



Morris, B., Jackson, J., & Roberts, A. (2024). Effects of long-term Ashtanga yoga practice on psychological well-being. *Mental Health and Social Inclusion*, 28(5), 549-560. <https://doi.org/10.1108/MHSI-03-2023-0033>

Document version

Peer reviewed version

Licence

CC BY-NC

Copyright information

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above.

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

Takedown policy

Any individual, whether within or external to the University, has the right to request the removal of content from the Leeds Trinity University Repository, on the grounds that it breaches copyright, is in any other way unlawful, or represents research misconduct.

Complaints can be submitted via the Repository Complaints Form at <https://www.leedstrinity.ac.uk/media/site-assets/documents/key-documents/pdfs/repository-complaints-form.pdf>

Effects of long-term Ashtanga Yoga practice on psychological well-being

Ben Morris, James Jackson and Anthony Roberts III

Abstract

Purpose – In recent years, Yoga practice has seen a rapid rise in popularity with many positive consequences, both physical and mental attributed to its practice. Ashtanga Yoga has been less well researched in this area and is the specific focus on this work. The aim of this study is to investigate the possible positive impact of long-term Ashtanga Yoga on psychological well-being.

Design/methodology/approach – In total, 213 long-term Ashtanga Yoga practitioners were asked to complete the positive emotion, engagement, relationships, meaning, accomplishment (PERMA) 23 scale (Butler and Kern, 2016) which measures psychological well-being. The values given by these individuals were then compared against a larger sample of 31,966 representative of the general population.

Findings – Scores were then compared with a PERMA data set representative of the general population (see Butler and Kern, 2016), primarily using a test of difference to compare samples. Secondly, the causal relationship between time spent in practice upon well-being scores.

Research limitations/implications – Findings indicated that those individuals engaged in long-term Ashtanga Yoga practice significantly outperformed the control group on all dimensions of psychological well-being.

Practical implications – This work has demonstrated specific benefits to the practice of Ashtanga Yoga on psychological well-being. Yoga is a form of exercise that is now widely available across the globe, and as such, represents an accessible form of physical practice, which has important psychological benefits.

Originality/value – To the authors' knowledge, this is the first work investigating differences in psychological well-being profiles using PERMA, as a function of Yoga practice.

Keywords Well-being, Health, PERMA, Ashtanga Yoga

Paper type Research paper

Ben Morris and James Jackson both are based at Department of Psychology and Therapeutic Studies, Leeds Trinity University, Leeds, UK. Anthony Roberts III is based at Department of Social Work and Social Policy, The University of Western Australia, Perth, Australia.

Introduction

Yoga is an ancient practice that integrates mind–body disciplines of stretching, breathing, alignment, balance and meditation (Fiori *et al.*, 2014), and is believed to have originated on the Indian sub-continent. One of the first recorded accounts of Yogis practicing Asana (postures made using the body) was in 400 BC by the army of Alexander the Great (Mallinson and Singleton, 2017). Today, Yoga is popular globally as a complementary therapy (Lin *et al.*, 2011). More than 21 million Americans practice some form of Yoga, with close to 70% of these turning to Yoga “explicitly to improve their health” (Cramer *et al.*, 2016a; Field, 2016).

Yoga and health

In recent years, investigations into Yoga have focused on medical conditions such as pain, stress, anxiety and depression (Lin *et al.*, 2011; McCall, 2014; Jeter *et al.*, 2015b; Field, 2016). Benefits of practice includes improving cardio-metabolic health (Chu *et al.*, 2016), improved chemotherapy recovery in cancer patients (Moadel *et al.*, 2007; Galantino *et al.*, 2012) and depressive disorders (Cramer *et al.*, 2013; Jeter *et al.*, 2015a). Over the past 20 years, a growing body of research is suggesting that Yoga

can be used to mitigate disease-related symptoms in some key clinical populations ([Jeter et al., 2015b](#)).

Nevertheless, by itself, the term “Yoga” is as broad as the term “Swimming” is within the context of the Olympic Games, as there are distinct methods of swimming like freestyle, backstroke and butterfly, all individual events, all requiring noticeably different knowledge, effort and skillsets to master ([Craig and Pendergast, 1979](#); [Kennedy et al., 1990](#); [Howells, and Fletcher, 2015](#)). Similarly, Yoga is made up of several different schools that operate with different methodologies ([Cramer et al., 2016b](#); [Field, 2016](#)). Presently, the Ashtanga branch of Yoga will be the focus of investigation.

Ashtanga practice

Ashtanga Yoga literally means “eight-limbed yoga” and takes its name from the framework outlined in the eighth century CE text “the Yoga Sutras” ([Mallinson and Singleton, 2017](#)). Its lineage is through hatha Yoga ([Worthington, 1982](#)) and was developed via the “Yoga Kortuna” – a 15th-century manuscript containing hundreds of classical Asana, which have been described as “technically complex”; thus, correct execution requires careful mental focus and the use of strength, flexibility and alignment ([Jarry et al., 2017](#)). These postures have since been organised into six series of progression (44 postures in total). Importantly, this is the only form of Yoga that requires the synchronisation of breath control, Asana ([Mallinson and Singleton, 2017](#)) and point of focus ([Rosen, 2003](#)). Together, these characteristics require enhanced concentration and allow the practice of Ashtanga Yoga to be considered a “moving meditation” ([Phillips, 2005](#); [Bennett, 2007](#); [Maehle, 2007](#); [Mohan, 2010](#); [Luu and Hall, 2016](#); [Jarry et al., 2017](#)).

