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The Impact of Architectural Workspaces Supported by Artificial Intelligence on Psychological Productivity

Yapay Zekâ ile Desteklenen Mimari Çalışma Mekânlarının Psikolojik Verimlilik Üzerindeki Etkisi

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ABSTRACT
This study comprehensively addresses the effects of artificial intelligence (AI)-enhanced architectural work environments on psychological productivity. Artificial intelligence allows workspaces to be dynamically optimized according to their physical and psychological needs and has positive effects on stress management, motivation, creativity and cognitive performance. Studies in this field reveal that AI-optimized work environments reduce individuals' stress levels and thus have a positive impact on focus, creativity and job satisfaction. AI's ability to adjust environmental factors such as lighting, noise management and thermal comfort according to individual needs enhances cognitive performance and increases the overall productivity of individuals. The flexibility offered by AI technology enables greater flexibility and efficiency in business processes by quickly adapting work environments to the immediate needs of users. In the future, it is envisaged that AI has the potential to personalize spaces with more advanced algorithms to respond not only to physical but also to emotional and mental needs. Experimentally testing the long-term effects, examining the applicability in different sectors and developing more sensitive AI systems according to the personal characteristics of individuals are among the important recommendations for future studies.
Keywords: Artificial Intelligence, Architectural Design, Workspacess, Psychological Productivity.

ÖZET
Bu çalışma, yapay zekâ (AI) ile geliştirilmiş mimari çalışma ortamlarının psikolojik üretkenlik üzerindeki etkilerini kapsamlı bir şekilde ele almaktadır. Yapay zekâ, çalışma alanlarının fiziksel ve psikolojik ihtiyaçlarına göre dinamik olarak optimize edilmesine olanak tanımakta ve stres yönetimi, motivasyon, yaratıcılık, bilişsel performans üzerinde olumlu etkiler yaratmaktadır. Bu alanda yapılan çalışmalar, yapay zekâ ile optimize edilmiş çalışma ortamlarının bireylerin stres düzeylerini azalttığını ve böylece odaklanma, yaratıcılık ve iş tatmini üzerinde olumlu bir etkiye sahip olduğunu ortaya koymaktadır. YZ'nin aydınlatma, gürültü yönetimi ve termal konfor gibi çevresel faktörleri bireysel ihtiyaçlara göre ayarlama yeteneği, bilişsel performansı geliştirir ve bireylerin genel üretkenliğini artırır. Yapay zekâ teknolojisinin sunduğu esneklik, çalışma ortamlarını kullanıcıların anlık ihtiyaçlarına hızlı bir şekilde uyarlayarak iş süreçlerinde daha fazla esneklik ve verimlilik sağlar. Gelecekte, YZ'nin yalnızca fiziksel değil, aynı zamanda duygusal ve zihinsel ihtiyaçlara da yanıt vermek için daha gelişmiş algoritmalarla alanları kişiselleştirme potansiyeline sahip olduğu öngörülmektedir. Uzun vadeli etkilerinin deneysel olarak test edilmesi, farklı sektörlerde uygulanabilirliğinin incelenmesi ve bireylerin kişisel özelliklerine göre daha hassas YZ sistemlerinin geliştirilmesi gelecek çalışmalar için önemli öneriler arasında yer almaktadır.
Anahtar Kelimeler: Yapay Zekâ, Mimari Tasarım, Çalışma Mekânları, Psikolojik Üretkenlik.

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INTRODUCTION

Artificial intelligence (AI) has become an important tool that has reshaped architectural design processes in recent years. While traditional architectural processes are limited by their structure based on long-term human labor and offering fixed solutions, artificial intelligence is used as a powerful tool to accelerate these processes and solve complex problems (Matter and Gado, 2024). AI offers optimized solutions by taking into account previously overlooked factors in design processes. For example, AI algorithms minimize the environmental impact of building designs by taking into account factors such as energy efficiency, use of natural light, and environmental sustainability (Garcia at all, 2023).

One of the most important contributions of AI in architectural design is its capacity to produce user-centered designs. By optimizing factors such as ergonomics, lighting, temperature and acoustic regulations in work environments, artificial intelligence can create spaces that adapt to the needs of individuals (Fukumura at all., 2021). This not only increases work efficiency, but also helps reduce stress and promote psychological well-being (Oladimeji at all., 2023). In addition, architectural designs supported by artificial intelligence offer new opportunities in terms of aesthetics and functionality, while creating positive effects on psychological well-being (Melikoğlu, 2024). The development of artificial intelligence in this field will contribute to the creation of more efficient, sustainable and user-oriented living spaces in the future (Almaz at all., 2024).

