

Expectations and effects of a single yoga session on pain perception

Marie-Louise Gander Ferrari¹, Silvia Thuraisingam¹, Roland von Känel^{1,2}, Niklaus Egloff^{1,2}

¹Department of General Internal Medicine, Division of Psychosomatic Medicine, Inselspital, Bern University Hospital, ²Department of Clinical Research, University of Bern, Switzerland

Address for correspondence: Dr. Niklaus Egloff,
Division of Psychosomatic Medicine, Inselspital,
Bern University Hospital, University of Bern, Switzerland.
E-mail: niklaus.egloff@insel.ch

ABSTRACT

Background: Several studies show yoga may benefit chronic pain management. We investigated the effect of a single yoga session on the perception of pain, measured by a standardized pain provocation test in healthy yoga participants while also comparing pain perception to participants' own expectations.

Materials and Methods: Ninety yoga participants were recruited at hatha yoga schools in Switzerland. Pain perception was measured with a standardized algometric pain provocation test; i.e., a calibrated peg was applied for 10 seconds after which the participant rated pain intensity on a 0–10 numerical rating scale. The test was applied to the middle finger, ear lobe, and second toe before and after a 60-minute yoga session.

Results: Sixty out of 90 (66.7%) yoga participants expected a reduced pain perception after the yoga session. However, 36 (40%) participants actually experienced less pain after compared to before the yoga session. But overall, pain perception statistically did not significantly change from before to after the yoga session at any of the three body locations assessed. The expectations and also the previous yoga experience did not significantly influence the participants' pain perception.

Conclusions: Regardless of the high positive expectations on the influence of yoga on pain, a single yoga session does not significantly influence pain perception induced by a pain provocation test. Hypoalgesic effects of yoga should be explained otherwise.

Key words: Algometry; expectation; pain; pain perception; yoga

INTRODUCTION

Numerous studies have shown the effect of yoga on pain perception.^[1,2] Mostly chronic pain patients (lower back pain^[3,4], fibromyalgia^[5], arthritis^[6]) participated in these studies. These studies assessed the effect of yoga over extended periods of time and applied regular yoga sessions once or twice per week. As a general trend, the findings from these studies suggest that yoga has a beneficial effect on chronic pain. A recent study by Do Rosario *et al.*^[7] showed immediate effects of modified yoga


positions on musculoskeletal pain relief in participants with musculoskeletal pain.

It is likely that the benefits of yoga to sufferers of chronic pain are complex and manifold. Potentially involved mechanisms are hormonal changes, changes in neurotransmitters, reduction in muscular tonus, better posture, changes in attitude, and beliefs, and the lowering of anxiety.

Responses to pain are also influenced by expectations and beliefs about pain and the emotional significance attributed to it.^[8,9]

Furthermore, in the realm of sports medicine, there is the notion of exercise having hypoalgesic effects. Specifically, a recent meta-analysis^[10] showed that aerobic, isometric, and dynamic resistance exercise reduced the perception of experimentally induced pain in healthy participants.

Access this article online

Website: www.ijoy.org.in	Quick Response Code 
DOI: 10.4103/0973-6131.158486	

Yoga can be considered a mind body intervention that includes low impact exercise and, as such, yoga can be expected to have an immediate hypoalgesic effect.

Finally, yoga also acts through mental processes on the body's system. Its mindful, meditative way of combining breathing with stretching exercises (asanas) lowers the activity of the stress system; therefore, sensations are perceived in a neutral way, as they are not intensified by emotions. Grant *et al.*^[11] observed the pain sensitivity and analgesic effects of mindful states in Zen Meditators. The results indicate that Zen meditators have lower pain sensitivity and experience analgesic effects during mindful states.

In this theoretical context, our primary hypothesis was that after a single yoga session a reduced pain perception could be objectified by algometry measurement.

As a secondary hypothesis, we assumed that generally the participant's subjective expectation before intervention was to perceive less pain after a single yoga session.

Thirdly, we wanted to quantify the potential correlation of the participant's subjective expectations on the actual pain perception measurement.

MATERIALS AND METHODS

The local ethics committee of Canton Bern, Switzerland, approved the study protocol.

