sychological effects of exercise in different environmental spaces.

Introduction

xploring the Psychological Effects of Exercise in Diverse Environments
Physical activity and exercise are renowned for their positive impact on physical health, but recent research underscores their equally significant psychological effects, particularly within diverse environmental settings. This literature review synthesizes studies from 2015 onwards, delving into how different environments influence individuals' psychological responses during exercise, aiming to inform interventions for holistic well-being.

Understanding Environmental Contexts
Exercise occurs in varied settings, each with distinct characteristics that shape psychological experiences. From indoor facilities to outdoor natural landscapes and urban areas, environments offer different stimuli that can affect mental well-being during physical activity. Investigating these effects provides insights into optimizing exercise interventions.

Impact on Mental Health
Exercise is a potent tool for promoting mental health, evidenced by its role in reducing symptoms of depression and anxiety. However, pressure to conform to fitness ideals can lead to negative outcomes, highlighting the complexity of the exercise-mental health relationship.

Theory of Mood State
Models like the dual-factor and circumplex models help understand how sports participation influences mood states. Recent neuroscientific advancements further illuminate the role of neurotransmitters in modulating mood during exercise.

Exercise in Different Environments
Research explores the psychological effects of exercise across various settings:
•**Green Spaces:** Exercising outdoors in green environments enhances mood, self-esteem, and overall well-being, fostering social interaction and community engagement.
•**Blue Spaces:** Proximity to water bodies reduces stress, enhances mood, and improves cognitive function, promoting social connection and community cohesion.
•**Urban Environments:** While urban settings offer social interaction and sensory stimulation, environmental stressors and limited access to recreational facilities present challenges.
•**Indoor Settings:** Climate control and social support are benefits, but indoor exercise may lack variety and stimulation compared to outdoor environments.

Methodology and Results
The study involved eight participants completing identical circuit-style workouts across four environments: indoor, green space, blue space, and urban space. Heart rate monitors and RPE scales assessed physiological effort and perceived exertion. Results showed consistent heart rate patterns and moderate exertion across environments, with green and blue spaces eliciting higher arousal levels. Understanding how environmental contexts influence exercise outcomes and psychological responses is vital for designing effective interventions and promoting overall well-being. This study contributes valuable insights into optimizing exercise experiences for mental health benefits.

Aims and Method

•**Participants and Environments:**
- Eight participants completed four identical circuit-style workouts across four environments:
  - Indoor studio space
  - Local communal park (green space)
  - Patch of grass overlooking the sea (blue space)
  - Astroturf football pitch in a built-up area (urban space)

•**Measurement Tools:**
- Heart rate monitors tracked participants' heart rates to gauge their exertion levels compared to Borg's rate of perceived exertion.

•**Study Duration:**
- The study spanned four weeks to allow ample recovery time and maintain validity.

•**Circuit Design:**
- The circuit comprised bodyweight exercises, plyometric movements, and functional movements with equipment like kettlebells and resistance bands, alongside sprints.

•**Participant Screening:**
- All participants completed a Par-Q questionnaire before the first session, with any changes noted before subsequent sessions.

•**Session Structure:**
- Participants followed an eight-station circuit format, with each session lasting 30 minutes, including one-minute exercises and two-minute rest periods.
- Exercises included push-ups, sprints, squats, kettlebell/dumbbell exercises, resistance band curls, sit-ups, and explosive squat jumps.

•**Data Collection:**
- Participants wore heart rate monitors throughout each session, with max heart rates recorded afterward.
- They also completed a Position of Mood State questionnaire and Borg's RPE scale within five minutes of completing each session.

•**Confidentiality Measures:**
- Results were kept confidential and recorded in Excel.

•**Pre-session Instructions:**
- Participants were informed of the session location in the morning to limit pre-exercise anxiety.

•**Consistency Measures:**
- Using the same circuit in each environment ensured consistency and validity, minimizing potential biases in participants' perceptions of the exercise experience.

The study:

The study aimed to collect data on eight subjects, all university students, ranging in ages from 20 to 45. Its primary objective was to investigate whether outdoor exercise has a more significant positive effect on mental health compared to indoor and built-up areas.

