



BMJ Open Are yoga and physical activity determinants of quality of life in Polish adults? a cross-sectional study

Agnieszka Pluto-Pradzynska ,¹ Karolina Pluto-Pradzynska,^{1,2} Magdalena Frydrychowicz,¹ Malgorzata Lagiedo-Zelazowska,¹ Jakub Owoc,¹ Shamiram Benjamin,¹ Tsz Yuen Au ,¹ Krystyna Jaracz,³ Grzegorz Dworacki,¹ Jacek Wysocki,⁴ Jacek Wasik⁵

To cite: Pluto-Pradzynska A, Pluto-Pradzynska K, Frydrychowicz M, *et al.* Are yoga and physical activity determinants of quality of life in Polish adults? a cross-sectional study. *BMJ Open* 2022;**12**:e059658. doi:10.1136/bmjopen-2021-059658

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-059658>).

Received 29 November 2021
Accepted 25 August 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Agnieszka Pluto-Pradzynska; agapp@ump.edu.pl

ABSTRACT

Objectives Yoga is an ancient form of physical activity (PA) that encompasses meditation, stretching and breathing techniques. Although the benefits of PA and associated lifestyle interventions are clear, we here addressed the paucity of evidence regarding the specific relationship between yoga and quality of life (QOL) in adults in Poland. We hypothesised that participation in PA and yoga could result in a positive impact on QOL.

Design Cross-sectional, self-administered questionnaire-based survey. Both the quantitative and qualitative variables were statistically compared. Multivariate analyses were performed using linear regression. Results were determined based on age, sex and education level; a $p < 0.05$ was considered significant.

Setting Questionnaires were delivered to participants online, at high schools and universities, and in elderly communities in Poland.

Participants 714 Polish citizens aged over 18 participated in the study; there are no specific entry and exclusion criteria besides age.

Results Statistically significant differences ($p < 0.05$) were observed between the QOL of the physically active group (PAG) and non-PAG (N-PAG). Meanwhile, yoga practice was revealed to have a significant effect on QOL; QOL was found to be statistically higher ($p < 0.001$) in the PAG with yoga (PAG-Y) (4.29 ± 0.66) than in the N-PAG (3.83 ± 0.92) and PAG without yoga (4.07 ± 0.68).

Conclusions The study shows that both regular PA and yoga practices could improve QOL; however, PAG-Y produced higher QOL scores than PA of other types. This outcome may be explained by the impact of physiological and psychological aspects within yoga practice. These results suggest that this unique combination impacts health more positively than other kinds of PA alone.

INTRODUCTION

Regular physical activity (PA) is an important factor in physiological growth, the development and maintenance of the central nervous system, as well as in general health.¹ A myriad of well-respected organisations, healthcare providers and political establishments maintain recommendations of regular leisure and

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study is one of the first to evaluate how physical activity and yoga practice may affect quality of life of Polish citizens.
- ⇒ Using online questionnaires permitted increased diversity and inclusion of a greater number of participants.
- ⇒ It was a cross-sectional study; therefore, it cannot be definitively concluded that the relationship between yoga and quality of life was of a cause-and-effect nature.
- ⇒ This study was conducted on a voluntary response sample, which may have contributed to a potential inclusion bias of those self-selected only, omitting the rest of the population.
- ⇒ Some elderly participants were surveyed via traditional structured interviews due to lack of access to online surveys.

recreational PA for the sake of public health and as preventive medicine.² Additionally, published evidence supports the positive impact of a balanced diet and PA, associated with social education, in the prevention and treatment of disease.^{3,4}

Nevertheless, in 2018 insufficient PA levels were confirmed in global surveys.⁵ Additionally, the European Union reported that only about half of Europeans exercise or play sports, of which only 7% do it regularly, with the remaining 46% reporting that they never participate in PA. This report emphasised individual health benefits and a decrease in both social and economic costs achieved through PA implementation.⁶ In Poland, the government promotes increase of PA, in order to reduce deaths due to lifestyle-related diseases.⁷ Improving PA lifestyle efficiency can pay dividends in terms of both individual and public health.⁸ Previous studies confirmed better well-being due to lifestyle



enhancements like yoga intervention combined with physical training in an industry worker group.⁹

Lifestyle enhancement may include exercise, nutrition, behavioural changes and self-care, which involve all levels of collaborative medical education.⁴ This concept is ascribable to the ancient Greek physician and philosopher, Hippocrates of Kos (c. 460 BC to 370 BC) who proclaimed: 'Let food be medicine' and 'Exercise is medicine,' and was recognised as the first practitioner who prescribed exercise in treating diseases linked to obesity and sedentary living.¹⁰

The WHO defined quality of life (QOL) as 'an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns'.¹¹ Some studies on QOL, including those conducted in Poland,¹² have referred to the relationship between yoga and disease-related QOL,¹³ whereas others have discussed health-related QOL in cancer treatment and therapy,^{14 15} and in older adults.¹⁶ In most observations, higher QOL scores were observed for those engaging in all types of PA than in those who did not.