Recruitment and participants

Ninety yoga students were recruited from five renowned hatha yoga schools (Krishna Yoga, Sapta Yoga International, Yoga Langnau, Iyengar Yoga Bern, UniSport Bern) around Bern, Switzerland, between May and July 2011. Each school had about 30 attendees of whom about two-thirds volunteered to participate in this study. To be included, volunteers had to be 18 years or older. All eligible participants completed the study protocol. The second author (S.T.) observed the course and schedule of all yoga sessions, assessed all participants, and measured their pain perception before and after every yoga class. The participants filled in a consent form and a demographic questionnaire. All the participating yoga schools were teaching hatha yoga with mindful awareness, asanas, pranayama, meditation, and also a relaxation part. A yoga session was 60-minutes long.

Expectation

Before the experiment, all participants were asked about their general expectation as to whether a single yoga session would reduce or increase or have no effect on their measured pain perception.

Pain provocation test

Pain perception was measured with a standardized pain provocation test (Algopeg, Annette Kocher, Inselspital Bern) a polypropylene peg, calibrated to a clamping force of exactly 10 Newton at an extension of 5 mm. The use of this standardized pain provocation test has already been demonstrated in earlier studies.^[12,13] The standardized and calibrated peg was clipped on the middle finger, ear lobes, and second toe of both body sides for 10 seconds each. The participant was asked to rate pain immediately after the end of the 10 seconds on a numeric rating scale from 0–10, where 0 signifies “no pain” and 10 “the worst pain imaginable.”

Statistical analysis

All data were analyzed using Statistical Package for the Social Sciences (SPSS) 18.

We calculated the means of the Algopeg measurements from the right and left for each of the three locations; middle fingers, ear lobes, and toes. A t-test was used to compare pain perception scores before and after the yoga session. We further computed a general linear model to investigate whether cofactors such as yoga regularity and experience, as well as gender, age, and mood would influence outcomes.

We used the sign test to compare the actual change in pain scores to those that were expected by the participants.

Expectation (E) was coded as follows:

- 0= Aggravation (i.e. more pain after the yoga session than before)
- 1= Neutral
- 2= Improvement (i.e. less pain after the yoga session than before)

We calculated the change scores (CS) as follows: Pain scores before the yoga session minus pain scores after the yoga session. If a participant experienced less pain after the yoga session, the CS would be positive.

We coded the CS as follows:

- Negative scores =0 (i.e. more pain after the yoga session compared with before)
- Neutral scores =1 (i.e. the same pain before as after the yoga session)
- Positive scores =2 (i.e. less pain after the yoga session compared with before)

RESULTS

The 90 yoga participants were recruited from five hatha yoga schools. Table 1 shows the characteristics of the participants per level of yoga regularity and experience.

Table 1: Participants' characteristics

	Yoga (n=90)	Yoga regularity		Yoga experience	
		More than 2 hours per week (n=29)	Less than 2 hours per week (n=61)	More than 1 year of experience (n=68)	Less than 1 year of experience (n=22)
Female sex (%)	74 (82)	23 (79)	51 (84)	58 (85%)	16 (73)
Age (years)	42.2 (12.0)	43 (9.9)	41.9 (12.8)	43.7 (11.9)	37.6 (10.8)
Age above 50 (%)	21 (23)	8 (28)	13 (21)	17 (25%)	4 (18)
Mood before yoga 0=good mood, 10=bad mood	4.0 (2.1)	3.1 (1.8)	4.4 (2.1)	3.7 (1.9)	4.8 (2.6)
NRS middle finger before yoga	1.8 (1.6)	1.5 (1.2)	1.9 (1.7)	1.8 (1.6)	1.8 (1.6)
NRS middle finger after yoga	1.8 (1.7)	1.6 (1.5)	1.8 (1.7)	1.9 (1.7)	1.5 (1.6)
NRS ear before yoga	5.4 (2.5)	5.1 (2.5)	5.4 (2.6)	5.3 (2.5)	5.5 (2.6)
NRS ear after yoga	5.8 (2.6)	5.9 (2.3)	5.5 (2.7)	5.6 (2.7)	6.0 (2.3)
NRS toe before yoga	2.5 (2.0)	2.3 (1.6)	2.6 (2.1)	2.6 (2.0)	2.0 (1.9)
NRS toe after yoga	2.2 (2.0)	1.8 (1.3)	2.4 (2.2)	2.2 (1.8)	2.2 (2.6)
Expectation					
Aggravation (more pain)	25	8	17	19	6
Neutral	5	1	4	4	1
Improvement (less pain)	60	20	40	45	15

