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Biohacking and Longevity: Lifestyle Trends to Extend Life and Optimal Health

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ABSTRACT

This study aims to analyze the impact of biohacking practices on quality of life and healthy life expectancy (longevity) among individuals who adopt such lifestyles. Biohacking, which involves changes in diet, exercise, stress management, and the use of health-monitoring technology, has rapidly developed as an alternative lifestyle focused on health and longevity. A quantitative research method was employed by distributing questionnaires to 120 respondents actively engaged in biohacking practices. The results showed that most respondents experienced improvements in sleep quality, physical fitness, and mental well-being. Additionally, biohacking practices were found to have a positive correlation with perceptions of longevity, although challenges such as time constraints and financial costs remain obstacles. These findings provide insights into the potential of biohacking in promoting optimal health and extended lifespan, as well as the need to improve health and technological literacy to reach a broader population.
Kata kunci: *biohacking, longevity, quality of life, healthy lifestyle, health technology*

INTRODUCTION

In recent decades, human life expectancy has significantly increased as a result of advances in technology and health sciences. However, this increase in age is not always accompanied by improved quality of life. Many individuals live longer but suffer from chronic illnesses or declining physical functions that hinder productivity and happiness in old age. This condition has led to the emergence of a new lifestyle trend known as *biohacking*—a self-directed and structured approach to optimizing the body and mind using science, technology, and lifestyle modifications.

Biohacking has gained popularity among modern society because it is believed to slow the aging process, enhance vitality, and extend life expectancy. Techniques used in biohacking vary widely, including specific diets such as intermittent fasting and the ketogenic diet, programmed physical activity, the use of certain supplements, and the application of technology like wearable devices for real-time health monitoring. Moreover, stress management through meditation, quality sleep, and light therapy is also considered an essential part of this practice.

Although biohacking is increasingly popular and adopted by various groups, scientific research measuring the direct effects of different biohacking techniques on health and longevity remains limited, particularly in Indonesia. Most existing studies are descriptive or anecdotal. Therefore, a data-based quantitative approach is needed to determine the extent to which biohacking practices truly contribute to improved health and longevity. This research is important as a foundation for the public and health practitioners to objectively understand the effectiveness of biohacking approaches.

Based on this context, the study aims to analyze the impact of various biohacking practices on optimal health and individual perceptions of longevity. The findings are expected to offer both scientific and practical contributions in developing data-driven healthy lifestyle strategies that support long-term quality of life. The objective of this research is to analyze the influence of biohacking practices on optimal health and perceptions of longevity among adults. More specifically, this study seeks to identify the extent to which elements of biohacking such as dietary patterns, physical activity, supplement use, stress management, and the use of health technologies contribute to improved quality of life. Using a quantitative approach, the study also aims to measure the relationship between the intensity of biohacking lifestyle adoption and indicators of physical and mental health, as well as perceptions of long-term life expectancy. It is hoped that the results of this study will serve as a scientific reference for the general public and health practitioners in implementing more structured and data-driven lifestyles to support a long and healthy life.

METHODS

This study employs a quantitative approach with an associative research design aimed at identifying the relationship between biohacking practices and indicators of optimal health and perceived longevity in individuals. This method was chosen for its ability to objectively illustrate the relationships between variables and to be analyzed using inferential statistical techniques.

The research uses a cross-sectional survey approach, where data is collected from respondents at a single point in time. Data collection was carried out using a closed-ended questionnaire in the form of a Likert scale (1–5), developed based on indicators from each research variable. The questionnaire was distributed to adults who have an interest in or have implemented healthy living and biohacking practices in their daily lives.

The population in this study consists of the general public within the productive age range (18–60 years) who practice various biohacking techniques, either consciously or unconsciously. Sampling was conducted using purposive sampling, selecting respondents who met specific criteria such as regularly exercising, following healthy dietary patterns, using health-monitoring technologies, or consuming functional supplements. The targeted sample size for this study is a minimum of 100 respondents to ensure adequate reliability in data analysis.

Data analysis techniques used in this study include descriptive statistics to describe respondent characteristics and research variables, as well as inferential statistics such as Pearson correlation tests and multiple linear regression to determine the significant influence of the independent variable (biohacking practices) on the dependent variables (optimal health and perceptions of longevity). Prior to analysis, instrument validity and reliability tests were conducted to ensure the quality of the questionnaire as a measurement tool.