Yoga is an ancient form of PA brought to the West at the end of the XIXth century. Its practice encompasses meditation in conjunction with stretching and breathing techniques.¹⁷ In addition to straightening and elongating the body, yoga increases strength, flexibility and range of motion,¹ combining physical training with conscious breathing,¹⁸ while drawing attention to the practitioner's consciousness and psychological state.¹ Therefore, yoga provides not only physical benefits, but also mental health benefits,^{14 19} even reducing symptoms of anxiety and depression, positively affecting mood and reducing stress.^{14 20} Special types of yoga, such as laughter yoga, may benefit everyone, including patients with cancer.¹⁵ Yoga offers effective exercises to intensify cognitive and behavioural factors for learning, concentration and achievement, and can be used to mitigate the risk of burnout.^{15 21} A combination of yoga and aerobic exercise has been shown to reduce mental, physical and vascular stress in cardiovascular diseases.²² Therefore, both yoga and mindfulness may be significant factors for lifestyle change interventions.²³ Yoga also offers promise as a preventive health intervention,²⁴ in supplementation to the management of symptoms and conditions.

The system of yoga encompasses specific exercises, with results augmented by a skilled teacher.²⁵ It often involves holding positions for increasing amounts of time. It can be readily implemented in the workplace to reduce burnout symptoms and stress levels,²¹ and prevent pain back associated with prolonged sitting.²⁴ A special yogic type of breathing, known as pranayama,¹⁷ leads to the development of self-control and mindfulness.¹ Additionally, yoga, meditation and pranayama practice have been shown to increase the stability of telomeres by stimulating telomerase activity, which inhibits ageing processes and protects against certain diseases,²³ including cancer.¹⁷ Using tools of positive psychology like yoga practice

or even laughter therapy can stimulate the thinking processes and communication skills of individuals.¹⁵

In Poland, data on yoga among adults in different age groups, which could represent a wider cross-section of society, are lacking.²⁶ Although yoga has been practised in Poland for many years, it has never been widely accepted and many Polish citizens have never tried yoga at all; some scepticism likely stems from popular Catholic Church doctrine which frowns on the activity's ties to Jainism, Buddhism, Hinduism and other non-Christian faiths.²⁷

Even if not every book on yoga promotes Hindu gods, and not every yoga class has pagan statuary, some do, and this concern was voiced in the 'Letter to the bishops of the Catholic Church of some aspects of Christian meditation'.²⁸ The impact of religious beliefs was observed in the willingness to integrate complementary and alternative therapies into a treatment programme, too.^{29 30} Therefore, the positive impact of yoga on health may need to be recognised and promoted, regardless of religious affiliations.¹⁹ Thus, in this study, we sought to investigate the effects of yoga on QOL relative to the effects of PA without components of yoga.^{26 31}

METHODS

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

The survey was conducted in April, May and June of 2017.

Participants

This study included a sample (n=714) of Polish adults (≥ 18 years), composed of 46% men and 54% women. Respondents were recruited through Internet advertisements, at high schools and universities, and in elderly communities. The following groups were composed and compared with each other: control group (non-physically active group (N-PAG), n=72), PA group (PAG, n=642) and PA with yoga group (PAG-Y; n=151). There were differences between groups in sex, age and educational level.

Survey

QOL was evaluated using the WHO's standardised questionnaire (WHOQOL-BREF), which is a short-version questionnaire approved for use in many countries including Poland.^{16 32 33} It is dedicated to the study of the QOL of adults, with respect to individual perceptions.³⁴ The WHOQOL-BREF contains 26 items, 24 of which use a scale of 1–100 (min–max), pertaining to four domains of QOL that are incorporated into specified facets. These domains include the following: The Physical health domain (PHD-QOL) includes items on activities of daily living, dependence on medicinal substances and medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity; the psychological domain (PD-QOL) includes questions on body image

and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, thinking, learning, memory and concentration; the social domain (SD-QOL) addresses personal relationships, social support, and sexual activity; the environmental domain (ED-QOL) investigates financial resources, freedom, physical safety and security, health and social care (accessibility and quality), home environment, opportunities for acquiring new information and skills, participation in and opportunities for recreation/leisure activities, physical environment (pollution/noise/traffic/climate) and transport. Two items are examined separately, with a scale of 1–5 (min–max), and ask about an individual’s overall perception of QOL and health (HP).¹¹

