

Is there a link between flow and meditation?

Joshua N. Pritikin

Department of Psychology
University of Virginia

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Flow a.k.a. Optimal Experience

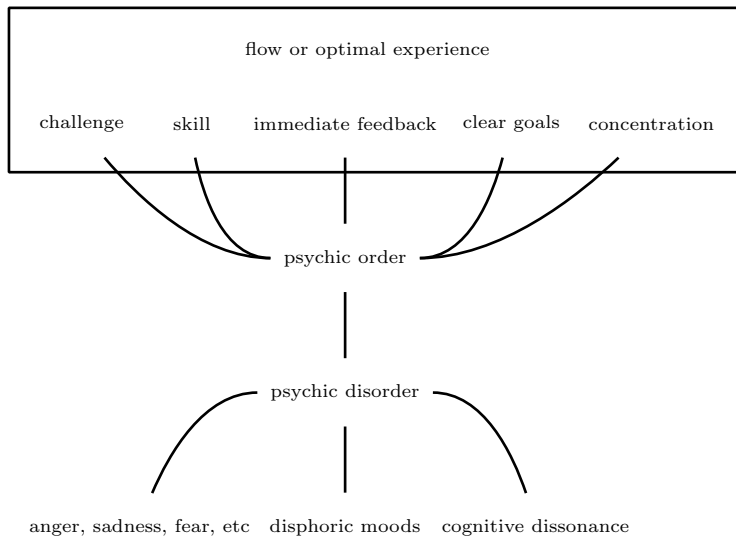
Flow is an intrinsically rewarding experience in which a person is absorbed in the optimal performance of an activity.

Flow can occur in diverse contexts (Csikszentmihalyi, 1991)¹

- ▶ Music performance
- ▶ Reading
- ▶ Writing
- ▶ Mountain climbing
- ▶ Japanese motorcycle gangs
- ▶ etc

¹Csikszentmihalyi is pronounced “C-Z”





Csikszentmihalyi (1991, p. 103) suggested that yoga is “one of the oldest and most systematic methods of producing the flow experience,” in the sense of facilitating flow in other activities besides yoga/meditation (cf. Csikszentmihalyi, 1988, p. 31).

There is little outward commonality between stereotypical yogic practices and the diverse activities in which flow has been found.

What aspect of yoga/meditation might facilitate flow?



Meditation means two different things!

Because of a limitation in our vocabulary, the West refers to the simple psychological centering devices, the preliminary steps, as “meditation.” We therefore give the same name to the techniques used to produce meditation as we do to the end state itself. According to the great meditative traditions, however, the centering techniques are not meditation. They are simply means toward the goal—which is meditation. These techniques are therefore more or less interchangeable, and the advanced practitioner will eventually discard all of them when he can achieve meditation directly. (Carrington, 1977, pp. 8–9)

Hence, *meditation* means:

- ▶ Psychological centering devices
- ▶ Experience of complete mental silence or thoughtless awareness



Psychological centering devices are a dime a dozen (mantra, breathing focus, visual focus, mindfulness, etc). Of interest here is complete mental silence.

The notion of thoughtless awareness is found in widely translated, centuries old books such as the Mahabharat, Upanishads, Yoga Sutras of Patanjali, and Gyaneshwari (Manocha, 2009, pp. 93–94).

Complete mental silence is an experience in which one is no longer is thinking and no longer feels the urge to continuously engage in thought. The experience occurs in a normal waking state; thoughtless awareness is not similar to sleeping or unconsciousness.



Can thoughtless awareness be a component of or itself a flow experience?

- ▶ **Challenge/Skill** A naive thought suppression approach fails (Wegner, 2003). However, Manocha (2000) reported that participants in his Meditation Research Program “consistently describe the ability to achieve this experience” (p. 1137). Perhaps with the appropriate training, the challenge of thoughtless awareness can be made navigable.
- ▶ **Clear goal/Immediate feedback** Yes
- ▶ **Concentration** Without engrossment in thoughtless awareness, thinking is bound to resume.

Can meet the basic conditions of flow experience but ... ?



Thoughtless awareness has not been studied

- ▶ PsysNET searches for “thoughtless awareness” or “mental silence” turn up nothing.
- ▶ In a collection of 13 scales related to spiritual and religious experience, no attempt was made to measure “thoughtless awareness” (Fetzer Institute/National Institute on Aging Workgroup, 1999).
- ▶ In two recent reviews of the state of the research on meditation/mindfulness, the possibility of thoughtless awareness or mental silence was not even acknowledged (Shapiro, 2009; Baer & Lykins, 2011).