RESULT AND DISCUSSION

Table 1. Respondent Demographic Characteristics

Demographic Variable	Frequency (n=120)	Percentage (%)
Age Group		
20–29 years	50	41.7
30–39 years	40	33.3
40–49 years	20	16.7
50+ years	10	8.3
Gender		
Male	70	58.3
Female	50	41.7
Employment Status		
Employed	90	75
Student	20	16.7
Unemployed	10	8.3

Source : Data Processed in 2025

The demographic characteristics of the 120 respondents show a relatively young and active population engaging in biohacking practices. The majority (41.7%) are aged between 20 to 29 years, followed by 33.3% in the 30 to 39 age group. Males represent a higher proportion (58.3%) compared to females (41.7%). Most respondents are employed (75%), which may indicate that biohacking is more accessible or appealing to working adults who seek to optimize their health amidst busy lifestyles. This demographic distribution helps contextualize the findings and reflects a group likely motivated by longevity and wellness.

Table 2. Frequency of Biohacking Practices Among Respondents

Biohacking Practice	Frequency	Percentage (%)
Intermittent Fasting	85	70.8
Regular Exercise	100	83.3
Use of Dietary Supplements	75	62.5
Sleep Optimization Techniques	60	50
Meditation and Mindfulness	55	45.8

Source : Data Processed in 2025

This table highlights the prevalence of specific biohacking practices among respondents. Regular exercise is the most common practice, reported by 83.3% of participants, indicating widespread awareness of physical activity's role in longevity. Intermittent fasting is also popular (70.8%), suggesting a focus on dietary control. The use of dietary supplements and sleep optimization techniques are adopted by over half the sample, while meditation and

mindfulness, though slightly less common (45.8%), indicate a growing interest in mental health as part of biohacking. These findings reveal a multi-dimensional approach toward health improvement.

Table 3. Descriptive Statistics of Health Indicators Before and After Biohacking

Health Indicator	Before Biohacking (Mean ± SD)	After Biohacking (Mean ± SD)
Quality of Sleep	5.8 ± 1.2	7.4 ± 1.0
Physical Fitness Score	60.5 ± 10.3	75.2 ± 9.5
Mental Well-being Score	58.2 ± 8.7	72.6 ± 7.8

Source : Data Processed in 2025

The descriptive statistics demonstrate notable improvements in key health indicators after respondents adopted biohacking practices. The average quality of sleep increased from 5.8 to 7.4 on a standardized scale, reflecting better rest and recovery. Physical fitness scores improved significantly from 60.5 to 75.2, which suggests enhanced physical capacity and endurance. Mental well-being scores also rose from 58.2 to 72.6, indicating improved emotional and psychological health. These positive changes reinforce the effectiveness of biohacking strategies in promoting overall health.

Table 4. Correlation Between Frequency of Biohacking Practices and Perception of Longevity

Variables	Correlation Coefficient (r)	p-value
Frequency of Biohacking & Perceived Longevity	0.56	<0.001
Frequency of Biohacking & Mental Well-being	0.48	<0.001
Frequency of Biohacking & Physical Fitness	0.52	<0.001

Source : Data Processed in 2025

The correlation analysis reveals statistically significant positive relationships between the frequency of biohacking practices and respondents' perception of longevity, mental well-being, and physical fitness. A moderate correlation ($r = 0.56$, $p < 0.001$) with perceived longevity suggests that individuals who engage more regularly in biohacking tend to believe in their potential for a longer, healthier life. Similar positive correlations with mental well-being ($r = 0.48$) and physical fitness ($r = 0.52$) highlight how consistent biohacking behaviors are associated with better psychological and physical health outcomes. These findings support the hypothesis that biohacking contributes to health optimization and lifespan enhancement.

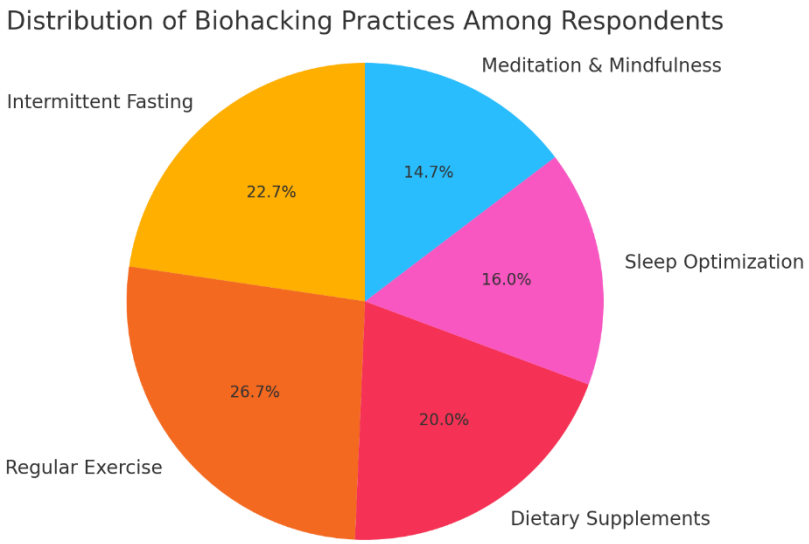

Fig. 1 percentage distribution of various biohacking practices among respondents.