Data are given as means with Std. deviations or absolute number with percentage values, NRS = Numeric rating scale

The paired sample *t*-test comparing the means of the Algopeg before and after the yoga (on middle finger, ear lobe, and toe) did not reveal any significant difference (all $P > 0.05$). There was no significant difference in this outcome between the five different hatha yoga schools (*t*-test).

Moreover, in a general linear model, including experience, regularity, as well as gender, age, and mood as cofactors, no significant differences in the Algopeg measurements before and after the yoga session were found (data not shown in detail).

Sixty out of 90 (66.7%) yoga participants expected before testing to have a reduced pain perception after the yoga session [Table 1]

Only 36–43% (depending on the location) of all the participants actually experienced less pain after one single yoga session [Table 2].

Regarding the 60 participants who expected less pain after the yoga session, [Table 3] shows the actual change scores (CS) of their pain perception.

Among the subgroup of the 60 participants with positive expectation, 18 (30%) experienced more pain after the yoga, 19 (32%) experienced the same pain before and after the yoga, and 23 (38%) actually experienced less pain after the yoga session on their middle finger.

The results of the sign test show overall significant difference on finger ($P < 0.001$) and ear ($P = 0.001$) locations, and a trend toward statistical significance on the toe location ($P = 0.099$) between the expectations of the participant's pain and the actual measurements.

Specifically, there were more participants who—before the yoga session—expected to have less pain after the yoga session, although there was actually no change in the measured pain perception between before and after the yoga.

DISCUSSION

To our knowledge, the effects of a single yoga session on pain perception have not previously been examined in subjects without a pain disorder. Interestingly, before testing, two-thirds (66.7%) of our yoga participants expected to have a lower pain reaction after the yoga session. However, the application of a standardized pain provocation test did not uncover any significant difference in pain perception between before and after a single yoga session. Therefore, our primary hypothesis was not confirmed. This means that the pain reducing effect in chronic pain patients through yoga interventions described in the literature^[1-3] cannot be demonstrated through a single (60 minutes) yoga session in healthy participants. Moreover, the previously reported immediate effects of “sportive” exercise on pain reduction^[10] could not be found following a single yoga session. The pain-reducing effects of yoga in studies where participants practiced over a longer period of time might therefore have mechanisms that are different from those underlying an immediate analgetic effect.

In all interventions aimed at reducing pain, the placebo effect of expectation should be considered.^[11] In order to include such a potential confounding factor through positive expectation, we assessed the participant's expectation before testing. As suspected in our second hypothesis, the majority of yoga practitioners (66.7%) expected a pain-reducing effect of the yoga session. However in our study, there was no correlation between these expectations and the actual change in pain perception.

Table 2: The actual change in score of the pain measurements at the three locations

(n=90)	Negative CS: More pain (%)	Zero, no change (%)	Positive CS: less pain (%)
Middle finger	26 (29)	28 (31)	36 (40)
Ear	46 (51)	12 (13)	32 (36)
Toe	26 (29)	25 (28)	39 (43)

CS = Change scores

Table 3: Subgroup of the participants with positive expectation (less pain after a single yoga session)

(n=60)	Middle finger (%)	Ear (%)	Toe (%)
Negative CS: More pain	18 (30)	31 (52)	17 (28)
Neutral CS: No change	19 (32)	6 (10)	15 (25)
Positive CS: Less pain	23 (38)	23 (28)	28 (4)

CS = Change scores

This suggests that the general expectation did not have a strong influence on the actual algometric measurements in our study. However, it should be acknowledged that there is literature to show that expectation is able to influence perception of experimentally induced pain.^[9] Also, our results might have been different if we had obtained expectation scores after the post reading of pain rather than before.