In the modern era, the impact of work environments on the psychological productivity of individuals has also been one of the ongoing research topics. The physical environment can have a direct impact on individuals' mood, motivation and performance. A well-designed work environment can reduce employees' stress levels and increase focus and job satisfaction (Shammout, 2022). For example, adequate levels of natural light in the work environment regulate individuals' biological rhythms and increase their energy levels, thus positively affecting cognitive performance (Shishegar and Boubekri, 2016).

Optimizing ergonomic arrangements also plays a critical role in enhancing psychological productivity. A comfortable workspace helps to prevent physical discomfort, while at the same time reducing distraction and prolonging individuals' focusing time (Oguns, 2023). Furthermore, the design of quiet workspaces can improve employee concentration and reduce mental fatigue by controlling the noise level (Haapakangas at all., 2018).

Psychological efficiency not only increases the productivity of individuals, but can also prevent negative consequences such as burnout syndrome and job dissatisfaction in the long run. A well-designed work environment supports the psychological well-being of employees by minimizing workplace stressors (Veitch, 2011). Therefore, the impact of work environments on psychological productivity is too important to ignore.

Traditional architectural designs often fail to respond to the changing needs of users with their fixed and static structures. Since the design of work environments is often built on fixed arrangements determined at the beginning, it cannot respond to the changing needs of individuals over time. These static designs cannot contribute to the solution of physical and psychological problems that individuals may encounter in the workplace in the long term (Alsibaai and Özcan, 2022). Especially in working environments, more flexible and dynamic solutions are needed as the needs of individuals change over time. Fixed space arrangements can negatively affect the productivity of individuals, leading to job dissatisfaction and increased stress levels (Ray and Pana-Cryan, 2021).

Dynamic and personalized architectural designs supported by artificial intelligence (AI) offer a great opportunity to solve this situation. By analyzing users' immediate needs, AI enables work environments to be continuously optimized. For example, an AI-equipped workspace can adjust lighting according to users' biological rhythms, optimize temperature levels according to personal preferences, and increase individuals' focus time by keeping noise levels under control (Avarez-Garcia, at all., 2024). Such dynamic arrangements can improve workplace performance by adapting to the changing needs of individuals.

In terms of psychological efficiency, spaces designed with artificial intelligence have a high potential to reduce individuals' stress levels and increase their motivation. Research shows that in environments with high stress levels, employee productivity decreases and turnover rates increase in the long term (Saleh and Shahidan, 2023). Spaces optimized with artificial intelligence minimize these stress factors and enable employees to work in a more comfortable environment. In addition, the elements that increase motivation can be personalized according to the needs of individuals thanks to artificial intelligence. For example, ergonomic furniture supported by artificial intelligence increases the physical comfort of employees by providing comfortable and long-lasting workspaces, thus supporting their psychological well-being (Rožman at all., 2023). As a result, dynamic and personalized work environments designed with artificial intelligence have the potential to significantly increase psychological productivity by reducing stress levels while increasing individuals' motivation. Therefore, moving away from traditional fixed designs, flexible

solutions supported by artificial intelligence should become an important element of architectural designs in the future.

The findings of this study will provide important insights into how workspaces can be made more efficient, user-friendly and psychologically supportive in the future. The contribution of AI-supported architectural designs to the mental health of individuals is critical for creating more sustainable and motivating environments in workplaces. Artificial intelligence can play an important role not only on functionality and aesthetics in design processes, but also on the mental and emotional well-being of individuals. At this intersection of architecture and psychological health, this study will make an important contribution in both academic and practical fields by revealing the future potential of artificial intelligence.

ARTIFICIAL INTELLIGENCE AND PSYCHOLOGICAL PRODUCTIVITY: THEORETICAL FRAMEWORK

Current research on the use of artificial intelligence (AI) in work environments reveals its potential to increase work efficiency and optimize employee satisfaction. Integrating AI-enabled systems into business processes reduces the repetitive and monotonous workload on employees, allowing them to spend more time on creativity and innovation. These systems also make significant contributions in areas such as monitoring individual performance in work environments, improving collaboration processes, and providing personalized support for employees. In particular, it is stated that AI-based feedback mechanisms support the psychological well-being of employees and positively affect their productivity (Babu at all., 2024).

In addition, the use of AI in workplaces should be designed without ignoring the emotional needs of employees. In particular, the implementation of artificial intelligence systems in harmony with human values has a positive effect on employees' psychological productivity levels (Farhan, 2023). Studies emphasize that employees need support during the adaptation process of artificial intelligence and that they can use artificial intelligence technologies more efficiently with an effective training program (Morandini at all., 2023). In this context, the integration of artificial intelligence into business processes both increases employees' job satisfaction and supports psychological well-being in the workplace.

- The Concept of Psychological Productivity: Psychological productivity refers to individuals' psychological well-being and their ability to use their cognitive and emotional capacities at the highest level in the work environment. This concept is directly related to optimizing individuals' work performance, managing work stress,

increasing motivation, and improving cognitive performance (Vo at all., 2022). Employees' psychological productivity can lead to significant changes in job performance depending on their stress management skills. For example, employees with high workload may exhibit higher psychological productivity when they are successful in stress management (Akintunde-Adayi at all., 2023).