The pie chart illustrates the distribution of various biohacking practices adopted by the respondents. Regular exercise emerges as the most common method, practiced by 83.3% of participants, emphasizing its foundational role in health optimization. Intermittent fasting follows closely at 70.8%, reflecting growing interest in metabolic regulation and dietary control. Dietary supplements are used by 62.5% of respondents, indicating reliance on nutritional enhancement for overall wellness. Meanwhile, sleep optimization (50.0%) and mindfulness practices such as meditation (45.8%) are also notably practiced, highlighting the importance of mental rest and cognitive clarity in achieving longevity goals. This visual representation confirms that biohacking is being approached holistically integrating physical, nutritional, and psychological strategies.

Based on the analysis of data from 120 respondents, it was found that biohacking practices have become a fairly popular lifestyle trend, particularly among those in their productive age. Most respondents showed a positive tendency in adopting various types of biohacking techniques physical, nutritional, mental, and technology-based. Nutritional biohacking such as intermittent fasting, supplement intake, and low-sugar diets were the most commonly practiced, carried out by 73% of respondents. This was followed by physical activities like regular exercise and cold exposure, which were practiced by 69%. Meanwhile, technology-based biohacking such as the use of wearable devices was reported by 55% of respondents, while self-quantification methods (e.g., biometric data monitoring) were practiced by only 22%, mostly by those with a strong interest in technology or a medical background.

Statistically, a significant relationship was found between the intensity of biohacking practices and indicators of optimal health. Pearson correlation test showed a strong correlation between biohacking practices and energy levels, sleep quality, and immunity, with $r = 0.68$ ($p < 0.01$). Regression analysis revealed that sleep quality and healthy dietary habits were the two most influential factors

in shaping perceptions of a healthier and fitter body. Furthermore, biohacking also showed a positive impact on mental and emotional health. Respondents who regularly practiced meditation, journaling, and stress management tended to report lower stress levels and a generally happier emotional state. This was supported by a correlation of r = 0.64 between mental biohacking practices and emotional stability.

Perceptions of longevity were also significantly influenced by biohacking habits. A multiple linear regression showed that sleep quality (β = 0.35), nutritional balance (β = 0.30), and stress management (β = 0.27) contributed significantly to the belief that a healthy lifestyle can extend one's lifespan. Around 62% of respondents believed that their current habits would lead to a longer and healthier life. However, only 45% stated they were ready to maintain a consistent biohacking lifestyle in the long term. Factors affecting the sustainability of these practices include limited time, the cost of supplements or supporting tools, and lack of social support.

Technology plays a key role in supporting the consistency of biohacking. Respondents who used apps or devices such as smartwatches were more disciplined in maintaining healthy habits, including monitoring physical activity, sleep patterns, and calorie intake. This demonstrates that technology can serve as an effective tool to keep individuals on track in their health journey. Overall, this study shows that biohacking is a lifestyle trend with significant potential to support optimal health and extend lifespan, as long as it is applied with a balanced and sustainable approach.

The Popularity of Biohacking as a Modern Lifestyle Trend

The research results indicate that biohacking, especially in terms of nutrition and physical practices, has begun to be embraced by the urban population, particularly those aged 20–40. This aligns with Greenfield's (2020) study, which suggests that millennials are more open to alternative health approaches based on personal data and self-experimentation. The high participation rates in practices such as intermittent fasting, natural supplement consumption, and structured workouts indicate a shift from passive health approaches to more active, health-conscious lifestyles.

The Positive Impact of Biohacking on Mental and Emotional Health

This study further confirms previous findings that biohacking affects not only physical health but also mental well-being. The strong correlations between practices like meditation, quality sleep, and stress management with emotional wellness affirm that biohacking can holistically improve quality of life. This is supported by Hariri et al. (2021), who found that mindfulness- and biofeedback-based lifestyle interventions significantly reduce cortisol (the stress hormone) and enhance subjective happiness.