While increased academic interest in Yoga is undeniable, very few published quantitative studies specifically research Ashtanga Yoga. Furthermore, those that do, seek to assess a modified or truncated form of Asana practice for their participants. This is far less challenging than that prescribed in its classical format, which also recommends that students practice a specific sequence of Asana for at least 60 min a day for six days a week [note that exceptions to the six days a week practice guidelines are detailed in [Maehle \(2007\)](#)]. As such, the issue of duration of practice (i.e. “dose”) of Ashtanga Yoga is viewed as a central tenant to its efficacy and can be the source of significant confounds ([Whalley and Miller, 2013](#); [Jarry et al., 2017](#)). This is significant because Ashtanga Yoga is a rigorous and physically demanding style of Yoga, and truncated practice (in form, duration and frequency during the week) may result in insufficient ‘dose’ ([Buško and Rychlik, 2006](#); [Benavides, and Caballero, 2009](#); [Kim et al., 2015](#)).

Current tests of Ashtanga Yoga

A review of existing Ashtanga Yoga literature ([Streeter et al., 2007](#); [Jeter et al., 2012](#); [Kim et al., 2012](#); [Kim et al., 2015](#)) reveals that far less is known about the psychological effects of this system of Yoga compared with those physical. To the authors’ best knowledge, only two quantitative studies exist on the topic of psychological benefits.

The first by [Phillips \(2005\)](#) studied “Flow” in a sample of 127 female participants. Flow was defined as an optimal psychological state in which complete absorption in Ashtanga Yoga practice can occur. The authors suggest that this led to a number of positive experiential qualities and ultimately overall happiness and well-being ([Jackson et al., 1998](#); [Jackson, 2000](#); [Jackson, and Eklund, 2002](#); [Phillips, 2005](#)). The study concluded that practicing Ashtanga Yoga in its classical form (for more than 90 min at a time) did correlate with experiencing flow states. Flow states are described by [Csikszentmihalyi \(1990\)](#) as an optimal state of intrinsic motivation, where the person is fully immersed in what they are doing characterised by feelings of great absorption and engagement where “normal” concerns are waylaid (e.g. time, the need for food, the ego-self).

Furthermore, [Jarry et al. \(2017\)](#) found Ashtanga Yoga to be effective in improving psychological well-being (on measures of depression, anxiety, self-esteem and interpersonal function). However, [Jarry and colleagues \(2017\)](#) designed their study around observing novice participants, learning, then practicing a modified truncated sequence of Ashtanga Yoga only, and to do so for only a nine-week period. Their study concluded by theorising that sustained gains in psychological well-being would require sustained practice in Ashtanga Yoga ([Jarry et al., 2017](#)).

Positive emotion, engagement, relationships, meaning, accomplishment

[Seligman \(2012\)](#) developed a definition for psychological well-being in terms of five “pillars” of positive emotion, engagement, relationships, meaning, accomplishment (PERMA). Positive emotions refer to pleasant feelings (e.g. happiness and joy). Engagement refers to psychological connection to activities (e.g. immersion and interest). Relationships include feeling socially integrated, cared about and supported by others and at ease with this. Meaning refers to believing that one’s life is of value and feeling a connection to something greater than oneself. Lastly, accomplishment involves feelings associated with making progress towards goals and having a sense of achievement. [Seligman \(2012\)](#) emphasises that these five “pillars” make a contribution to overall well-being and are important areas that individuals can/may pursue and are independent from one another.

In accordance with this, [Butler and Kern \(2016\)](#) recently developed a psychometric test to measure PERMA; in addition their 23 question profiler quantifies levels of overall well-being, negative emotions and health. During the development of their profiler, [Butler and Kern \(2016\)](#) collected PERMA results from large samples world-wide, with mean scores for overall well-being derived from a population sample of 31,966 completed responses. In doing so, they have essentially created a baseline database of mean PERMA scores or control group for comparison.

The present study attempts to build on the above findings to specifically assess the efficacy of Ashtanga Yoga using the established psychometric test of psychological well-being, i.e. PERMA ([Butler and Kern, 2016](#)). It is predicted that the Ashtanga population will, on average, score higher on PERMA than the control group. Should this be the case, then this would suggest that the Ashtanga Yoga system as classically prescribed enhances psychological well-being. To test this hypothesis, data was collected from Ashtanga practitioners who adhered to the classical teachings of the Ashtanga Yoga system and had been doing so for a minimum of one year.

Methods

Ethics

Ethical approval for this study was granted by Leeds Trinity University. Written permission from the Psychology Department was obtained in November 2017. All participants for this study gave informed and written consent via the Bristol Online Survey (BOS) website, which served as the interface between participant and researcher.

Eligibility criteria

Inclusion criteria centred on the competencies of the individuals in Ashtanga Yoga. Participants were required to have been practicing the Ashtanga Yoga System for at least 12 months and to be consistently practicing Asana for a minimum of five days per week, excluding rest and/or moon days as prescribed by the Ashtanga Yoga system.

