying that elevated heart rates may signal decreased physical wellness and lower oxygenation. Furthermore, emotional states were moderately to strongly correlated with diastolic blood pressure (BPD, r = 0.692), systolic blood pressure (BPS, r = 0.623), and pulse (r = 0.528), confirming the significant influence of emotions on cardiovascular responses. Blood pressure indices (BPD and BPS) were strongly positively correlated (r = 0.707), validating their expected physiological coherence. Interestingly, room temperature negatively correlated with both BPD and BPS, though more modestly, suggesting that environmental conditions impact cardiovascular parameters.

These findings reinforce the concept that physiological, emotional, and environmental factors are tightly integrated and must be considered holistically in wellness and health research.

How to maintain healthy oxygen saturation?

- ✓ Regular exercise strengthens the lungs and improves oxygenation.
- ✓ Deep breathing and yoga help increase oxygen capacity.
- ✓ Avoid smoking because tobacco reduces oxygen transport in the blood.
- ✓ Stay hydrated since proper water intake aids oxygen circulation.
- ✓ Fresh air exposure, such as walks in nature and ventilating indoor spaces can boost oxygen levels.

The sentiment classification as a vital area of research and the complexity of emotions and temporal aspects of modalities were analysed as follows:

- *Context and significance.* Sentiment classification is recognised as a crucial research domain within natural language processing (NLP) and affective computing. It involves identifying and categorising the emotional tone or attitude expressed in text, speech, or other modalities. The phrase emphasises the importance of this area, highlighting its role in understanding human communication and emotional expression.
- *Complexity of emotions.* Emotions are inherently complex and multifaceted, involving various dimensions such as valence (positive/negative), arousal (intensity), and specific emotional states (happiness, anger, sadness, etc.). Emotions can be mixed or ambiguous, making their computational classification challenging. The subtlety and variability in emotional expression across individuals, cultures, and contexts further add to this complexity.
- *Temporal aspects of modalities.* Temporal aspects refer to how emotions and sentiments evolve over time and how they are expressed dynamically across different modalities (text, speech, facial expressions, gestures). For example, in speech, emotions may fluctuate during a conversation, requiring models to capture sequential and temporal dependencies. In writing, sentiment can change within a document or conversation, necessitating analysis of context over time. Modalities (e.g., audio, visual, textual) have different temporal characteristics, and integrating these effectively is a significant challenge. The complexity arises from the need to model not just static emotional states, but their transitions and interactions across modalities and over time. The statement underscores that sentiment classification is a vital and challenging research area, primarily due to the intrinsic complexity of human emotions and their temporal evolution across various modalities. Addressing these complexities requires sophisticated models capable of capturing nuanced emotional states and their dynamic nature over time. The second keyword in our title is human emotions analysed and classified as a vital area of research by an advanced researcher. We explain the area as follows:
- *Significance of the classification of human emotions.* Human emotions classification involves identifying, categorising, and understanding the emotional states expressed by individuals through various modalities, such as text, speech, facial expressions, and gestures. This field is crucial for enabling machines to interpret human feelings, fostering more natural and empathetic interactions between humans and technology.