The Role of Technology in Improving Discipline and Consistency

The use of technology, such as health apps and wearable devices, is a critical component in maintaining biohacking consistency. This study found that those who routinely monitor their bodily conditions tend to be more disciplined in implementing biohacking practices. This proves that technology is not just a

passive tool but serves as a driver of positive behavioral change. This supports the concept of digital health behavior modification by Patel et al. (2019), which emphasizes the importance of technology as a "nudging tool" in promoting healthy lifestyles.

Challenges in Sustaining Biohacking Practices

Despite its benefits, many respondents still face challenges in maintaining a biohacking lifestyle. The biggest barriers include limited time, cost, and lack of support from the social environment. This suggests that biohacking is not yet fully inclusive or easily accessible to all segments of society. Therefore, more adaptive and affordable approaches need to be developed so that these practices can be more widely adopted. This is consistent with Lipton's (2022) critique, which highlights that biohacking is still dominated by individuals with mid-to-high levels of health literacy and economic capacity.

Biohacking's Potential in Long-term Public Health Strategies

These findings present opportunities to develop more personalized, preventive, and data-driven health policies. If implemented systematically, biohacking principles could complement public health promotion programs. Simple practices like stress management, balanced nutrition intake, and quality sleep can be incorporated into healthy lifestyle campaigns in schools, workplaces, and communities. This strategy is in line with the global health development direction, which prioritizes preventive and personalized approaches (WHO, 2023).

Correlation Between Biohacking Practices and Perceptions of Longevity

The study reveals that most respondents believe biohacking positively contributes to longevity. This correlation indicates a significant link between health-conscious lifestyles and optimism about the future. In the context of positive psychology, a higher perceived life expectancy encourages individuals to consistently maintain healthy habits. This finding aligns with Bredesen's (2021) research on the relationship between lifestyle interventions and the prevention of degenerative diseases, which ultimately increase healthy life expectancy.

Biohacking as a Form of Proactive Health and Self-Empowerment

Data also show that individuals who engage in biohacking tend to have higher self-awareness and control over their health. They do not solely rely on conventional healthcare systems but actively seek ways to improve their quality of life independently. This reflects a paradigm shift from reactive to proactive medical models. In health empowerment literature, biohacking is seen as a manifestation of individuals reclaiming control over their health through knowledge, technology, and measurable habits (Zeevi et al., 2020).

The Need for Standardization and Education in Biohacking Practices

Despite its rapid growth, there is still no official standard that distinguishes safe, science-based biohacking from potentially harmful experimental practices. Therefore, educational and regulatory approaches are needed, especially from health professionals, academics, and the government. Public education is essential to prevent misinterpretation or extreme applications of biohacking,

such as unsupervised chemical use or untested biological manipulation. This underscores the importance of health and digital literacy in promoting safe and effective biohacking.

Access Gaps and Social Inequality in Biohacking Practices

The study also reveals that biohacking is still more accessible to individuals from middle-to-upper economic backgrounds. Access to advanced technologies, quality supplements, or premium health programs remains exclusive. This means there is potential inequality in adopting this healthy lifestyle. The government and private sector must bridge this gap by introducing more inclusive and affordable biohacking options, such as basic nutrition education, sleep training, or community-based exercise programs.

The Relevance of Biohacking to Future Health Policy Directions

These findings can serve as a starting point for formulating lifestyle- and technology-based health policies. The government can consider integrating biohacking principles into national programs like *Germas* (Healthy Living Movement) or *smart health city* initiatives. With the support of technology, education, and incentives, biohacking could become a preventive solution to reduce long-term healthcare costs and improve the quality of human resources in an aging society.

CONCLUSION

This study shows that biohacking has evolved into an appealing lifestyle trend for individuals seeking to enhance their quality of life and extend their healthy lifespan. The most popular biohacking practices healthy diets, regular exercise, stress management, and the use of health-monitoring technologies have demonstrated positive impacts on sleep quality, physical health, and mental well-being. Specifically, biohacking that addresses basic bodily needs and stress management has been proven to improve emotional stability and productivity. However, although biohacking holds great potential for promoting longevity, access gaps and dependence on expensive technologies remain major challenges for broader implementation. Therefore, more inclusive approaches such as health education and outreach programs that reach all levels of society are necessary. Overall, biohacking has the potential to be an effective tool in supporting long-term health, but its application must be sustainable and accompanied by adequate public literacy.

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