Participants

A survey link specific to this study was generated via the BOS platform and was posted on two Facebook groups. Namely, the “Ashtanga Home Practitioners Network” (with 10,069 members) and the “Ashtanga Community in Mysore” (with 15,406 members). No compensation was offered in return for participation. Data was collected between 19 November 2017 and 5 December 2017, and a total of 280 responses were collected, of which 213 completed the PERMA items (83% female). And, while expertise was not explicitly requested, 20% of respondents ($n = 213$) indicated that they had been practicing Ashtanga consistently for ten years or more.

Materials

The PERMA profiler is a 23-item measure developed by [Butler and Kern \(2016\)](#), was used to assess eight domains of psychological health (i.e. overall well-being, positive emotion, engagement, relationships, meaning, accomplishment, negative emotion, physical health). For example, for a physical health item “Compared to others of your same age and sex, how is your health?”, respondents answer using an 11-point Likert scale, with 0 = Never to a maximum of 10 = Always.

Procedure

Data was collected using the online collection tool BOS ([Bristol Online Survey, 2018](#)). BOS is an online platform designed for use in academic institutes for administering and analysis of research data ([Paterson et al., 2016](#)).

Results

Plan of analysis

Scoring of the PERMA (as per [Butler and Kern, 2016](#)) enabled the identification of the eight dimensions of positive emotion ($\alpha = 0.84$), engagement ($\alpha = 0.60$), relationships ($\alpha = 0.77$), meaning ($\alpha = 0.84$), accomplishment ($\alpha = 0.71$), overall well-being ($\alpha = 0.79$), negative emotion ($\alpha = 0.67$) and physical health ($\alpha = 0.85$). [Table 1](#) demonstrates the sample size obtained for both PERMA and Yoga groups. Data from 213 Ashtanga Yoga practitioners was compared against a previously collected data set of PERMA constructs.

Test of difference

The principle analysis sought to determine differences in scores on the dimensions of PERMA by group (namely, Yoga versus general population). A “one-sample t-test” was conducted to compare the Ashtanga group and the PERMA population. [Table 2](#) demonstrates the results of this analysis.

Table 1 Demonstrates sample sizes of both groups analysed by the PERMA constructs

PERMA constructs	N of PERMA group	N of Yoga group
Positive emotion	31,965	213
Engagement	31,962	213
Relationships	31,940	213
Meaning	31,931	213
Accomplishment	31,963	213
Overall well-being	31,966	213
Negative emotion	31,386	213
Physical health	30,601	213

Source: Table by authors

Table 2 Demonstrates the mean, standard deviations, *t*-test and Cohen's *d* effect size by PERMA constructs and group

PERMA construct	Group	Means	SD	t	d
Positive emotion	Yoga	7.51	1.40	8.56*	0.58
	PERMA	6.69	1.40		
Engagement	Yoga	7.71	1.23	5.48*	0.52
	PERMA	7.25	1.23		
Relationships	Yoga	7.64	1.72	6.29*	0.43
	PERMA	6.90	1.72		
Meaning	Yoga	7.94	1.46	8.75*	0.60
	PERMA	7.06	1.46		
Accomplishment	Yoga	7.73	1.21	6.34*	0.42
	PERMA	7.21	1.21		
Overall well-being	Yoga	7.71	1.07	9.42*	0.49
	PERMA	7.02	1.66		
Negative emotion	Yoga	3.85	1.73	5.16*	0.35
	PERMA	4.46	1.73		
Physical health	Yoga	8.40	1.28	16.47*	3.07
	PERMA	4.46	1.28		

Note: * $p < 0.05$
Source: Table by authors

Respondents from the Ashtanga Yoga population significantly differed ($p < 0.001$) on all constructs assessed by the PERMA scale. Specifically, positive emotion, engagement, relationships, meaning, accomplishment, overall well-being and physical health were all higher in the Ashtanga Yoga group compared with the PERMA population. Negative emotion was found to be lower in the Ashtanga Yoga group compared with the PERMA population.

Linear regression

Regression assumptions

All of the assumptions of regression analysis were met. None of the outliers was having an undue influence on the model (Cook's distance values, Mahalanobis distance values and leverage values were all acceptable). The assumption of homoscedasticity was not violated. Residuals appeared to be both independent (Durbin–Watson value > 1 and < 3) and normally distributed. Collinearity diagnostics for this regression were satisfactory (tolerances < 0.02 ; VIF < 1). Table 3 reports the result of correlations between age and PERMA constructs.