For about one-third of the participants in our study who expected a positive effect of the yoga on pain perception, we actually recorded increased pain perception within the scope of a single yoga session. One reason for this could be that through positive expectations the total awareness of our body sensations and mental state could be increased.^[14] Therefore, shortly after a yoga session, a pressure sensation of an Algopeg can even be perceived more intensively than before yoga.

Our study included participants from five different European hatha yoga schools. Whether the results of these single session interventions are generalizable, remains to be proven. According to our results, however, we assume that the well-documented pain reducing effect of long-term yoga in literature cannot be compared to the spectra of short-time mechanisms as demonstrated in this study.

CONCLUSION

Regardless of the high positive expectations of the participants, this study showed that a single yoga session

did not significantly affect provoked pain perception. The positive impact of yoga on pain perception described in other yoga studies that were executed over a longer period of time must be due to other reasons than expectation or an immediate analgesic effect induced by exercise.

REFERENCES

- Büssing A, Ostermann T, Lütke R, Michalsen A. Effects of yoga interventions on pain and pain-associated disability: A meta-analysis. *J Pain* 2012;13:1-9.
- Posadzki P, Ernst E. Yoga for low back pain: A systematic review of randomized clinical trials. *Clin Rheumatol* 2011;30:1257-62.
- Posadzki P, Ernst E, Terry R, Lee MS. Is yoga effective for pain? A systematic review of randomized clinical trials. *Complement Ther Med* 2011;19:281-7.
- Kelly Z. Is yoga an effective treatment for low back pain: A research review. *Int J Yoga Therap* 2009;19:103-12.
- Curtis K, Osadchuk A, Katz J. An eight-week yoga intervention is associated with improvements in pain, psychological functioning and mindfulness, and changes in cortisol levels in women with fibromyalgia. *J Pain Res* 2011;4:189-201.
- Haaz S, Bartlett SJ. Yoga for arthritis: A scoping review. *Rheum Dis Clin North Am* 2011;37:33-46.
- do Rosario JL, Orcesi LS, Kobayashi FN, Aun AN, Diolindo Assumpacao IT, Blasioli GJ, *et al.* The immediate effects of modified yoga positions on musculoskeletal pain relief. *J Bodyw Mov Ther* 2013;17:469-74.
- Main CJ, Foster N, Buchbinder R. How important are back pain beliefs and expectations for satisfactory recovery from back pain? *Best Pract Res Clin Rheumatol* 2010;24:205-17.
- Fiorio M, Recchia S, Corra F, Simonetto S, Garcia-Larrea L, Tinazzi M. Enhancing non-noxious perception: Behavioural and neurophysiological correlates of a placebo-like manipulation. *Neuroscience* 2012;217:96-104.
- Naugle KM, Fillingim RB, Riley JL 3rd. A meta-analytic review of the hypoalgesic effects of exercise. *J Pain* 2012;13:1139-50.
- Grant JA, Rainville P. Pain sensitivity and analgesic effects of mindful states in zen meditators: A cross-sectional study. *Psychosom Med* 2009;71:106-14.
- Egloff N, Klingler N, von Känel R, Camara RJ, Curatolo M, Wegmann B, *et al.* Algometry with a clothes peg compared to an electronic pressure algometer: A randomized cross-sectional study in pain patients. *BMC Musculoskelet Disord* 2011;12:174.
- Egloff N, Cámara RJ, von Känel R, Klingler N, Marti E, Gander Ferrari ML. Hypersensitivity and hyperalgesia in somatoform pain disorders. *Gen Hosp Psychiatry* 2014;36:284-90.
- Mackenzie MJ, Carlson LD, Paskevich DM, kkekakis P, Wurz AJ, Wytmsa K, *et al.* Associations between attention, affect and cardiac activity in a single yoga session for female cancer survivors: An enactive neurophenomenology-based approach. *Conscious Cogn* 2014;27:129-46.

How to cite this article: Ferrari MLG, Thuraisingam S, Känel Rv, Egloff N. Expectations and effects of a single yoga session on pain perception. *Int J Yoga* 2015;8:154-7.

Source of Support: Nil, **Conflict of Interest:** None declared