The respondents were asked about participation in the listed PAs (swimming, long or intensive walking, cycling, jogging, riding, gym/fitness, tennis/squash/badminton, gardening, yoga and ‘others’). They were asked to select the frequency of participation in the activity from among the following: none; 1–3 hours per month; 1, 1–3 hours or >3 hours/week. Additionally, the period of yoga practice was matched in years: < 1, 1–3, 3–5, 5–10 or ≥10 years.

Statistical analysis

Qualitative variables were compared among the groups using the χ^2 test or the Fisher’s exact test where low expected frequencies appeared in the tables. Quantitative variables in the three groups were compared using the Kruskal-Wallis test. After detecting statistically significant differences, post hoc analysis was performed with Dunn’s test to identify statistically significant differences between groups. Multivariate analysis of the influence of a number of factors (age, sex and education) on the quantitative variables was performed using linear regression. The results are presented as regression model parameter values with a 95% CI. A significance level of 0.05 was adopted in the analysis, and all p values <0.05 were interpreted as showing significant relationships. The analysis

was performed using R V.4.1.0. (R Core Team, 2021. R Foundation for Statistical Computing, Vienna, Austria, <https://www.R-project.org/>).

RESULTS

Group constitution

The entire sample consisted of 714 participants. Twice as many women as men declared a non-physically active lifestyle, and nearly three times more women than men practised yoga (females 73.51%, males 26.49%). In the N-PAG, middle-aged adults (35–55-years-old) predominated (52.78%), whereas 36.11% were young adults (< 35 years). In the PAG, young adults predominated (50.71%), while middle-aged adults comprised one-third of this group (32.79%). In the PAG-Y prevailed middle-aged individuals (49.67%), as compared with young adults (39.07%), while 11.26% were older adults (>55 years). In terms of education level, the majority of each group were individuals with a university degree (table 1).

The mean QOL perception in the researched population was good (4.09 points on a 1–5 point scale; SD=0.7), as was the level of health perception (HP), (3.83 points on a 1–5 scale; SD=0.82). Across the domains, the highest mean level of QOL perception was in the PD-QOL, which was only 1.03 points higher than that of the PHD-QOL, while the SD-QOL had a mean value of 70.23. The lowest perception of QOL was observed in the ED-QOL (table 2).

Given the differences in the QOL between the observed groups, the results indicated that PA could be linked to an improved QOL. In all four domains of the WHOQOL - BREF, the QOL was statistically significantly higher (p<0.05) in both PA groups (PAG and PAG-Y) than in the N-PAG.

Yoga practice was an important predictor of QOL, which was significantly higher (p<0.001) in the PAG-Y

Table 1 Composition of the research groups

Parameters	Groups				P value
	N-PAG (n=72)	PAG (n=491)	PAG-Y (n=151)		
Sex	Females	47 (65.28%)	228 (46.44%)	111 (73.51%)	<0.001
	Males	25 (34.72%)	263 (53.56%)	40 (26.49%)	
Age	18–35 years	26 (36.11%)	249 (50.71%)	59 (39.07%)	<0.001
	36–55 years	38 (52.78%)	161 (32.79%)	75 (49.67%)	
	> 55 years	8 (11.11%)	81 (16.50%)	17 (11.26%)	
Education	Primary	1 (1.39%)	4 (0.81%)	1 (0.66%)	0.001
	Secondary	17 (23.61%)	149 (30.35%)	22 (14.57%)	
	Postsecondary	12 (16.67%)	93 (18.94%)	17 (11.26%)	
	University	34 (47.22%)	190 (38.70%)	89 (58.94%)	
	Postgraduate	8 (11.11%)	55 (11.20%)	22 (14.57%)	

P values were obtained by the χ^2 test or Fisher’s exact test.

N-PAG, non-physically active group; PAG, physically active group; PAG-Y, physically active group with yoga.