Regression analysis

The focus of the regression analyses centred on the effect that time spent engaged in Ashtanga Yoga could have on the PERMA profile. A number of significant models were

Table 3 Descriptive statistics and correlations between length of practice and PERMA variables

PERMA	Mean	SD	1	2	3	4	5	6	7	8	9
Length of practice	5.47	3.28	–	0.15*	0.06	0.19**	0.24**	0.29**	0.24**	–0.12	0.16*
Positive emotion	7.51	1.40		–	0.43	0.51**	0.66**	0.54**	0.84**	0.57**	0.42**
Engagement	7.71	1.23			–	0.25**	0.42**	0.41**	0.63**	–0.23**	0.31**
Relationships	7.64	1.71				–	0.47**	0.42**	0.73**	–0.26**	0.29**
Meaning	7.93	1.46					–	0.61**	0.83**	–0.39**	0.39**
Accomplishment	7.73	1.21						–	0.76**	–0.39**	0.38**
Overall well-being	7.71	1.08							–	–0.48**	0.47**
Negative emotion	3.85	1.73								–	–0.31**
Physical health	8.39	1.28									–

Notes: * $p < 0.05$; ** $p < 0.01$
Source: Table by authors

identified, with age as the predictor variable. These are as follows, positive emotion $F(1, 211) = 4.62, p = 0.03$, adjusted $R^2 = 0.017$, relationship $F(1, 211) = 7.64, p = 0.006$, adjusted $R^2 = 0.033$, meaning $F(1, 211) = 12.81, p = 0.000$, adjusted $R^2 = 0.053$, accomplishment $F(1, 211) = 19.43, p = 0.000$, adjusted $R^2 = 0.080$, overall well-being $F(1, 211) = 12.99, p = 0.000$, adjusted $R^2 = 0.054$ and physical health $F(1, 211) = 5.40, p = 0.021$, adjusted $R^2 = 0.020$. Table 4 reports the results of the regression analysis.

Discussion

The present study adds to an emerging literature assessing the role of Yoga in benefiting psychological and physical health (Casden, 2005; Phillips, 2005; Streeter *et al.*, 2007; Benavides and Caballero, 2009; Kim *et al.*, 2012; Nichter, 2013; Fiori *et al.*, 2014; Kim *et al.*, 2015; Jeter *et al.*, 2015b; Jarry *et al.*, 2017). Our sample was made up entirely of participants who were long-term practitioners of Ashtanga Yoga from around the world, with 20% of respondents indicating that they had been practicing Ashtanga consistently for a decade or more. As such, it could be argued that this study is the largest and most representative sample of the Ashtanga Yoga population reported to date. The results of this study demonstrate that consistent long-term practice of Ashtanga Yoga positively influences multiple components of the PERMA framework (Seligman, 2012). Furthermore, the results of the regression analysis on time spent practicing Yoga and PERMA constructs identified that for positive emotion, relationships, meaning, accomplishment, overall well-being and physical health, the length of practice made a significant contribution to scores. Furthermore, the nature of this significance is to indicate that Yoga practice is positive for all psychological dimensions measured through PERMA.

Positive and negative emotions

Emotions range across a spectrum from negative to positive and can be experienced in various intensities (Huelsman *et al.*, 1998; Cacioppo *et al.*, 2011, 2003; Butler and Kern, 2016). To capture and recognise both positive and negative spectrums of mental health; the PERMA 23 ascertains levels of both positive and negative emotions, with negative emotions measured through the use of questions that assess sadness, anger and anxiety (Butler and Kern, 2016). The Ashtanga population reported significantly lower levels of negative emotions as well as significantly higher positive emotions than the comparison population. These results are consistent with research by Streeter *et al.* (2007) who suggest that experienced Yoga practitioners are better placed to stave off negative emotion due to more effective action of γ -aminobutyric acid (GABA) within their brain. GABA is an inhibitory neurotransmitter that can assist in the regulation of emotion and is known to play an important role in the regulation of muscle tone (Watanabe *et al.*, 2002). As such, Streeter *et al.* (2007) also suggested that Yoga should be explored as possible treatment for

Table 4 Demonstrates the results of the linear regression showing the relationship between time spent practicing Ashtanga Yoga and dimensions of PERMA

PERMA	B	SE B	β
Positive emotion	0.062	0.029	0.146*
Engagement	0.023	0.026	0.063
Relationships	0.095	0.035	0.187**
Meaning	0.107	0.030	0.239***
Accomplishment	0.107	0.024	0.290***
Overall well-being	0.079	0.022	0.241***
Negative emotion	-0.061	0.036	-0.116
Physical health	0.062	0.027	0.158*

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: Table by authors

disorders with low GABA levels. Conversely, research into the cumulative effect of daily meditative practice (Singh *et al.*, 2004; Phillips, 2005; Fredrickson *et al.*, 2008; Cohn *et al.*, 2009; Lyubomirsky *et al.*, 2011) has found with a high degree of certainty that that meditative practices promote a greater sense of positive emotions compared with non-meditators.

Engagement

The Ashtanga population reported significantly higher scores than the control population in the “Engagement” domain. Butler and Kern (2016) report that their interpretation of “Engagement” parallels that of Csikszentmihalyi (1990), in that they aspired to measure “flow, or an extreme level of psychological engagement that involves intense concentration, absorption, and focus”. This is consistent with the findings above.

Relationships

The Ashtanga population reported significantly higher scores than the comparison population in the “Relationship” domain. Healthy social relationships have been found to be fundamental to a well-lived life; a host of research (Berscheid and Reis, 1998; Diener and Seligman, 2002; Malone *et al.*, 2013; Waldinger, 2015; Mineo, 2017) demonstrates that healthy relationships with friends, family and community enhance lifespan and quality of life. Lynch (2016) describes Ashtangis as a tight-knit community; part of the reason for this is the strong connection with other Ashtanga practitioners from around the world.