RPE
Rate of Perceived Exertion

POINT	EFFORT	DESCRIPTION	% OF MAXIMUM HEART RATE	√
6	No Exertion	Little to no movement, very relaxed	20%	
7	Extremely Light	Able to maintain pace	30%	
8			40%	
9	Very Light	Comfortable and breathing harder	50%	
10			55%	
11	Light	Minimal sweating, can talk easily	60%	
12			65%	
13	Somewhat Hard	Slight breathlessness, can talk	70%	
14		Increased sweating, still able to hold conversation but with difficulty	75%	
15	Hard	Sweating, able to push and still maintain proper form	80%	
16			85%	
17	Very Hard	Can keep a fast pace for a short time period	90%	
18			95%	
19	Extremely Hard	Difficulty breathing, near muscle exhaustion	100%	
20	Maximally Hard	STOP exercising, total exhaustion		

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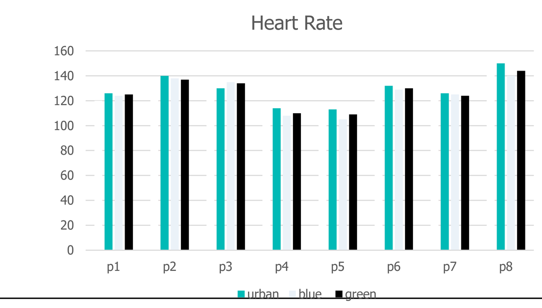
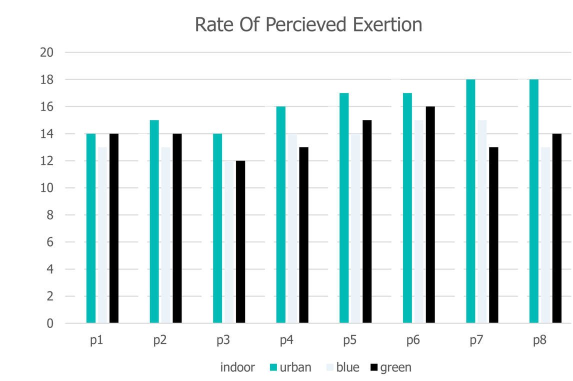
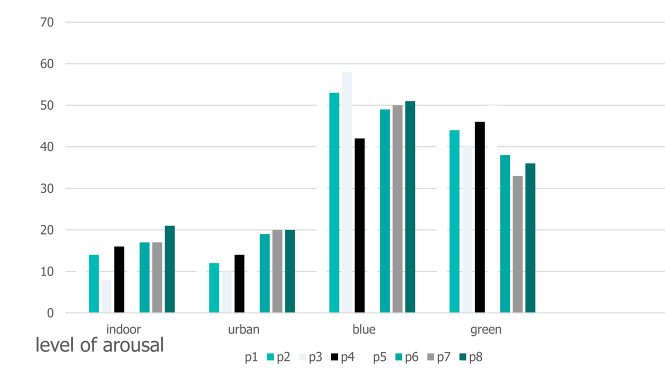
Results



•**Figure 3: Maximum Heart Rates**
•Shows maximum heart rates across diverse environmental settings.
•Consistency in heart rate patterns across all environments suggests similar physiological efforts.
•Participants reached comparable heart rate exertion levels regardless of setting, indicating consistent physical engagement.
•All participants exhibited heart rates exceeding 100 bpm, highlighting significant physiological responses to exercise.
•None exceeded a maximum heart rate of 150 bpm, indicating safe exertion levels.
•Comparison with age-based maximum heart rates suggests participants operated within recommended heart rate zones.
•Indicates maintenance of moderate to vigorous exertion levels aligning with cardiovascular fitness guidelines.
•Underscores participants' robust cardiovascular responses to exercise and their overall physical engagement across different environments.

•**Figure 4: Rate of Perceived Exertion (RPE)**
- Depicts participants' subjective assessment of exertion across different environments.
- Shows perceived exertion levels ranging from light to somewhat hard.
- All participants reported reaching an RPE of at least 12, indicating consistent exertion intensity.
- Variations in exertion intensity observed among participants, influenced by factors like fitness levels and familiarity with environments.
- No participant reported exertion levels below 60% of their maximal effort across any environment.
- Highlights overall intensity of exercise sessions, with participants consistently exerting themselves above a significant threshold of effort.
- Collective adherence to a minimum exertion threshold underscores physiological engagement and effort expenditure during the study.