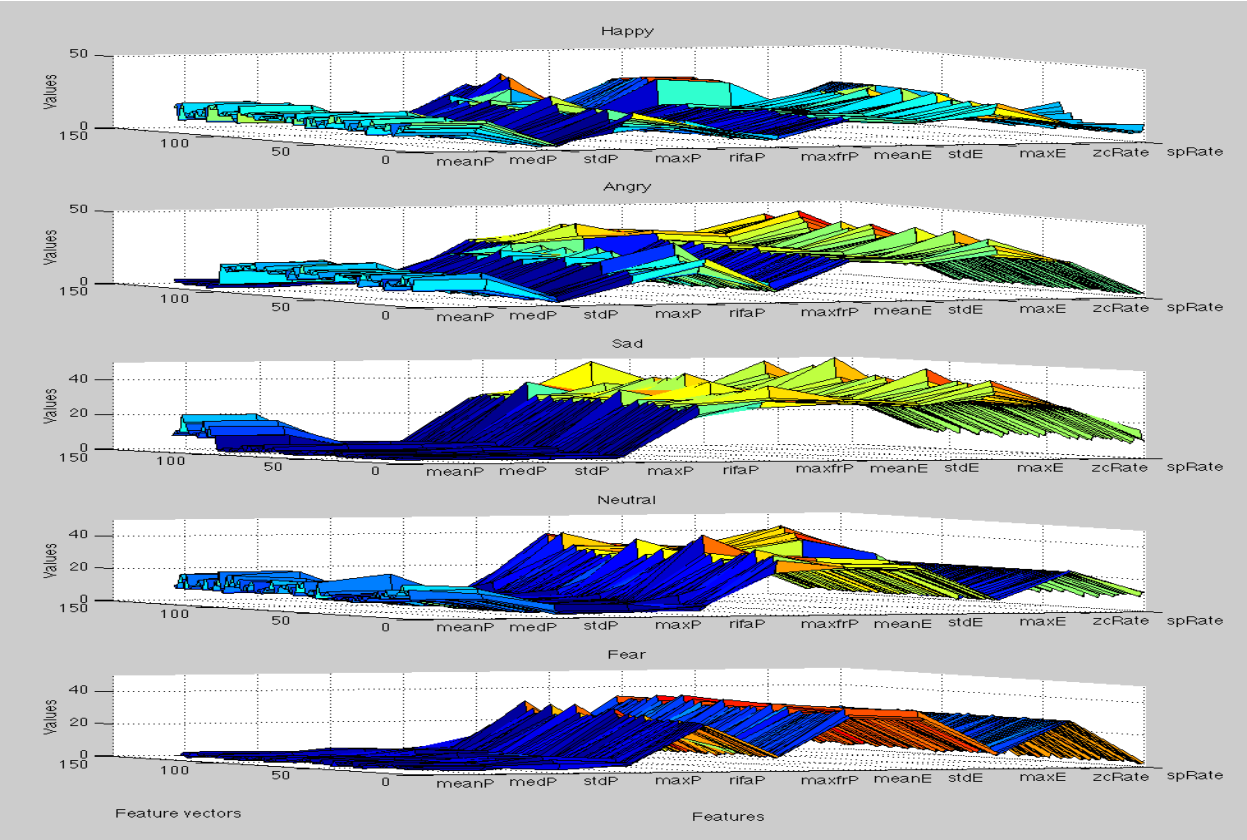

Figure 4. 3-D view of all feature vectors for each emotion

2. *Why is it a vital area of research?*
It supports mental health and well-being. Emotion classification can aid in detecting emotional distress, depression, or anxiety, contributing to mental health diagnostics and interventions. Advanced affective computing pushes the boundaries of AI by integrating emotional intelligence, making machines more human-like in understanding and responding to feelings.

In **Figure 4** we have a 3-D display of all feature vectors for each emotion. There are 120 feature vectors, each containing 11 features and all of them with their corresponding values. It can be noted that for the most part there are visual differences in each model, such as the lower first part of each feature vector, especially for the emotional cases in sad, neutral and fear (27). We can deduce that emotional states demonstrate some direct independences with the health and well-being index. This area of research possesses multidisciplinary impact and intersects with psychology, neuroscience, wellness lifestyle and computer science, highlighting its broad importance. Regarding the challenges and focus in scientific interests, emotions are subjective, complex, and context-dependent, making their classification inherently challenging. Variability across individuals, cultures, and situations necessitates robust and adaptable models. The multimodal nature of emotional expression requires integrated approaches that combine data from various sources.