Meaning and health

The Ashtanga population reported significantly higher scores than the comparison population in the “Meaning” domain. For many long-term Ashtangis, living a Yogic life also means living the eight limbs of Yoga; this in itself gives rise to a form of spirituality and meaning, which provides a sense that one’s life actually matters; this in turn has been linked to better physical health, reduced mortality risk and higher life satisfaction (Ryff *et al.*, 2004; Crawford, 2006; Boyle *et al.*, 2009; Steger, 2012).

In line with this, the Ashtanga population reported significantly higher scores than the control population in the “Health” domain. This was by far the most significant result with the Ashtanga group reporting scores close to the 75th percentile of the general population, with 87.5% of long-term Ashtanga practitioners reporting either 8.9 or the maximum 10 as their level of physical health. This stems from Ashtanga Yoga being a “Keystone habit” for long-term practitioners, that is to say an important foundation habit that marshals and upholds other healthy habits, this is consistent with the multidimensional nature of health (Duhigg, 2012; Denison and Nieminen, 2014; Nemecek *et al.*, 2015). An example of this in action are that starting times for practicing Yoga can be as early as 4 a.m.; the implications of this are numerous; firstly, this means that to get adequate sleep, a key factor for good health (Redline *et al.*, 2010), they must retire early. Secondly, this may necessitate low levels of alcohol consumption and the avoidance of large meals the evening before practice due to early start times. Lastly, living the eight limbs would incline long-term Ashtangis to consume a predominantly plant-based diet (this is in keeping with the first limb of non-violence). A growing body of research assert that a plant-based diet dramatically reduces the risk of several different types of cancers related to digestion (Chan *et al.*, 2011; Bouvard *et al.*, 2015). As a whole, therefore, Ashtanga practice may benefit positive lifestyle habits in addition to the practical aspects of performing the postures.

Achievement

The Ashtanga population reported significantly higher scores than the control population in the “Achievement” domain. Butler and Kern (2016) designed the PERMA 23 to capture accomplishments that involve “a sense of working toward and reaching goals, mastery, and efficacy to complete tasks”. As reported above, a significant percentage of the Ashtanga sample have been practicing Ashtanga for over a decade; from the design of the Ashtanga system, it can be inferred that part of the longevity is the effort required to gain mastery over each posture as progression occurs through each series.

Limitations and implications

The present work sought to investigate the long-term effects of Ashtanga Yoga on its practitioners. Whilst the data suggests a number of important insights, there are several limitations to the present study design, which could be improved upon for future work of this nature.

Firstly, it is worth noting that it is possible that the PERMA population that were presently used as a comparison group had Yoga practitioners within it. The presence of this small group of individuals would have only likely weakened the significance of the group difference, not strengthened it. In any case, future work might usefully assess the activity levels of any comparison group to see if any significant health habits distort potential group differences.

Secondly, future work may usefully investigate qualitative insight into the experiences of Ashtanga practitioners compared with non-practitioners to ascertain whether there are any specific psychological individual difference characteristics more prevalent in Yoga practitioners that might be driving this group difference. As the present work used a quantitative methodology bound by the PERMA profile, it is possible that a certain level of data sophistication has been lost.

Lastly, future work may usefully assess the differences between Yoga and other forms of concentrated and focused physical activity on psychological health. One may look towards the plethora of complementary therapies as a starting point for this comparative work.

To conclude, the results of this study suggest that long-term Ashtanga Yoga practice acts as a keystone habit that is of benefit to overall well-being across psychological and physical domains.

References

- Benavides, S. and Caballero, J. (2009), “Ashtanga yoga for children and adolescents for weight management and psychological well-being: an uncontrolled open pilot study”, *Complementary Therapies in Clinical Practice*, Vol. 15 No. 2, pp. 110-114.
- Berscheid, E. and Reis, H.T. (1998), “Attraction and close relationships”, in Gilbert, D.T., Fiske, S.T. and Lindzey, G. (Eds), *The Handbook of Social Psychology*, 4th ed., McGraw-Hill, New York, NY, Vol. 2, pp. 193-281.
- Bouvard, V., Loomis, D., Guyton, K.Z., Grosse, Y., El Ghissassi, F., Benbrahim-Tallaa, L. and Straif, K. (2015), “Carcinogenicity of consumption of red and processed meat”, *The Lancet Oncology*, Vol. 16 No. 16, pp. 1599-1600.
- Boyle, P.A., Barnes, L.L., Buchman, A.S. and Bennett, D.A. (2009), “Purpose in life is associated with mortality among community-dwelling older persons”, *Psychosomatic Medicine*, Vol. 71 No. 5, pp. 574-579.
- Bristol Online Survey (2018), “[computer software]. (2018)”, available at: www.onlinesurveys.ac.uk/
- Buško, K. and Rychlik, R. (2006), “Changes of the maximal muscle torque in women training power yoga (Ashtanga Vinyasa)”, *Journal of Human Movement*, Vol. 7 No. 2, pp. 168-177.