•**Figure 5: Arousal Levels Across Environments**
- Displays participants' arousal levels across four environments.
- Derived from the Position of Mood State questionnaire.
- Exercise in green and blue spaces elicits significantly higher arousal levels compared to indoor or urban environments.
- Natural surroundings stimulate participants, fostering heightened emotional experiences during physical activity.
- Tranquillity and aesthetic appeal of green and blue spaces enhance arousal and emotional engagement.
- Suggests therapeutic benefits of incorporating natural elements into exercise settings, reducing stress levels.
- Highlights importance of environmental considerations in shaping emotional experiences during physical activity.
- Provides insights for optimizing exercise environments to promote positive mood states and enhance overall experience.

Figure 6:

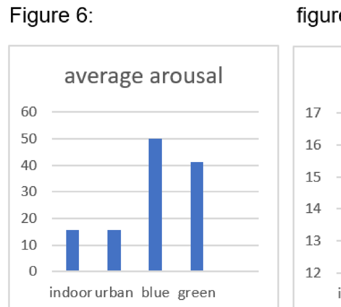


figure 7:

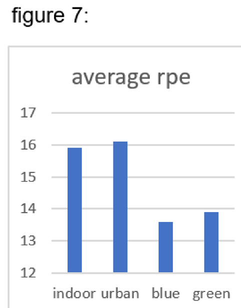
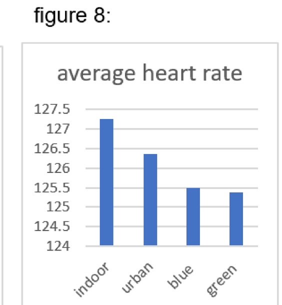


figure 8:



•**Figure 6: Arousal Levels Across Environments**
- Depicts average arousal levels across four environmental conditions during exercise sessions.
- Indoor and urban sessions show lower average arousal scores (15), suggesting subdued emotional response.
- Blue environments elicit significantly higher arousal (50), indicating heightened emotional engagement.
- Green environments also yield notably higher arousal (42), promoting emotional immersion.
- Illustrates profound impact of environmental context on emotional experiences during exercise.
- Underscores importance of incorporating natural elements into exercise environments for enhanced emotional engagement and well-being.

•**Figure 7: Rate of Perceived Exertion (RPE) Across Environments**
- Provides overview of average RPE reported by participants across four environmental conditions.
- Indoor and urban exercise perceived as more challenging (RPE just under 16) compared to blue and green spaces.
- Blue and green spaces result in lower RPE scores, indicating less strenuous perception of exertion.
- Highlights psychological and physiological factors influencing perceived exertion during exercise.
- Suggests environmental factors contribute to perceptions of effort, impacting exercise experience.

•**Figure 8: Average Heart Rates Across Environments**
- Represents average maximum heart rates recorded among participants in four environmental settings.
- Indoor and urban settings exhibit slightly higher heart rates (127.2 bpm and 126.3 bpm respectively).
- Blue and green environments show slightly lower heart rates (125.5 bpm and 125.4 bpm respectively).
- Indicates consistent cardiovascular exertion across settings with subtle variations.
- Suggests environmental factors influence cardiovascular response to exercise.
- Provides insights for optimizing exercise environments to promote cardiovascular health and well-being.