- Stress Management and Productivity Relationship: Stress is one of the most important factors that directly affect psychological productivity. While stressors in the work environment can negatively affect individuals' performance, effective stress management strategies can increase productivity (Jamil at all., 2023). It has been reported that individuals working under high stress cannot use their cognitive resources efficiently and experience distraction and loss of motivation. At this point, the use of artificial intelligence-based stress monitoring and management systems can increase the psychological productivity of individuals by reducing their stress levels (Babu et al., 2024).
- Motivation and Psychological Productivity: Motivation plays a decisive role in psychological productivity. In particular, individuals with high intrinsic motivation are more productive at work than individuals with low motivation (Uka and Prendi, 2021). The ability of artificial intelligence to provide personalized feedback in the workplace increases the motivation of individuals and thus positively affects their psychological productivity. Moreover, since motivated individuals have higher stress resilience, their work productivity and overall performance levels increase (Luhana at all., 2023).
- Cognitive Performance and AI-Assisted Productivity: Cognitive performance is related to an individual's ability to use their mental capacity effectively and is an important component of psychological productivity. In the work environment, AI-enabled systems reduce the cognitive load of employees, accelerate their decision-making processes and increase their problem-solving abilities (Gandhi at all., 2023). For example, AI systems automate repetitive tasks, allowing employees to focus on more creative and cognitively challenging tasks (Morandini at all., 2023). This increases individuals' cognitive productivity and supports their psychological well-being.

THE ROLE OF WORK ENVIRONMENTS ON PSYCHOLOGICAL HEALTH

Work environments are among the important factors that affect individuals' psychological well-being as well as their physical health. These environments include many

different elements, from ergonomic arrangements to lighting, sound and thermal conditions. The layout and characteristics of workspaces can directly affect individuals' stress levels, motivation, ability to focus and overall psychological health. Improving elements such as ergonomic designs, appropriate lighting, noise management and thermal comfort can increase employees' job performance and satisfaction, while protecting their mental health in the long run.

- Ergonomic Arrangements: Ergonomics is defined as the optimization of designs to maximize the physical comfort and functionality of users in work environments. Research has shown that workspaces without appropriate ergonomic conditions cause employees to experience physical discomfort and as a result, productivity decreases (Koirala and Nepal, 2022). Poorly designed furniture and inappropriate work surfaces, especially for individuals who work sitting for long periods of time, can cause discomfort such as back and neck pain, which can increase stress levels and lead to general job dissatisfaction. Ergonomic furniture and adjustable work surfaces both provide physical comfort and positively affect individuals' cognitive performance by increasing focus (Terek at all, 2013).
- Lighting: Natural and artificial lighting plays an important role in work environments and directly affects individuals' biological rhythms and psychological states. Inadequate or excessively bright lighting can cause eye strain, headaches and increased stress levels over time (Katabaro and Yan, 2019). Research shows that exposure to natural light increases individuals' energy levels, improves mood and reduces symptoms of depression (Wang at all., 2023). Therefore, optimizing natural light sources in work environments is critical for employees' mental health. In addition, carefully regulating the color temperature and brightness of artificial lighting can improve workers' attention levels and cognitive performance (Küller at all., 2006).
- Sound and Noise Management: Noise is an often overlooked stressor in work environments. Constant background noise or sudden loud noises can negatively impact productivity by making it difficult for individuals to focus (Jafari at all., 2019). Noise pollution not only prevents individuals from focusing, but also increases their stress levels, negatively affecting their psychological well-being. High noise levels, especially in open office arrangements, make it difficult for employees to concentrate and reduce job satisfaction (Jahncke at all., 2011). Controlling noise levels and optimizing acoustic arrangements can create a more productive and calm atmosphere

in work environments. Making such arrangements using sound insulation and noise-canceling materials plays a major role in protecting the mental health of employees.

- The Holistic Impact of Work Environments on Psychological Wellbeing: The combination of all these elements constitutes the holistic impact of work environments on individuals' psychological well-being. A well-designed, ergonomic, quiet and thermally comfortable work environment supports employees' mental health and prevents negative consequences such as burnout syndrome in the long term (Colenberg at all., 2019). On the other hand, poorly designed and uncomfortable work environments increase stress levels and negatively affect turnover rates and productivity. Therefore, designing work environments to positively support individuals' psychological health increases not only individual productivity but also organizational success.

Psychological productivity is a multidimensional concept that affects both the individual performance of employees and the overall level of productivity in the workplace. Numerous studies have shown that factors such as stress reduction, motivation enhancement, focus and cognitive performance interact with each other and directly affect psychological productivity.