- Butler, J. and Kern, M.L. (2016), "The PERMA-Profiler: a brief multidimensional measure of flourishing", *International Journal of Wellbeing*, Vol. 6 No. 3.
- Cacioppo, J.T., Hawkey, L.C. and Berntson, G.G. (2003), "The anatomy of loneliness", *Current Directions in Psychological Science*, Vol. 12 No. 3, pp. 71-74.
- Cacioppo, J.T., Berntson, G.G., Norris, C.J. and Gollan, J.K. (2011), "The evaluative space model", in Van Lange, P., Kruglanski, A. and Higgins, E.T. (Eds), *Handbook of Theories of Social Psychology*, CA: Sage, Thousand Oaks, Vol. 1.
- Casden, D.R. (2005), "The effects of Ashtanga yoga on autonomic, respiratory and cognitive functioning; psychological symptoms and somatic complaints: a controlled study", *Dissertation Abstracts International: Section B: Sciences and Engineering*, Vol. 66 No. 2-B, p. 1164.
- Chan, D.S., Lau, R., Aune, D., Vieira, R., Greenwood, D.C., Kampman, E. and Norat, T. (2011), "Red and processed meat and colorectal cancer incidence: meta-analysis of prospective studies", *PLoS ONE*, Vol. 6 No. 6, p. e20456.
- Chu, P., Gotink, R.A., Yeh, G.Y., Goldie, S.J. and Hunink, M.M. (2016), "The effectiveness of yoga in modifying risk factors for cardiovascular disease and metabolic syndrome: a systematic review and meta-analysis of randomized controlled trials", *European Journal of Preventive Cardiology*, Vol. 23 No. 3, pp. 291-307.
- Cohn, M.A., Fredrickson, B.L., Brown, S.L., Mikels, J.A. and Conway, A.M. (2009), "Happiness unpacked: positive emotions increase life satisfaction by building resilience", *Emotion*, Vol. 9 No. 3, p. 361.
- Craig, A.B. and Pendergast, D.R. (1979), "Relationships of stroke rate, distance per stroke, and velocity in competitive swimming", *Medicine & Science in Sports & Exercise*, Vol. 11 No. 3, pp. 278-283.
- Cramer, H., Lauche, R., Langhorst, J. and Dobos, G. (2013), "Yoga for depression: a systematic review and meta-analysis", *Depression and Anxiety*, Vol. 30 No. 11, pp. 1068-1083.
- Cramer, H., Lauche, R., Langhorst, J. and Dobos, G. (2016a), "Is one yoga style better than another? A systematic review of associations of yoga style and conclusions in randomized yoga trials", *Complementary Therapies in Medicine*, Vol. 25, pp. 178-187.
- Cramer, H., Ward, L., Steel, A., Lauche, R., Dobos, G. and Zhang, Y. (2016b), "Prevalence, patterns, and predictors of yoga use: results of a US nationally representative survey", *American Journal of Preventive Medicine*, Vol. 50 No. 2, pp. 230-235.
- Crawford, R. (2006), "Health as a meaningful social practice", *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine*, Vol. 10 No. 4, pp. 401-420.
- Csikszentmihalyi, M. (1990), *Flow: The Psychology of Optimal Experience*, Harper and Row, New York, NY.
- Denison, D. and Nieminen, L. (2014), "Habits as change levers", *People and Strategy*, Vol. 37 No. 1, p. 23.
- Diener, E. and Seligman, M.E. (2002), "Very happy people", *Psychological Science*, Vol. 13 No. 1, pp. 81-84.
- Duhigg, C. (2012), "The power of habit: why we do what we do in life and business", *Random House*, Vol. 34, p. 10.
- Field, T. (2016), "Yoga research review", *Complementary Therapies in Clinical Practice*, Vol. 24, pp. 145-161.
- Fiori, F., David, N. and Aglioti, S.M. (2014), "Processing of proprioceptive and vestibular body signals and self-transcendence in Ashtanga yoga practitioners", *Frontiers in Human Neuroscience*, Vol. 8, pp. 1-9.
- Fredrickson, B.L., Cohn, M.A., Coffey, K.A., Pek, J. and Finkel, S.M. (2008), "Open hearts build lives: positive emotions, induced through loving-kindness meditation, build consequential personal resources", *Journal of Personality and Social Psychology*, Vol. 95 No. 5, p. 1045.
- Galantino, M., Greene, L., Daniels, L., Dooley, B., Muscatello, L. and O'donnell, L. (2012), "Longitudinal impact of yoga on chemotherapy-related cognitive impairment and quality of life in women with early stage breast cancer: a case series", *Explore: The Journal of Science and Healing*, Vol. 8 No. 2, pp. 127-135.
- Howells, K. and Fletcher, D. (2015), "Sink or swim: adversity-and growth-related experiences in Olympic swimming champions", *Psychology of Sport and Exercise*, Vol. 16, pp. 37-48.