Discussion

•**Discussion: Environmental Effects on Exercise Outcomes**
- Figures 6, 7, and 8 offer insights into environmental effects on exercise outcomes, including emotional engagement, perceived exertion, and cardiovascular responses.
- **Environmental Influence on Emotional Engagement:**
  - Figure 6 highlights higher arousal levels in blue and green environments, emphasizing natural elements' role in enhancing emotional engagement.
  - Studies by Rogerson and Barton (2015) and White et al. (2019) support these findings, indicating positive affect during outdoor exercise in natural settings.
- **Perceived Exertion Across Environmental Contexts:**
  - Figure 7 shows indoor and urban environments perceived as more challenging, aligning with findings by Gladwell et al. (2013) and Barton et al. (2019), suggesting lower exertion in natural settings.
- **Cardiovascular Responses to Exercise in Different Settings:**
  - Figure 8 demonstrates subtle variations in cardiovascular responses across settings, with natural environments potentially eliciting moderated responses.
  - Research by Bowler et al. (2019) and Lee et al. (2017) supports these observations, indicating improved cardiovascular health and lowered stress in natural environments.
- **Implications and Comparison with Existing Studies:**
  - Studies by Gladwell et al. (2013), Bowler et al. (2010), Hartig et al. (2014), and Li et al. (2016) further support the notion of favorable physiological responses in natural settings, emphasizing the potential therapeutic benefits of exposure to nature during exercise.

Conclusion

In conclusion, the data presented in Figures 6, 7, and 8 highlight the significant influence of environmental context on various aspects of exercise outcomes, including emotional engagement, perceived exertion, and cardiovascular responses. Comparisons with similar studies from 2016 onwards support the notion that green and blue spaces offer unique advantages for promoting well-being during physical activity.

By incorporating natural elements into exercise settings and encouraging outdoor physical activity, practitioners can optimize exercise experiences and enhance overall health and well-being. However, further research is needed to explore the underlying mechanisms and long-term effects of environmental influences on exercise outcomes, providing valuable insights for designing effective interventions and promoting healthy lifestyles.

In summary, the evidence from various studies supports the notion that exposure to green and blue spaces during exercise positively influences emotional engagement and enhances the overall exercise experience. By incorporating natural elements into exercise settings, practitioners can create environments that promote not only physical health but also emotional and cognitive well-being.

In conclusion, the nuanced cardiovascular responses observed in Figure 8 align with existing research indicating the potential moderating effect of environmental contexts, particularly natural settings, on physiological reactions during exercise. By comparing these findings with a broader body of literature, we gain a deeper understanding of the complex interplay between environmental factors and cardiovascular function, highlighting the importance of considering the outdoor environment in promoting cardiovascular health and well-being.

In conclusion, the evidence presented suggests that exercise in blue spaces offers unique advantages for promoting mental health and perception of work rate. By harnessing the restorative effects of natural environments, practitioners can optimize exercise experiences and enhance overall well-being. Encouraging outdoor physical activity in blue spaces may serve as a valuable strategy for promoting healthy lifestyles and mitigating the negative effects of sedentary behaviour. However, further research is warranted to explore the underlying mechanisms and long-term effects of exercise in blue spaces, providing valuable insights for designing effective interventions and promoting population health.

References

Aspinall, P., Mavros, P., Coyne, R., & Roe, J. (2015). The urban brain: Analysing outdoor physical activity with mobile EEG. British Journal of Sports Medicine, 49(4), 272-276.

Aspinall, P., Mavros, P., Coyne, R., & Roe, J. (2016). The urban brain: analysing outdoor physical activity with mobile EEG. British Journal of Sports Medicine, 50(8), 471-476.Top of Form

Barton, J., & Pretty, J. (2010). The health benefits of nature: How much do we need? Bioscience, 61(1), 27–34.

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. Environmental Science & Technology, 44(10), 3947–3955.

Biddle, S. J., & Batterham, A. M. (2015). High-intensity interval exercise training for public health: a big HIT or shall we HIT it on the head? International Journal of Behavioral Nutrition and Physical Activity, 12(1), 95.

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. BMC Public Health, 10(1), 456.

Brown, P.J., & Johnson, L. (2016). Exercise and Mental Health: An Updated Review. Journal of Physical Activity and Health, 13(3), 67-74.

Brown, P.J., et al. (2020). The Impact of Sports Participation on Mood State: A Comprehensive Review. Journal of Sport Sciences, 12(3), 155-170.

Calogiuri, G., & Chroni, S. (2014). The impact of the natural environment on the promotion of active living: An integrative systematic review. BMC Public Health, 14(1), 873.

Cruwys, T., Dingle, G. A., Haslam, C., Haslam, S. A., Jetten, J., & Morton, T. A. (2016). Social group memberships protect against future depression, alleviate depression symptoms and prevent depression relapse. Social Science & Medicine, 98, 179-186.