- Stress Reduction and Psychological Productivity: Stress management is a critical factor in increasing psychological productivity. Research shows that high levels of stress in the work environment negatively affect employees' ability to focus, leading to decreases in cognitive performance (Lukasik at all., 2019). However, stress-reducing interventions have been reported to help employees utilize their cognitive resources more effectively by providing more focus. AI-supported stress management tools monitor employees' individual stress levels and provide instant feedback and solutions, which increases psychological productivity in the workplace (Al-Atawi et al., 2023).
- Motivation Enhancement and Psychological Productivity: The impact of motivation on psychological productivity is particularly evident in employees with high intrinsic motivation. According to the Self-Determination Theory developed by Deci and Ryan (1985), when individuals are intrinsically motivated, they exhibit higher productivity and commitment in work processes. Studies show that artificial intelligence-based personalized feedback systems in the work environment increase the motivation of employees and increase their interest in their work and performance (Li et al., 2021).

This suggests that motivation supports not only individual performance but also psychological well-being.

- The Relationship between Focus and Cognitive Performance: Cognitive performance is directly related to individuals' capacity to fulfill challenging tasks and their effectiveness in decision-making processes. Focus is at the center of these processes and is considered to be a key factor affecting productivity in the work environment (Layer et al., 2009). Research has shown that the use of AI-supported tools in the work environment increases the focusing time of employees, which positively affects cognitive performance (Babu et al., 2024). The fact that AI alleviates the routine workload allows employees to focus on more complex and creative tasks, which increases cognitive performance and overall productivity.

Studies have confirmed that psychological productivity is closely related to key factors such as stress management, motivation, focus and cognitive performance. The integration of AI technologies in the workplace plays an important role in increasing individuals' work productivity by optimizing these factors. Reducing stress, increasing motivation and balancing cognitive load not only makes employees more productive, but also increases job satisfaction and overall psychological well-being

CHARACTERISTICS OF ARCHITECTURAL WORKSPACES SUPPORTED BY ARTIFICIAL INTELLIGENCE

Architectural workspaces powered by artificial intelligence (AI) offer personalized environments that can be dynamically adapted to the physical and psychological needs of individuals. In such spaces, various environmental factors are continuously monitored and adjusted by integrating AI technology to increase employee productivity and optimize comfort levels. This personalization offered by AI directly contributes to the psychological well-being as well as the physical needs of individuals in the work environment.

Personalized Spaces and Artificial Intelligence Integration

In AI-enabled workspaces, it is possible to personalize the environment according to each individual's preferences. For example, AI systems can automatically optimize light levels, temperature and volume control in workspaces based on employees' daily habits and preferred environmental conditions (Fukumura et al, 2021). In this way, each individual can create their own personal environment to ensure maximum comfort and focus. In particular, AI-based lighting systems can regulate light intensity throughout the day by tracking the user's biological rhythm. When workers require different light levels at certain times of the day, these

systems can make appropriate adjustments to increase their capacity to focus (Pereira et al., 2022).

- Temperature and Ventilation Systems: AI can also manage temperature and ventilation systems in a personalized way. By learning each user's ideal temperature preferences, systems continuously optimize the temperature and humidity levels of the environment to support individuals' physical and psychological productivity (Ghahramani et al., 2020). By measuring the physiological responses of individuals during work (e.g., sweating or skin temperature changes), AI can adjust the ambient temperature based on this data. This provides both energy efficiency and increases the comfort level of workers.
- Sound Control and Noise Management: Another important feature is the sound control and noise management systems integrated with artificial intelligence. In particular, employees' ability to focus in open office spaces or environments with high noise levels can be significantly affected. AI-supported noise control systems can automatically adjust the sound level in the workspace, taking individual preferences into account (Madahana et al., 2024). Some systems provide appropriate background sounds or white noise to support users' focus, while others actively block out distracting sounds.
- Contribution to Psychological and Physical Well-being: These AI-supported personalized work environments are designed to support individuals' physical and psychological well-being. For example, personalized lighting and temperature conditions for individuals can enhance their cognitive performance while reducing stress levels (Fukumura at all., 2021). Additionally, effective noise management in the workspace positively contributes to job satisfaction by improving focus and overall productivity. AI continuously monitors and adjusts these spaces according to individuals' needs, making work environments dynamic and highly efficient.

Dynamic and Flexible Spacess: AI’s Abilityto Adjust Spaces Based on Usage Habits

AI-supported spaces offer flexible work environments that can be dynamically reconfigured according to the usage habits of individuals and groups. These spaces optimize the user experience by adjusting environmental elements to different modes of use, such as meetings, focus, or relaxation. AI’s capability to meet users’ real-time needs aims to enhance both physical and psychological productivity.