Table 2 Quality of life scores according to the WHOQOL-BREF domains

WHOQOL-BREF	N	Mean	±SD	Median	Min	Max	Q1	Q3
Physical domain	714	71.58	14.74	75	12	100	62	81
Psychological domain	714	72.61	14.07	75	0	100	69	81
Social domain	714	70.23	17.42	75	0	100	56	81
Environmental domain	714	65.24	13.65	62	19	100	56	75

Max, maximum; Min, minimum; N, number of participants; Q, quartile; QOL, quality of life; SD, standard deviation.

than in the N-PAG and PAG only. The same association was observed in three separate domains: PHD-QOL, PD-QOL and ED-QOL ($p < 0.001$). Similar results were obtained for HP ($p < 0.003$; [table 3](#), [figure 1](#)).

Linear regression

The multivariate linear regression model, adjusted for age, sex and education, showed that PA was a significant ($p < 0.05$), independent predictor of both QOL and HP. The perception of QOL in the PAG was on average 0.25 points higher than that in the N-PAG, with a regression parameter of 0.25. The regression parameter for PAG-Y was 0.46, while the QOL perception of PAG-Y was on average 0.46 points higher than in the N-PAG.

In HP, the regression parameter in the PAG was 0.309 and in PAG-Y it was 0.352. It showed higher QOL and HP in those groups than in N-PAG. The value of the regression

parameter in each of the four WHOQOL-BREF domains presented yoga and other PA as statistically significant parameters that improved QOL. Similarly, the addition of yoga practice to PA resulted in a nearly doubled regression parameter in PD-QOL (9.786) in relation to N-PAG, when compared with PAG and N-PAG (5.905). Only the SD-QOL regression parameter level, in relation to N-PAG, had similar scores in both groups with a slightly higher score (5.303) in the PAG than in the PAG-Y (5.076) ([table 4](#)).

DISCUSSION

In this study, we evaluated the specific relationship between yoga and QOL in a relatively large ($n=714$) group of Polish adults. The study relied on internet

Table 3 Presentation of QOL and HP, and QOL according to WHOQOL-BREF domains in each of the researched groups

WHOQOL-BREF Items		Groups			P value
		N-PAG	PAG	PAG-Y	
Quality of life perception	Mean±SD	3.83±0.92	4.07±0.68	4.29±0.66	<0.001
	Median	4	4	4	
	Quartiles	3–4	4–4	4–5	
Health perception	Mean±SD	3.56±0.95	3.86±0.78	3.89±0.87	0.003
	Median	4	4	4	
	Quartiles	3–4	4–4	4–4	
Physical domain	Mean±SD	64.24±17.88	71.78±14.21	74.42±13.7	<0.001 *
	Median	62	75	75	
	Quartiles	50–81	62–81	62–81	
Psychological domain	Mean±SD	66.31±17.92	72.55±13.09	75.79±14.16	<0.001*
	Median	69	69	81	
	Quartiles	56–81	69–81	69–81	
Social domain	Mean±SD	65.96±18.18	70.76±16.66	70.58±19.21	0.021*
	Median	69	75	75	
	Quartiles	56–75	56–81	56–81	
Environmental domain	Mean±SD	60.96±14.38	64.85±13.5	68.57±13.12	<0.001*
	Median	62	62	69	
	Quartiles	50–70.5	56–75	62–75	

P value=Kruskal-Wallis test+post hoc analysis (Dunn's test).

HP, health perception; N-PAG, non-physically active group; PAG, physically active group; PAG-Y, physically active group with yoga; QOL, quality of life.

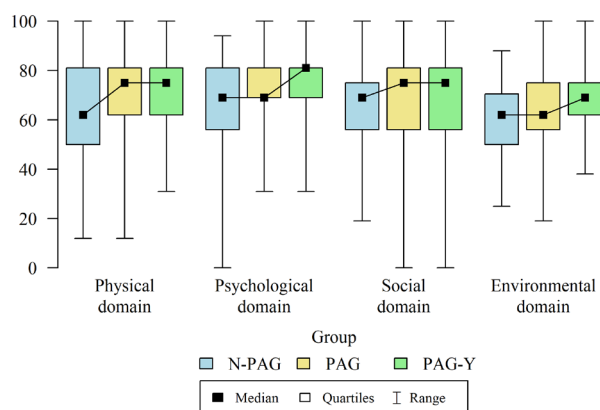


Figure 1 Presentation of quality of life (QOL) in the WHOQOL-BREF domains researched groups. N-PAG, non-physically active group; PAG, physically active group; PAG-Y, physically active group with yoga.

surveys delivered online, at high schools and universities, and in elderly communities.