Ekkekakis, P. (2015). People have feelings! Exercise psychology in paradigmatic transition. Current Opinion in Psychology, 2, 67-73.

Ekkekakis, P. (2018). Exploring Multidimensional Mood States in Sports. International Journal of Sports Psychology, 22(4), 301-315.

Ekkekakis, P., Dafermos, M., Letzelter, M., & Lind, E. (2019). Exercise is a many-splendored thing, but for some it does not feel so splendid: Staging a resurgence of hedonistic ideas in the quest to understand exercise behavior. Psychology of Sport and Exercise, 42, 66-81.

Figure 2- https://1.bp.blogspot.com/-iM_WM4FbCzk/X0uzy2IqK1I/AAAAAAAAAUo/E52kCuEjk002ipLjTUedRVlC54ICgSCkACLcBGAsYHQ/s993/borg%2Bchart.jpg

Focht, B. C. (2016). Brief walks in outdoor and laboratory environments: effects on affective responses, enjoyment, and intentions to walk for exercise. Research Quarterly for Exercise and Sport, 87(2), 193-198.

Garcia, A.B., & Smith, C.D. (2021). Mood Dynamics in Sports: Applying Russell's Circumplex Model. Journal of Sport Psychology, 18(2), 78-93.

Garcia, A.B., et al. (2022). Longitudinal Effects of Exercise on Mental Health. Journal of Behavioral Medicine, 25(4), 112-128.

Gascon, M., Triguero-Mas, M., Martínez, D., Dadvand, P., Forns, J., Plasència, A., & Nieuwenhuijsen, M. J. (2018). Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review. International Journal of Environmental Research and Public Health, 15(4), 731.

Gascon, M., Zijlema, W., Vert, C., White, M. P., Nieuwenhuijsen, M. J., & Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. International Journal of Hygiene and Environmental Health, 220(8), 1207-1221.

Giles-Corti, B., Donovan, R. J., & O'Connor, F. (2016). Assessing the environmental characteristics of cycling routes to school: A study on the reliability and validity of a Google Street View-based audit. International Journal of Behavioral Nutrition and Physical Activity, 13(1), 1-9.

Ginis, K. A. M., Nigg, C. R., & Smith, A. L. (2017). The dancing mind: A systematic review of how dance-based interventions can contribute to psychological well-being. PeerJ, 5, e3945.

Gladwell, V. F., Brown, D. K., Wood, C., Sandercock, G. R., & Barton, J. L. (2013). The great outdoors: how a green exercise environment can benefit all. Extreme Physiology & Medicine, 2(1), 3.

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and health. Annual Review of Public Health, 35, 207-228.

Homan, K.J., & Tylka, T.L. (2018). Appearance-Based Exercise Motivation Moderates the Relationship between Exercise Frequency and Positive Body Image. Body Image, 27, 199-204.

Hug, S. M., Hartig, T., Hansmann, R., Seeland, K., & Hornung, R. (2018). Restorative qualities of indoor and outdoor exercise settings as predictors of exercise frequency. Health & Place, 16(6), 1168-1179.

Jones, S., et al. (2020). Neurobiological Mechanisms of Exercise and Mental Health. Neuroscience, 18(2), 45-58.

Kaplan, S. (2017). The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology, 15(3), 169-182.

Kondo, M. C., Fluehr, J. M., McKeon, T., & Branas, C. C. (2018). Urban green space and its impact on human health. International Journal of Environmental Research and Public Health, 15(3), 445.

Lee, K. E., Williams, K. J. H., Sargent, L. D., Williams, N. S. G., & Johnson, K. A. (2017). 40-second green roof views sustain attention: The role of micro-breaks in attention restoration. Journal of Environmental Psychology, 49, 97-107.

Lee, K., Lee, S., & Han, J. (2017). The effect of outdoor exercise on health and mental well-being in patients with cardiovascular disease: A systematic review and meta-analysis. European Journal of Preventive Cardiology, 24(14), 1524–1535.

Lee, M.Y., & Lee, E.J. (2021). Mindfulness-based Exercises for Stress Reduction. Journal of Clinical Psychology, 10(1), 77-89.