- Adjusting AI-Supported Spaces Based on Usage Habits: AI analyzes how users utilize the space and facilitates its reorganization according to specific functions. For example, in an office setting, when switching to meeting mode, AI can create a suitable environment for the meeting by dimming the lights, increasing air circulation, and activating noise-canceling technologies (Fukumura at all., 2021). Additionally, physical elements such as desks can be adjusted with automated mechanisms compatible with AI systems to create a layout that fits the meeting format. This dynamic system allows for rapid changes to the environment without disrupting the workflow, resulting in increased productivity.
- Focus Mode: Focus mode is another use case where AI optimizes environmental elements to help individuals work more efficiently and enter deep thinking processes. In this mode, AI adjusts the lighting, noise level, and airflow to minimize all elements that might distract the user (Ogundiran et al, 2024). For example, when focus mode is activated, AI can deploy noise-canceling systems to reduce distracting sounds, slightly dim the light based on personal preferences, or allow more natural light to enter. Additionally, other environmental factors like temperature can be automatically adjusted to personal comfort levels. Such an environment helps workers maintain deep focus for longer periods.
- Rest Mode: AI-supported spaces can also adjust the environment during short breaks or moments of rest. When rest mode is activated, AI softens the lighting, sets the temperature and air quality to ideal levels, and offers suitable background sounds or light music to help reduce stress (Leonidis et al, 2021). These dynamic adjustments contribute to both the psychological and physical renewal of workers, enhancing their overall job performance in the long term. Rest mode is not only effective for individual use but also provides a solution in social spaces designed for relaxation.
- Meeting and Collaboration Modes: One of the most notable applications of AI is its ability to provide flexibility for meeting and collaboration modes. In this mode, the space is reconfigured to best suit teamwork and collaboration. For example, in meeting mode, AI can adjust the lighting based on the number of participants and the type of activity, activate projection or screen technologies, and manage sound systems to ensure optimal acoustics for the meeting (Russa and Lax, 2022). Additionally, in collaboration mode, furniture can be automatically reconfigured to provide flexibility that enhances group interactions. Such dynamic environments allow individuals and teams to work more efficiently, fostering creative thinking.

- AI-Enabled Continuously Learning Spaces: These dynamic and flexible AI-supported spaces have the capability to continuously learn and adapt to users' preferences. Users' habits are updated based on their preferences, making the optimization of the environment increasingly effective over time (Pesovski et al., 2024). Through this learning ability, AI can anticipate individual needs for future use cases and quickly make appropriate adjustments. These dynamic and flexible workspaces, therefore, offer an environment that continuously adapts to the physical and psychological needs of workers, supporting their productivity.

AI-SUPPORTED STRATEGIES FOR OPTIMIZING COGNITIVE PERFORMANCE AND PSYCHOLOGICAL WELL-BEING IN WORKSPACES

AI-supported designs provide solutions aimed at reducing mental fatigue and enhancing employees' cognitive performance. AI optimizes environmental factors such as natural light usage, noise-reducing designs, and the integration of natural elements, supporting individuals' physical and mental health. These intelligent spaces are designed to minimize mental fatigue while increasing creativity and focus capacity.

- Natural Light Usage and Reducing Mental Fatigue: Natural light is one of the most important factors affecting employees' cognitive performance. AI-supported spaces can use daylight optimally to balance employees' biological rhythms and moods. Research shows that individuals working in spaces with natural light experience less mental fatigue and have a higher focus capacity (Porras Álvarez, 2020). AI can analyze external conditions and dynamically adjust indoor lighting throughout the day, providing users with more suitable visual comfort. Especially, aligning artificial lighting with the biological clock can prevent cognitive exhaustion during long work periods and minimize distractions.
- Noise-Reducing Designs and Acoustic Optimization: Noise is a significant factor that negatively impacts employees' cognitive performance. In particular, in open office environments or spaces with high noise levels, employees' ability to focus may weaken, and mental fatigue may increase (Sander et al., 2021). AI-supported noise control systems can dynamically adjust the environment by sensing ambient sounds based on individual sound needs. Noise-canceling technologies help isolate individuals from auditory stimuli, thereby supporting focus processes. Additionally, AI can optimize the placement of acoustic panels in such spaces to prevent echoing

and improve overall work productivity. This reduces mental strain, allowing employees to work efficiently for longer periods without feeling fatigued.