- Huelsman, T.J., Nemanick, R.C., Jr. and Munz, D.C. (1998), "Scale to measure four dimensions of dispositional mood: positive energy, tiredness, negative activation, and relaxation", *Educational and Psychological Measurement*, Vol. 58 No. 5, pp. 804-819.
- Jackson, S.A. (2000), "Joy, fun, and flow state in sport", in Hanin, Y. (Ed.), *Emotions in Sport*, Human Kinetics, Champaign, pp. 135-156.
- Jackson, S.A. and Eklund, R.C. (2002), "Assessing flow in physical activity: the flow state scale-2 and dispositional flow scale-2", *Journal of Sport and Exercise Psychology*, Vol. 24 No. 2, pp. 133-150.
- Jackson, S.A., Kimiecik, J., Ford, S.K. and Marsh, H.W. (1998), "Psychological correlates of flow in sport", *Journal of Sport and Exercise Psychology*, Vol. 20 No. 4, pp. 358-378.
- Jarry, J.L., Chang, F.M. and La Civita, L. (2017), "Ashtanga yoga for psychological well-being: initial effectiveness study", *Mindfulness*, Vol. 8 No. 5, pp. 1-11.
- Jeter, P.E., Moonaz, S.H., Bittner, A.K. and Dagnelie, G. (2015a), "Ashtanga-based yoga therapy increases the sensory contribution to postural stability in visually-impaired persons at risk for falls as measured by the Wii balance board: a pilot randomized controlled trial", *Plos One*, Vol. 10 No. 6, p. e0129646.
- Jeter, P.E., Slutsky, J., Singh, N. and Khalsa, S.B.S. (2015b), "Yoga as a therapeutic intervention: a bibliometric analysis of published research studies from 1967 to 2013", *The Journal of Alternative and Complementary Medicine*, Vol. 21 No. 10, pp. 586-592.
- Kennedy, P., Brown, P., Chengalur, S.N. and Nelson, R.C. (1990), "Analysis of male and female Olympic swimmers in the 100-meter events", *International Journal of Sport Biomechanics*, Vol. 6 No. 2, pp. 187-197.
- Kim, S., Bemben, M.G. and Bemben, D.A. (2012), "Effects of an 8-month yoga intervention on arterial compliance and muscle strength in premenopausal women", *Journal of Sports Science & Medicine*, Vol. 11 No. 2, p. 322.
- Kim, S., Bemben, M.G., Knehans, A.W. and Bemben, D.A. (2015), "Effects of an 8-month Ashtanga-based yoga intervention on bone metabolism in middle-aged premenopausal women: a randomized controlled study", *Journal of Sports Science & Medicine*, Vol. 14 No. 4, p. 756.
- Lin, K.Y., Hu, Y.T., Chang, K.J., Lin, H.F. and Tsauo, J.Y. (2011), "Effects of yoga on psychological health, quality of life, and physical health of patients with cancer: a meta-analysis", *Evidence-Based Complementary and Alternative Medicine*, Vol. 2011.
- Luu, K. and Hall, P.A. (2016), "Hatha yoga and executive function: a systematic review", *The Journal of Alternative and Complementary Medicine*, Vol. 22 No. 2, pp. 125-133.
- Lynch, R.P. (2016), "Bending and binding: what builds and bounds the Ashtanga yoga community", Senior Honors Projects, 2010-current, p. 202.
- Lyubomirsky, S., Dickerhoof, R., Boehm, J.K. and Sheldon, K.M. (2011), "Becoming happier takes both a will and a proper way: an experimental longitudinal intervention to boost well-being", *Emotion*, Vol. 11 No. 2, p. 391.
- McCall, M.C. (2014), "In search of yoga: research trends in a Western medical database", *International Journal of Yoga*, Vol. 7 No. 1, p. 4.
- Maehle, G. (2007), "Ashtanga yoga: practice and philosophy: a comprehensive description of the primary series of Ashtanga yoga, following the traditional Vinyasa count, and an authentic explanation of the yoga sutra of Patanjali", *Ashtanga Yoga: Practice and Philosophy*, New World Library, Novato, CA.
- Mallinson, J. and Singleton, M. (2017), *Roots of Yoga*, Penguin Random House, United Kingdom.
- Malone, J.C., Cohen, S., Liu, S.R., Vaillant, G.E. and Waldinger, R.J. (2013), "Adaptive midlife defense mechanisms and late-life health", *Personality and Individual Differences*, Vol. 55 No. 2, pp. 85-89.
- Mineo, L. (2017), "Good genes are nice, but joy is better: Harvard study, almost 80 years old, has proved that embracing community helps us live longer, and be happier", *Harvard Gazette*.
- Moadel, A.B., Shah, C., Wylie-Rosett, J., Harris, M.S., Patel, S.R., Hall, C.B. and Sparano, J.A. (2007), "Randomized controlled trial of yoga among a multiethnic sample of breast cancer patients: effects on quality of life", *Journal of Clinical Oncology*, Vol. 25 No. 28, pp. 4387-4395.
- Mohan, A.G. (2010), *Krishnamacharya: His Life and Teachings*, Shambhala Publications, Boulder, CO.
- Nemec, P.B., Swarbrick, M.A. and Merlo, D.M. (2015), "The force of habit: creating and sustaining a wellness lifestyle", *Journal of Psychosocial Nursing and Mental Health Services*, Vol. 53 No. 9, pp. 24-30.

Nichter, M. (2013), "The social life of yoga: exploring transnational flows in India: bodily practice in transcultural perspective", *Yoga Traveling: Bodily Practice in Transcultural Perspective*, Springer Press, Cham.