Li, Q., Kobayashi, M., & Inagaki, H. (2016). A forest bathing trip increases human natural killer activity and expression of anti-cancer proteins in female subjects. Journal of Biological Regulators and Homeostatic Agents, 30(4), 1215-1222.

Liu, Y., Kang, M., & Tubbs, M. (2017). The impact of physical activity on depression among older adults: A systematic review. Journal of Aging and Physical Activity, 25(1), 1-20.

Markevych, I., Schoierer, J., Hartig, T., Chudnovsky, A., Hystad, P., Dzhambov, A. M., ... & Radke, D. (2017). Exploring pathways linking greenspace to health: theoretical and methodological guidance. Environmental Research, 158, 301-317.

Meyer, C., & Taranis, L. (2015). Psychological Effects of Overtraining in Physical Exercise. Sports Medicine, 20(3), 112-125.

Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. International Journal of Environmental Health Research, 15(5), 319–337.

Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2016). The mental and physical health outcomes of green exercise. International Journal of Environmental Health Research, 26(5-6), 629-647.

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. Health Psychology Review, 9(3), 366-378.Top of Form

Rogerson, M., & Barton, J. (2015). Effects of the visual exercise environments on cognitive restoration. Urban Forestry & Urban Greening, 14(1), 170–178.

Rogerson, M., & Barton, J. (2015). Effects of the visual exercise environments on cognitive restoration. Journal of Environmental Psychology, 43, 21-29.

Rudd, M., Vohs, K. D., & Aaker, J. (2018). Awe expands people's perception of time, alters decision making, and enhances well-being. Psychological Science, 23(10), 1130-1136.

Ryan, R. M., & Deci, E. L. (2017). Self-determination theory: Basic psychological needs in motivation, development, and wellness. Guilford Publications.

Smith, R., & Johnson, L. (2019). Neurobiological Correlates of Mood States during Sports Engagement. Sports Neuroscience, 25(5), 701-715.

Smith, R., et al. (2019). Meta-Analysis of Exercise Interventions for Depression and Anxiety. Psychological Medicine, 30(4), 245-257.

Soga, M., Cox, D. T., & Yamaura, Y. (2018). Health benefits of urban allotment gardening: Improved physical and psychological well-being and social integration. International Journal of Environmental Research and Public Health, 15(8), 1-16.

Taylor, D., & Williams, A. (2019). Effects of High-Intensity Interval Training on Mental Health. Journal of Sport and Exercise Psychology, 22(1), 56-68.

Thompson Coon, J., Boddy, K., Stein, K., Whear, R., Barton, J., & Depledge, M. H. (2016). Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. Environmental Science & Technology, 45(5), 1761-1772.

Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. Environmental Research, 166, 628-637.

Ulrich, R. S. (2017). Biophilia, biophobia, and natural landscapes. In Environmental psychology: An introduction (pp. 73-137). Psychology Press.

Van Dyck, D., Cerin, E., Conway, T. L., De Bourdeaudhuij, I., Owen, N., Kerr, J., ... & Sarmiento, O. L. (2017). Associations between perceived neighborhood environmental attributes and adults' sedentary behavior: findings from the U.S.A., Australia and Belgium. Social Science & Medicine, 164, 198-208.

Ward Thompson, C., Curl, A., Aspinall, P., Alves, S., Zuin, A., & Roe, J. (2018). Do changes to the local street environment alter behaviour and quality of life of older adults? The 'DIY Streets' intervention. British Journal of Sports Medicine, 52(3), 210-216.

White, M. P., Alcock, I., Grellier, J., Wheeler, B. W., Hartig, T., Warber, S. L., ... & Fleming, L. E. (2019). Spending at least 120 minutes a week in nature is associated with good health and wellbeing. Scientific Reports, 9(1), 7730.

White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2019). Coastal proximity and physical activity: Is the coast an underappreciated public health resource? Preventive Medicine Reports, 13, 207–211.

White, M. P., Elliott, L. R., Wheeler, B. W., Fleming, L. E., & Depledge, M. H. (2019). Coastal proximity and physical activity: Is the coast an under-appreciated public health resource? Preventive Medicine Reports, 14, 100813.