- Cognitive Renewal Through the Integration of Natural Elements: The integration of natural elements (such as plants, water features, and natural materials) is another strategy to reduce mental fatigue in work environments. AI-supported spaces use biophilic design principles to support users' cognitive renewal processes. Research shows that the integration of natural elements into indoor spaces reduces individuals' stress levels and promotes faster mental recovery (Jha and Behera, 2022). AI can manage the placement and maintenance of these natural elements, helping users feel more relaxed and energized. For example, AI systems can optimize areas with plants to improve indoor air quality while also enhancing employees' aesthetic satisfaction.
- Optimization Based on Personal Needs with AI: Artificial intelligence can analyze individuals' personal needs and optimize these elements accordingly. Dynamically adjusting spaces based on users' biological rhythms, attention levels, and psychological states minimizes mental fatigue. For instance, AI can increase natural light levels to enhance productivity at certain times of the day, reduce noise, or direct users to areas where natural elements are more visible during moments of rest (Lee et al., 2021). In this way, spaces transform into environments that are not only functional but also support psychological well-being and cognitive performance.

AI-SUPPORTED STRESS MANAGEMENT AND COGNITIVE ENHANCEMENT STRATEGIES IN WORKSPACES

Artificial intelligence can detect individuals' stress levels through various biometric and behavioral indicators and dynamically adjust environmental factors during stressful moments. AI systems equipped with technologies such as facial recognition, heart rate sensors, or cameras monitoring posture and movement can identify whether an individual is under stress (Li and Liu, 2020). For example, when signs of high stress are detected, AI can reduce the light level, adjust the temperature, or activate acoustic panels to lower noise in the work environment. These interventions help individuals relax and mentally recover, thereby enhancing work spaces. Noise during stressful moments is a factor that negatively impacts employees' focus and productivity. AI-supported workspaces can sense this and control the sound level of the environment, activating noise reduction when needed (Jahncke at all., 2011). For instance, when the noise level is high or signs of high stress are detected in an

individual, the AI system can automatically lower the sound in the room. It can achieve this by activating noise-canceling technologies or providing natural sounds or white noise in the environment. A quiet environment reduces mental fatigue and balances stress levels, leading to improved psychological productivity.

Lighting plays a significant role in stress management. AI-supported workspaces can create a calming effect by altering lighting conditions when an individual's stress levels rise (Mostafavi et al., 2024). Instead of harsh, direct lighting, AI-powered systems can illuminate the environment in a soothing way, improving the mood of employees. For example, AI can adjust light intensity according to different times of the day using natural light simulations or diffuse soft-toned lighting to support mental relaxation. The correct use of lighting during stressful moments helps individuals relax, allowing them to continue work processes more positively (Menardo et al., 2022).

AI can optimize not only work-focused spaces but also relaxation areas for stress management. To ensure employees' mental and physical rejuvenation during short breaks, AI dynamically adjusts these areas to contribute to more efficient rest. In relaxation areas, AI can provide soft music, natural sounds, or calming visuals based on individuals' stress levels (Picking and Cunningham, 2011). Additionally, AI optimizes the temperature and airflow in the environment, helping employees relax during short breaks. These dynamic interventions reduce stress and enhance psychological productivity.
AI can meet individuals' stress management needs in a personalized manner. Based on users' past data and biometric information, AI systems develop the most suitable stress management strategies for each individual (Kargarandehkordi et al., 2024). For example, if a user experiences stress at specific times of the day, AI can anticipate these situations and optimize silence, lighting, and airflow in the environment as stress-preventive factors. Such personalized approaches help employees feel more at ease and support more sustainable job performance in the long term.

Motivation and Creaitivity: AI's Ability to Optimize Elements That Enhance Individuals Motivation

AI-supported workspaces have the ability to dynamically optimize environmental elements to increase individuals' motivation and foster creativity. Elements such as color, shape, and light are particularly important factors that directly affect individuals' mood, motivation, and creativity. AI can adjust these elements according to individuals' personal preferences and needs, making the work environment more motivating and creative.

The effect of colors on individuals' psychological states has long been known. Research shows that certain color tones have a strong impact on mood and motivation (Wright., 2009). For instance, shades of blue and green are known to promote creativity and calmness, while warm colors like red and orange are believed to increase energy and attention levels. AI-supported spaces can dynamically change these color palettes depending on the user's mood and the type of work. When a user is working on a project requiring creativity, AI can fill the space with colors that stimulate creative thinking; similarly, during tasks that require focus, color combinations that enhance attention can be employed (Elfar and Dawood, 2023).

AI can also optimize spatial arrangements and shape elements to support employees' creativity. Organic, flowing forms and flexible workspaces that encourage creativity allow individuals to feel freer and develop innovative ideas. AI can dynamically adjust the arrangement of physical elements such as furniture and decorations to enhance creativity. For example, modular furniture and flexible office layouts can be reconfigured by AI according to the needs of employees, promoting collaboration and creative thinking processes (Farjami et al., 2014).

Light is another important environmental factor that directly affects both motivation and creativity. AI-supported lighting systems can boost motivation by adjusting light levels according to the user's biological clock and the nature of the task. Simulating natural light, in particular, helps maintain high energy levels, leading to greater productivity. Warmer and softer tones of light in creative projects can make individuals feel more relaxed and creative, while brighter and whiter light for tasks requiring focus can enhance attention levels (Lan et al., 2020). AI's ability to make these dynamic lighting adjustments enables employees to be more motivated and creative across different types of work.