DISCUSSION

The findings of this study underscore the potential effectiveness of wellness influences (WI) as an evidence-based intervention aimed at enhancing individual conduct and promoting a more positive and creative mental and spiritual wellness environment. Both quantitative and qualitative data collected over the course of the study period of wellness procedures support the conclusion that WI implementation contributed to a positive mindfulness, self-enacted and facilitated improvements in positive behaviours. Quantitative analysis, derived from before and after comparisons within the experimental group indicates a positive behavioural shift associated with wellness procedures intervention. Although the resulting p-value of 0.0521 marginally exceeds the conventional threshold for statistical significance ($p < 0.05$), we consider this very small and insignificant

value (0.021). The findings validate a medium level of physiological and emotional changes. These findings, while not meeting the strict criteria for statistical significance, nonetheless warrant attention due to their potential practical implications in scientific, educational and behavioural management contexts. We registered the influence of emotions on mental and spiritual wellness by analysing the changes in saturation data, body temperature, blood pressure and pulse for an integrated approach to holistic health:

1. Understanding Vu in the context of wellness

✓ *Definition of Vu.* Vu can be understood as a holistic approach that emphasises balance and harmony within oneself and with the surrounding environment. It integrates physical, mental, and spiritual health, recognising that these aspects are interconnected.

Core Principles

✓ *Holistic perspective*. Treating the individual as a whole, rather than focusing on isolated symptoms.

✓ *Interconnectedness*. Acknowledging the relatedness between mind, body, and spirit.

Preventive care. Emphasising wellness through lifestyle choices, mindfulness, and emotional awareness.

2. The role of emotions in mental wellness

✓ *Emotional awareness*: Recognising and understanding one's emotions is crucial for mental health. Awareness helps in identifying triggers and patterns that can lead to stress, anxiety, or depression.

Impact on Mental States

✓ *Positive emotions.* Emotions like joy, gratitude, and love can enhance mental resilience, promote well-being, and reduce symptoms of mental illness.

✓ *Negative emotions.* Prolonged sadness, anger, or fear can lead to mental health challenges, including anxiety disorders and depression.

3. The influence of emotions on spiritual wellness

✓ *Emotional expression.* Spiritual wellness often involves the ability to express and process emotions. Healthy emotional expression fosters deeper connections with oneself and others, enhancing spiritual growth.

✓ *Mind-body connection.* Emotions can affect physical health; stress and negative emotions can lead to physical ailments, while positive emotions can promote healing and vitality.

✓ *Spiritual practices.* Activities like meditation, mindfulness, and prayer can help in managing emotions, providing clarity, peace, and a sense of purpose.

4. Interplay between mental and spiritual wellness

✓ *Stress management.* Healthy emotional regulation techniques, such as mindfulness and meditation, contribute to both mental clarity and spiritual peace.

✓ *Finding meaning.* Emotions often guide individuals to seek purpose and meaning in life, which is a core aspect of spiritual wellness. Reflecting on emotional experiences can lead to greater self-understanding and spiritual insight.

✓ *Community and connection:* Sharing emotional experiences within a community or through spiritual practices can foster a sense of belonging and support, enhancing overall wellness.

5. Practical approaches to integrate emotions for wellness.

✓ *Mindfulness practices.* Encourage mindfulness meditation to foster emotional awareness and reduce stress.

✓ *Emotional journaling.* Promote journaling as a tool to reflect on emotional experiences and their impacts on mental and spiritual health.

✓ *Therapeutic support.* Utilise counselling or therapy to address emotional challenges, enhancing mental health and spiritual growth.

✓ *Community engagement.* Create support groups or community events focused on emotional sharing and spiritual practices to foster connection and understanding.

CONCLUSION

Based on our analysis, we can draw the following conclusions in this study:

- Emotions play a pivotal role in influencing both mental and spiritual health, affecting resilience, clarity, and overall well-being.
- By fostering emotional awareness and employing practical approaches, individuals can enhance their mental and spiritual wellness, leading to a more balanced and fulfilling life.
- The healthy lifestyle advantage of Vu emphasises a holistic approach to wellness that integrates physical, mental, and spiritual dimensions.

These findings reinforce the concept that physiological, emotional, and environmental

factors are tightly integrated and must be considered holistically in wellness, well-being and health research.

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Declarations of informed consent have been signed regarding the publication of survey data. ChatGPT is used for English grammar revision and translation.

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