There were differences between groups in sex, age and educational level. We found that QOL measured with the WHOQOL-BREF was higher in participants whose PA included yoga, than in those who did not perform PA, as well as in those who practised PA other than yoga. QOL was measured holistically, accounting for satisfaction with health and three out of four WHOQOL-BREF

domains. These results are in line with previous studies confirming statistically significant differences in the QOL of individuals who participate in PA and PA with yoga, as compared with those who do not participate in PA.³⁴ Results seem attributable to the specific physiological and psychological benefits of yoga training.^{1,35} In adulthood, when movement is limited due to both technical inventions and a sedentary lifestyle,³⁶ suitable PA can assist in preventing diseases,³⁷ and spine and back pain.³⁸ In everyday activities, ordinary PA may include walking,³⁸ cycling, gardening and short periods of callisthenics.⁸ The physical and social aspects of gardening and walking in the forest elicit multifactorial positive health effects,³⁹ correlated with meaningful human relationships, constituting a part of SD-QOL, with higher scores for QOL.⁴⁰

In correlation with the PHD-QOL of the WHOQOL-BREF, PA results in greater mobility, increased energy, better study and work capacity,¹⁶ better sleep and rest, reduced pain, and diminished dependence on medical care.¹¹ For example, young industrial workers who performed morning physical training combined with yoga in the evening for 3 months achieved more beneficial psychological effect than did another group who did not include yoga.⁹ For ageing populations, increasing mobility, without overtraining, positively influences health and assists individuals in achieving daily goals.⁴¹ Yoga is thus particularly valuable for elderly populations,

Table 4 Results of linear regression analysis in the observed groups

WHOQOL-BREF Items	Group	Regression parameter**	95% CI	P value*	
Quality of life perception	N-PAG	Ref.			
	PAG	0.25	0.074	0.426	0.005
	PAG-Y	0.46	0.262	0.658	<0.001
Health perception	N-PAG	Ref.			
	PAG	0.309	0.107	0.512	0.003
	PAG-Y	0.352	0.125	0.58	0.002
Physical domain	N-PAG	Ref.			
	PAG	7.54	3.932	11.148	<0.001
	PAG-Y	10.305	6.247	14.362	<0.001
Psychological domain	N-PAG	Ref.			
	PAG	5.905	2.432	9.378	0.001
	PAG-Y	9.786	5.88	13.692	<0.001
Social domain	N-PAG	Ref.			
	PAG	5.303	0.951	9.654	0.017
	PAG-Y	5.076	0.182	9.97	0.042
Environmental domain	N-PAG	Ref.			
	PAG	4.313	0.944	7.682	0.012
	PAG-Y	7.29	3.501	11.078	<0.001

** adjusted to age, sex and education

* statistically significant (p<0.05)

N-PAG, non-physically active group; PAG, physically active group; PAG-Y, physically active group with yoga.



for whom other forms of PA may be too strenuous. The efficacy of a yogic and physically active lifestyle pays dividends for both individual and public health.

Psychological impacts of PA

A range of biological benefits have been linked to PA, yet yoga in particular confers unique psychological benefits for practitioners of all ages and ability levels.

Participation in PA has been shown to improve QOL and HP,⁴² awaken one's consciousness, assist in maintaining a life-work balance,^{3 39} and provide relaxation.⁴³ The American College of Sports Medicine launched 'The Global Initiative' to encourage physicians, healthcare professionals, and educators to promote exercise to ultimately prevent, reduce, manage or treat diseases that impact health and QOL in humans.¹⁰ Given the results of the current study, the implementation of yoga could address similar biological parameters while also potentially yielding positive effects on psychological parameters,^{15 43} as yoga practice is associated with better mental health outcomes and decreased severity of depressive symptoms.²⁰ Yoga is also recommended for cancer patients, as a means to improve physical and mental health,¹⁴ and may be also considered as a supplementary cancer treatment since it may improve therapy outcomes,⁴⁴ in agreement with patient's beliefs.³⁰ It is further considered a form of rehabilitation for patients at cardiovascular risk,²² and for patients with type 2 diabetes.⁴⁵ Specifically, WHOQOL-BREF related to PD-QOL measured body image and appearance, personal beliefs, self-esteem, feelings, thinking, learning, memory, and concentration. These parameters may be improved with regular yoga practice, which positively shapes QOL and HP.⁴¹ This study showed the benefits of yoga practice on QOL and in three of four WHOQOL-BREF domains.