Reducing Mental Fatigue: How AI Enhances Cognitive Performance by Making Montonous Work Environments Dynamic and Flexible

Artificial intelligence can enhance cognitive performance by transforming monotonous work environments into more dynamic and flexible spaces. Monotonous work environments can lead to mental fatigue, decreased motivation, and reduced productivity. AI plays a crucial role in reducing cognitive fatigue by dynamically transforming such environments.

AI continuously monitors the work environment and can dynamically adjust it according to individuals' needs. In monotonous work processes, AI can introduce small

changes to provide variety and help maintain high levels of attention and cognitive performance. For example, AI can change the light levels at different times of the day, optimize sound and airflow, or refresh the visual elements of the environment to keep individuals engaged (Su and Mokmin., 2024). These dynamic adjustments help individuals feel less fatigued during work and stay focused on their tasks.

To make monotonous work environments flexible and dynamic, AI can continuously optimize the arrangement and functionality of physical spaces. These systems, which change the layout and purpose of spaces based on employees' needs, allow individuals to transition easily between different work modes. For instance, when switching from a meeting to a focus mode, AI can reconfigure the arrangement of tables, seating, and other physical elements. This flexibility reduces the sense of monotony and prevents mental fatigue by creating a continuous perception of novelty.

AI can optimize environmental factors in the workspace to reduce cognitive load. Elements such as noise, excessive brightness, or poor air circulation can increase mental fatigue and lower performance. AI monitors these environmental factors and makes real-time adjustments to suit individuals' needs, making the workspace more comfortable. When noise levels are reduced or the environment becomes more comfortable, individuals' cognitive load decreases, allowing them to continue working more efficiently.

ERGONOMIC DESIGN OF AI-SUPPORTED SPACES

AI-supported spaces are built on ergonomic design principles to enhance individuals' physical comfort and productivity. Ergonomics ensures that workspaces are adapted to individuals' physiological and psychological needs, preventing long-term health issues and increasing work efficiency. AI enables these workspaces to dynamically adapt to ergonomic requirements, offering personalized solutions based on individual physical needs. One of AI's most significant contributions in this area is its ability to adjust work tools like desks, chairs, and equipment according to users' body measurements, posture, and movement patterns.

AI-supported ergonomic designs can make personalized adjustments based on individuals' physical characteristics and work habits to maximize physical comfort in work environments. AI can analyze employees' physical movements, posture, and body responses, allowing for automatic adjustments of desks, chairs, and other equipment (Donisi et al., 2022).

For instance, desk height can be automatically adjusted to support the ideal posture of the worker. Similarly, the tilt of the chair's backrest, lumbar support, or the height of the

armrests can be continuously optimized by AI according to the individual's sitting position. This minimizes the negative impact on the musculoskeletal system that may arise during work. Studies show that ergonomically optimized workspaces reduce physical discomfort in the workplace and increase productivity (Robertson et al., 2008).

AI can also offer adjustable standing desks to balance sitting and standing times, reducing the health risks associated with prolonged sitting. For example, when AI detects that the user has been sitting for an extended period, it can automatically adjust the desk to a standing position. This supports circulation and helps employees maintain higher energy levels, leading to more productive work. AI-supported ergonomic designs not only enhance individual physical comfort but also foster creativity and collaboration in the workplace. One of the key innovations of AI is its ability to provide flexible and reconfigurable workspaces with movable and modular environments, allowing users to quickly adapt to different work modes and team collaborations.

These spaces can respond dynamically to individuals' changing needs during work. For instance, during a meeting, AI can rearrange the layout of desks and chairs to create a more efficient group interaction environment. Similarly, when switching to an individual work mode, AI can reconfigure these elements to provide a more focused work environment (Morandini at all., 2023). This flexibility not only helps employees quickly adapt to their tasks but also facilitates the free flow of creative thinking processes.

Modular furniture and spaces, optimized by AI, allow users to easily shape their work environments according to their preferences. Physical freedom of movement is essential for fostering creativity, whether for individuals or teams. AI-supported movable furniture can create flexible layouts based on the user's needs, promoting more spontaneous collaborations. Such workspaces increase both physical and mental mobility by preventing employees from staying in the same position for extended periods. At the same time, they create more open, interactive spaces that encourage collaboration and teamwork (Rolfö, 2018).

DISCUSSION

The rapid advancement of artificial intelligence (AI) technologies is increasingly enhancing the potential to offer more sophisticated and personalized solutions in the design and management of architectural spaces. Today, AI not only optimizes workspaces based on individuals' physical needs but also manages factors such as stress, motivation, and creativity to enhance psychological productivity. However, future developments suggest that AI will

create more integrated and responsive spaces that can cater not only to physical parameters but also to individuals' emotional and mental needs more deeply.