Paterson, R.E., Redman, S.G., Unwin, R., McElhinney, E., Macphee, M. and Downer, F. (2016), "Non-medical prescribing assessment- an evaluation of a nationally agreed multi method approach", *Nurse Education in Practice*, Vol. 16 No. 1, pp. 280-286.

Phillips, L.L. (2005), "Examining flow states and motivational perspectives of Ashtanga yoga practitioners", Doctoral Dissertations, University of Kentucky, Vol. 336, available at: https://uknowledge.uky.edu/gradschool_diss/336

Rosen, R. (2003), "Here comes the sun", *Yoga Journal*, p. 176.

Ryff, C.D., Singer, B.H. and Love, G.D. (2004), "Positive health: connecting well-being with biology", *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, Vol. 359 No. 1449, pp. 1383-1394.

Seligman, M.E. (2012), *Flourish: A Visionary New Understanding of Happiness and Well-Being*, Simon and Schuster, New York, NY.

Singh, N.N., Lancioni, G.E., Winton, A.S., Wahler, R.G., Singh, J. and Sage, M. (2004), "Mindful caregiving increases happiness among individuals with profound multiple disabilities", *Research in Developmental Disabilities*, Vol. 25 No. 2, pp. 207-218.

Steger, M.F. (2012), "Experiencing meaning in life: optimal functioning at the nexus of spirituality, psychopathology, and wellbeing", in Wong, P.T.P. (Ed.), *The Human Quest for Meaning*, 2nd ed., Routledge, New York, NY, pp. 165-184.

Streeter, C.C., Jensen, J.E., Perlmutter, R.M., Cabral, H.J., Tian, H., Terhune, D.B. and Renshaw, P.F. (2007), "Yoga asana sessions increase brain GABA levels: a pilot study", *The Journal of Alternative and Complementary Medicine*, Vol. 13 No. 4, pp. 419-426.

Waldinger, W. (2015), "What makes a good life? Lessons from the longest study on happiness [video file]", available at: www.ted.com/talks/robert_waldinger_what_makes_a_good_life_lessons_from_the_longest_study_on_happiness

Watanabe, M., Maemura, K., Kanbara, K., Tamayama, T. and Hayasaki, H. (2002), "GABA and GABA receptors in the central nervous system and other organs", *K.W. Jeon Int. Rev. Cytol. International Review of Cytology*, Vol. 213, pp. 1-47, doi: [10.1016/S0074-7696\(02\)13011-7](https://doi.org/10.1016/S0074-7696(02)13011-7).

Whalley, J.B. and Miller, L. (2013), "Look right through: intention and accident in performer/audience training", *Theatre, Dance and Performance Training*, Vol. 4 No. 1, pp. 102-112.

Worthington, V. (1982), *History of Yoga*, Routledge and Kegan Paul, London.

Further reading

Csikszentmihalyi, M. (2000), *Beyond Boredom and Anxiety: Experiencing Flow in Work and Play*, Jossey-Bass, San Francisco.

About the authors

Dr Ben Morris is a Senior Lecturer in Psychology at Leeds Trinity University having previously been a member of the health and social psychology group at the University of Leeds. He holds a BSc (Hons) degree in Psychology from the York St John, an MSc (Psychology) and a PhD (Psychology) awarded by the University of Leeds. He holds a Senior Fellowship from the Higher Education Academy – now Advance HE (SFHEA). His research is specifically in attitude measurement and behaviour change, borrowing much of his theoretical foundations in the theory of planned behaviour and social cognition model tradition. His work covers many health-related behaviours, including diet improvement, physical activity uptake, reducing binge drinking and monitoring smoking rates in adolescent populations. More recently, he has been involved in work looking to assess measurable benefits of alternative forms of exercise, including tai chi and Yoga, and developing strategies to improve recycling rates in the general population. Ben Morris is the corresponding author and can be contacted at: b.morris@leedstrinity.ac.uk

James Jackson is a Chartered Psychologist and an Associate Fellow of the British Psychology Society. Having previously undertaken a degree in Biological Sciences from Heriot-Watt University, James also holds a BSc (hons) degree in Psychology from the University of Sheffield, an MSc in Industrial Psychology from the University of Hull and a PhD (Psychology) from the University of Hull. His doctorate considered the effects of tinnitus on concentration and task performance. He holds a Senior Fellowship from the Higher Education Academy – now Advance HE (SFHEA). James is a member of the Professional Advisor Committee for Tinnitus UK. His research interests include how people cope with their tinnitus, online interventions for tinnitus and the interaction between tinnitus, individual differences (e.g. personality) and physiology (i.e. stress hormones). He is also interested in such topics as 2d:4d digit ratio, “Mental Toughness” and how personality and environment can affect pain tolerance.

Anthony Roberts III holds an MSc in Psychology (awarded from Leeds Trinity University, UK). He is presently enrolled in a Master of Social Work at the University of Western Australia, with a view of practicing as a Clinical Mental Health Social Worker. Anthony holds a Postgraduate Diploma in Sustainability and Climate Policy, as well a Bachelor of Commerce from Curtin University (Western Australia). Prior to pursuing postgraduate education in the Social Sciences, Anthony was a HR executive in the oil and gas Industry. Anthony continues to practice Yoga and mindfulness for his overall mental health.

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: permissions@emeraldinsight.com