It should be taken into account that the effects of yoga may be different for each practitioner and depend not only on one's age, flexibility, frequency of training, and years of practice, but also on access to a skilled teacher.²⁵

Considering the general population, this study supports yoga as a practice that may potentially offer substantial physical and psychological benefit, even in patients with limited physical capacity for PA. In cases where individuals do not prefer yoga practice, the addition of a contemplative aspect to regular PA, using techniques found in yoga, like prayer, breathing exercises or daily mindfulness meditation,¹⁸ may offer significant benefits to physical and psychological well-being and to overall QOL.¹⁹

Limitations of this study revolve around its limited generalisability. The participants selected all come from Poland and consisted of Polish adults, as WHOQOL-BREF protocol advises, which limits the scalability. However, there is no prior yoga study of a group of this size, yet statistical significance was achieved nonetheless. Future studies could be done to include more diverse populations/nationalities, with comparison between different educational backgrounds and socioeconomic status. Additionally, future cohort studies could be performed

in order to better understand the relationship between PA and QOL.

The public should be encouraged to note that decreasing QOL may be associated with insufficient PA in leisure time.⁴⁶ Given the social responsibility to safeguard and promote public health, it is worth noting that the integration of scholars and students into interdisciplinary, and sport-based teams,² may serve as an innovative solution to promote health; this study shows that yoga may provide similar benefits, although enhanced in comparison.⁴⁷ In conclusion it can be stated that in order to achieve and maintain optimal physical and psychological health,¹⁷ people should be motivated from an early age by family's members, teachers and healthcare professionals to live physically active lives, particularly through meditative PA such as yoga.³⁶

CONCLUSIONS

The results of the observed groups of Polish adults showed that yoga practice might have greater beneficial effects on QOL than non-yogic PA alone. Nevertheless physically active individuals, regardless of their chosen activities, have higher QOL parameters than N-PAG. Taking into account the limitations of the study, these conclusions could be confirmed by further investigations employing a broader representative sample and more rigorous research design.

Historically, and especially as a result of the recent COVID-19 pandemic, there is a critical need to promote a healthy lifestyle within the population and reduce the prevalence of conditions that may place the general public at risk. Overall, the results of this study, coupled with existing literature, illustrate that yoga may be a powerful and inexpensive tool to promote healthier living and greater QOL within ageing societies. These findings are especially important for elderly populations since healthcare costs dramatically increase with age. So promoting PA in general, supplemented by elements of yoga, would be beneficial to introduce in the lifestyle from an early age. Further investigations on this topic could be conducted in order to enhance the observed relationships.

Author affiliations

¹Department of Immunology, Chair of Pathomorphology and Clinical Immunology, Poznan University of Medical Sciences, Poznan, Poland

²Faculty of Educational Studies, Adam Mickiewicz University, Poznan, Poland

³Department of Neurological Nursing, Poznan University of Medical Sciences, Poznan, Poland

⁴Chair of Health Prevention, Poznan University of Medical Sciences, Poznan, Poland

⁵Department of Kinesiology and Health Prevention, Faculty of Health Sciences, Jan Dlugosz University in Czestochowa, Czestochowa, Poland

Acknowledgements We would like to acknowledge and thank all study participants as well as the Editage Team and Mr. Douglas A. Neagoy for their contribution to this manuscript.

Collaborators AP-P conceived of the study. AP-P, KP-P, and GD initiated the study design and SB and TA helped with implementation. MF, ML, JO collected the data and KJ helped with analyzing statistical results. AP-P and GD are grant

holders. KJ, GD, J.Wysocki and J.Wasik as mentors supported in substantive scientific knowledge. All authors contributed to refinement of the study protocol and approved the final manuscript.

Contributors AP-P conceived of the study and is the author acting as guarantor. AP-P, KP-P and GD initiated the study design and SB, TYA, JWY and JWa helped with implementation. MF, ML-Z and JO collected the data and KJ helped with analysing statistical results. AP-P and GD are grant holders. KJ, GD, JWY and JWa as mentors supported in substantive scientific knowledge. All authors contributed to refinement of the study protocol and approved the final manuscript.