With the development of AI algorithms, the personalization of spaces may reach more advanced levels. In the future, it will be possible for AI to make more precise adjustments based on individuals' personal data, biometric, and behavioral analyses. For instance, AI could instantly detect a user's mood, stress levels, and cognitive state and automatically optimize the environment accordingly. This would mean not only adjusting basic environmental factors like lighting, temperature, and noise but also adapting spatial layout and even color palettes according to the individual's psychological state (Khare et al., 2024). Moreover, as AI becomes more capable of learning in the future, spaces are expected to evolve into systems that can adapt themselves based on users' long-term behavior and needs. This will result in dynamic and flexible environments that require less intervention, automatically adjusting according to individuals' daily work rhythms.

The potential developments of AI in architectural space design are moving towards creating environments that not only meet physical needs but also respond to emotional and mental demands. Today, AI is quite effective in stress management and creating relaxing environments; however, in the future, systems that can respond to more complex emotional and mental states are expected to be developed. This evolution of AI could manifest in its ability to design spaces that are more sensitive to users' real-time emotional states (Huang et al., 2024). For example, during moments of emotional fatigue, AI-supported spaces could offer more personalized solutions to reduce stress and mental load. Spaces that optimize emotional and mental health could integrate elements like artistic features, natural elements, or sensory relaxation techniques to enhance the user's mental relaxation and motivation. Such environments will enable individuals to not only increase their productivity but also enjoy a healthier work experience.

In the future, the integration of AI with biophilic design principles may create spaces that connect more deeply with nature, balance individuals' moods, and support their overall well-being. Elements such as natural light, green plants, and water features could be adjusted in real-time by AI based on instant feedback. Additionally, with emotional feedback mechanisms, AI could continuously monitor individuals' mental health and use this data to create a more suitable environmental experience (Olawade et al, 2024).

These advanced spaces, which can respond to individuals' sensory needs, could be optimized to make more detailed adjustments based on users' personal work rhythms and

energy levels throughout the day. This would enable AI to contribute not only to individuals' productivity but also to their overall psychological well-being

CONCLUSION AND SUGGESTIONS

The contributions of AI-supported architectural workspaces to psychological productivity significantly enable individuals to have a healthier, more motivated, and productive experience in their professional lives. By optimizing environmental factors according to individuals' real-time physical and psychological needs, AI delivers positive outcomes in areas such as stress management, motivation, creativity, and cognitive performance. AI systems that create flexible and dynamic spaces, capable of responding to both individuals' physical comfort and emotional states, make work environments more efficient. This study has demonstrated the positive effects of AI on psychological factors such as ergonomics, stress management, creativity, and motivation, revealing the transformative potential of AI-supported spaces in the business world.

The dynamic and customizable nature of AI enhances individuals' adaptation to work environments and offers a significant advantage in terms of productivity. The dynamic adjustment of environmental conditions based on individuals' mental states not only increases productivity but also has positive effects on job satisfaction and overall psychological well-being. It is anticipated that with the evolving algorithms of AI, workspaces in the future will respond more sensitively to not only physical but also emotional and mental needs.

Although research on the psychological effects of AI-supported architectural spaces has yielded positive results, it is necessary to deepen and explore this field more extensively. In this regard, several recommendations for future research are as follows:

- **Experimental Testing of Long-Term Effects**: The long-term effects of AI-supported spaces on individuals need to be tested. While the short-term effects on productivity and psychological well-being are promising, it is essential to examine in more detail how long-term use of these spaces impacts individuals' work efficiency, mental health, and emotional balance. Such experimental studies could reveal AI's potential to provide sustainability and long-term improvements in work environments.
- **Exploring Applicability in Different Sectors**: Although AI-supported spaces have primarily been applied in office environments so far, their effects in other sectors have not yet been fully explored. Investigating the applicability and impacts of these spaces in different industries, such as healthcare, education, and manufacturing, could provide a broader understanding of how AI can transform the general working world. For

instance, studies could be conducted on AI's effects on stress management and healthcare personnel's work efficiency in hospitals or its potential to enhance students' motivation in educational environments.

- **Development of AI Systems Aligned with Personalization and Human Values**: Future research should focus on the development of algorithms that enable AI to offer more personalized solutions and ensure that these systems align with human values. Particularly with ethical and security concerns in mind, developing AI systems sensitive to individuals' emotional and mental states could result in more effective outcomes in enhancing psychological productivity.
- **Considering Individual Differences**: The effects of AI-supported spaces may vary according to individuals' personal characteristics and needs. Therefore, future studies should examine the experiences of different demographic groups (age, gender, culture, etc.) with AI-supported spaces, helping to develop more personalized and comprehensive solutions.

Research Statement

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