Funding Poznan University of Medical Sciences supported this study.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study protocol was reviewed by the Bioethics Committee of the Poznan University of Medical Sciences (Resolution No.1263/18), which decreed that the study does not have the characteristics of a medical experiment and does not require approval from the Bioethics Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Agnieszka Pluto-Pradzynska <http://orcid.org/0000-0002-6402-7857>

Tsz Yuen Au <http://orcid.org/0000-0002-6709-4174>

REFERENCES

- Kwok JYY, Kwan JCY, Auyeung M, *et al.* Effects of mindfulness yoga vs stretching and resistance training exercises on anxiety and depression for people with Parkinson disease: a randomized clinical trial. *JAMA Neurol* 2019;76:755–63.
- Bull FC, Al-Ansari SS, Biddle S, *et al.* World Health organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med* 2020;54:1451–62.
- Füzéki E, Banzer W. Physical activity recommendations for health and beyond in currently inactive populations. *Int J Environ Res Public Health* 2018;15. doi:10.3390/ijerph15051042. [Epub ahead of print: 22 05 2018].
- Polak R, Pojednic RM. Phillips em: lifestyle medicine education. *Am J Lifestyle Med* 2015;9:361–7.
- Guthold R, Stevens GA, Riley LM, *et al.* Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Glob Health* 2018;6:e1077–86.
- Commission ES. *Special Eurobarometr 472*, 2018. <https://sport.ec.europa.eu/news/new-eurobarometer-on-sport-and-physical-activity>
- Ministry of Health P. National health program 2016–2020. In: *Public health act*, 2015.
- Li X, Ghosh D. Associations between Body Mass Index and Urban “Green” Streetscape in Cleveland, Ohio, USA. *Int J Environ Res Public Health* 2018;15:2186.
- Bhat PS, Chopra V, Mehta SG, *et al.* Psychological benefits of yoga in industrial workers. *Ind Psychiatry J* 2012;21:98–103.
- Tipton CM. The history of “Exercise Is Medicine” in ancient civilizations. *Adv Physiol Educ* 2014;38:109–17.
- WHO. Introduction, administration, scoring and generic version of the assessment.. Available: http://www.who.int/mental_health/media/en/76.pdf
- Łojko D, Czajkowska A, Suwalska A, *et al.* Symptoms of depression among adults in rural areas of Western Poland. *Ann Agric Environ Med* 2015;22:152–5.
- Joshi U, Subedi R, Poudel P, *et al.* Assessment of quality of life in patients undergoing hemodialysis using WHOQOL-BREF questionnaire: a multicenter study. *Int J Nephrol Renovasc Dis* 2017;10:195–203.
- El-Hashimi D, Gorey KM. Yoga-Specific enhancement of quality of life among women with breast cancer: systematic review and exploratory meta-analysis of randomized controlled trials. *J Evid Based Integr Med* 2019;24:2515690X1982832.
- Morishima T, Miyashiro I, Inoue N, *et al.* Effects of laughter therapy on quality of life in patients with cancer: an open-label, randomized controlled trial. *PLoS One* 2019;14:e0219065.
- Puciato D, Borysiuk Z, Rozpara M. Quality of life and physical activity in an older working-age population. *Clin Interv Aging* 2017;12:1627–34.
- Brown RP, Gerbarg PL. Yoga breathing, meditation, and longevity. *Ann N Y Acad Sci* 2009;1172:54–62.
- Weber M, Schnorr T, Morat M, *et al.* Effects of Mind-body interventions involving Meditative movements on quality of life, depressive symptoms, fear of falling and sleep quality in older adults: a systematic review with meta-analysis. *Int J Environ Res Public Health* 2020;17. doi:10.3390/ijerph17186556. [Epub ahead of print: 09 09 2020].
- Telles S, Gupta RK, Kumar A, *et al.* Mental wellbeing, quality of life, and perception of chronic illness in Yoga-Experienced compared with Yoga-Naïve patients. *Med Sci Monit Basic Res* 2019;25:153–63.
- Brinsley J, Schuch F, Lederman O, *et al.* Effects of yoga on depressive symptoms in people with mental disorders: a systematic review and meta-analysis. *Br J Sports Med* 2021;55:992–1000.
- Salvado M, Marques DL, Pires IM, *et al.* Mindfulness-Based interventions to reduce burnout in primary healthcare professionals: a systematic review and meta-analysis. *Healthcare* 2021;9. doi:10.3390/healthcare9101342. [Epub ahead of print: 09 10 2021].
- Satin JR, Linden W, Millman RD. Yoga and psychophysiological determinants of cardiovascular health: comparing yoga practitioners, runners, and sedentary individuals. *Ann Behav Med* 2014;47:231–41.
- Rathore M, Abraham J. Implication of Asana, Pranayama and meditation on telomere stability. *Int J Yoga* 2018;11:186–93.
- Cheema BS, Marshall PW, Chang D, *et al.* Effect of an office worksite-based yoga program on heart rate variability: a randomized controlled trial. *BMC Public Health* 2011;11:578.
- Awan R, Laskowski ER. Yoga: safe for all? *Mayo Clin Proc* 2019;94:385–7.
- Kmieciak A, Bakota D, Plomiński A. The level of mood regulation in practicing hatha yoga in the background of people who do not practice this physical activity. *Phys. Act. Rev.* 2020;8:95–103.
- Piotrowski MP, Czechura M. L: Joga, 2016–2022. Available: <https://milujciesiepl/?s=joga>
- Letter to the bishops of the Catholic church on some aspects of Christian meditation. Available: https://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_19891015_meditazione-cristiana_en.html
- Curlin FA, Rasinski KA, Kaptchuk TJ, *et al.* Religion, clinicians, and the integration of complementary and alternative medicines. *J Altern Complement Med* 2009;15:987–94.
- Arvonio MM. Cultural competency, autonomy, and spiritual conflicts related to Reiki/CAM therapies: should patients be informed? *Linacre Q* 2014;81:47–56.
- Yadav R, Yadav RK, Pandey RM, *et al.* Predictors of health-related quality of life in Indians with metabolic syndrome undergoing randomized controlled trial of Yoga-Based lifestyle intervention vs dietary intervention. *Behav Med* 2021;47:151–60.
- Jaracz K, Kalfoss M, Górna K, *et al.* Quality of life in Polish respondents: psychometric properties of the Polish WHOQOL-Bref. *Scand J Caring Sci* 2006;20:251–60.
- Jang Y, Hsieh C-L, Wang Y-H, *et al.* A validity study of the WHOQOL-BREF assessment in persons with traumatic spinal cord injury. *Arch Phys Med Rehabil* 2004;85:1890–5.
- Skevington SM. Advancing cross-cultural research on quality of life: observations drawn from the WHOQOL development. World health organisation quality of life assessment. *Qual Life Res* 2002;11:135–44.
- Ross A, Thomas S. The health benefits of yoga and exercise: a review of comparison studies. *J Altern Complement Med* 2010;16:3–12.
- Pluto-Pradzynska A. Man has always been in motion and seems to be created for movement: can everyday life in balance reverse the process of ageing? *J of Nursing and Health Studies* 2019;4:5.
- Strijk JE, Proper KI, van der Beek AJ, *et al.* A worksite vitality intervention to improve older workers' lifestyle and vitality-related outcomes: results of a randomised controlled trial. *J Epidemiol Community Health* 2012;66:1071–8.
- Gomefuka NA, Oliveira HB, Silva ES, *et al.* Effects of Nordic walking training on quality of life, balance and functional mobility in elderly: a randomized clinical trial. *PLoS One* 2019;14:e0211472.



- 39 Song C, Ikei H, Park B-J, *et al.* Psychological benefits of walking through forest areas. *Int J Environ Res Public Health* 2018;15:2804.
- 40 Alaimo K, Beavers AW, Crawford C, *et al.* Amplifying health through community gardens: a framework for advancing multicomponent, behaviorally based neighborhood interventions. *Curr Environ Health Rep* 2016;3:302–12.
- 41 Rostami K, Ghodsbini F. Effect of yoga on the quality of life of nurses working in intensive care units. randomized controlled clinical trial. *Invest Educ Enferm* 2019;37.
- 42 Kettunen O, Kyröläinen H, Santtila M, *et al.* Physical fitness and volume of leisure time physical activity relate with low stress and high mental resources in young men. *J Sports Med Phys Fitness* 2014;54:545–51.
- 43 Li D, Tsui MCM, Zhang G. Evidence-Based clinical application of yoga for stress management. *J Yoga Phys Ther* 2016;6:1.
- 44 Rao RM, Vadiraja HS, Nagaratna R, *et al.* Effect of yoga on sleep quality and neuroendocrine immune response in metastatic breast cancer patients. *Indian J Palliat Care* 2017;23:253–60.
- 45 Bock BC, Thind H, Fava JL, *et al.* Feasibility of yoga as a complementary therapy for patients with type 2 diabetes: the healthy active and in control (HA1C) study. *Complement Ther Med* 2019;42:125–31.
- 46 WHO. "Global Recommendations on Physical Activity for Health", 2010.
- 47 Cirillo J, Finch JB, Anson JG. The impact of physical activity on motor preparation in young adults. *Neurosci Lett* 2017;638:196–203.