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Thoughtless awareness has not been studied

- ▶ No glossary entry found in reference works on positive psychology and the psychology of religion (Pargament, 1997; Peterson & Seligman, 2004; Snyder & Lopez, 2009; Sheldon, Kashdan, Kashdan, & Steger, 2011).
- ▶ In comparison, extrasensory perception has attracted 2-3 orders of magnitude more scientific studies (Lau, 2004).

A potentially vital component of flow has not received any psychological scrutiny.



Maximum Likelihood

We would like to select the most likely model given the data.

$$\max p(\textit{Model}|\textit{Data})$$

However, what maximum likelihood does is maximize the probability of the data given a model.

$$\max p(\textit{Data}|\textit{Model})$$

Bayes' theorem tells us that

$$\max p(\textit{Model}|\textit{Data}) = \frac{p(\textit{Data}|\textit{Model})p(\textit{Model})}{p(\textit{Data})}$$

Since $p(\textit{Data})$ is constant, maximum likelihood will choose the most likely model only if $p(\textit{Model})$ is roughly equal for all candidate models.



Let's conduct a survey!

Some hypotheses:

- ▶ Intuitive or accidental thoughtless awareness is not uncommon.
- ▶ Thoughtless awareness occurs outside the context of meditation.
- ▶ Flow and complete mental silence will be judged as similar relative to some other obvious comparisons.
- ▶ Differential item functioning (DIF): Has received any training in meditation? By education? Trying to intend complete mental silence or not?



Let's conduct a survey!

Questionnaire sections:

- ▶ Biographical information
- ▶ Familiarity with complete mental silence (a.k.a. thoughtless awareness)
- ▶ Complete mental silence in context
- ▶ How is thoughtless awareness related to flow
- ▶ Supplemental questions²

²Omitted in this report.



Biographical information

Age?

Sex? Male/Female

Highest level of education attained?

- ▶ High school
- ▶ College degree
- ▶ Graduate degree

What is your current profession / occupation? (free text)

Have you pursued any training in meditation? Yes/No

If so, what kind of meditation do you practice currently? (free text)



Familiarity with complete mental silence

Of interest are your recent experiences of complete mental silence (within the last year or so).

On a 3-point Likert scale from *agree* to *disagree*, rate:

- ▶ The notion of complete mental silence does not make sense
- ▶ I doubt that complete mental silence is possible for anybody
- ▶ I doubt that complete mental silence is possible for myself
- ▶ I have experienced complete mental silence accidentally
- ▶ I have intentionally experienced complete mental silence
- ▶ I am certain that complete mental silence is possible for anybody



Context of complete mental silence

On a 5-point Likert scale from *important* to *not important*, rate:

- ▶ Is complete mental silence an important component of religion?
- ▶ ... of problem solving?
- ▶ ... of spiritual practice?
- ▶ ... of relaxation?
- ▶ ... of daydreaming?
- ▶ ... of meditation?
- ▶ ... of physical exercise?



Relationship to flow

Needs more brainstorming ...

- ▶ List a favorite flow activity: *text*
- ▶ Would complete mental silence help prepare you for your flow activity?
- ▶ Would flow activity help prepare you for complete mental silence?
- ▶ Do you experience complete mental silence during your flow activity?
- ▶ How similar are complete mental silence and your flow activity?
- ▶ *What else?*



Item Response Theory – Partial Credit Model

The Generalized Partial Credit Model (GPCM) model can be expressed in terms of the unconditional probability of each response $0, 1, \dots, m_i$ of person j 's attempt at item i . That is,

$$\sum_{h=0}^{m_i} P_{ijh} = 1.$$

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Item Response Theory – Partial Credit Model

The probability of person j scoring x on item i is

$$\forall x \in \{0, 1, \dots, m_i\}, \quad P_{ijx} = \frac{\exp \left[\sum_{k=0}^x \alpha_{ik} (\theta_j - \delta_{ik}) \right]}{\sum_{h=0}^{m_j} \left[\exp \sum_{k=0}^h \alpha_{ik} (\theta_j - \delta_{ik}) \right]}$$

where θ_j is person j 's trait level, δ_{ik} is the difficulty of the item i at category k , α_{ik} is the discrimination of the item i at category k , and
...



Item Response Theory – Partial Credit Model

...summing across all persons j , item parameters α and δ are centered at zero

$$\sum_j \alpha_{ij}(\theta - \delta_{ij}) \equiv 0.$$

Unfortunately, no **R** implementation of GPCM is working well enough yet. Data were analyzed using the **eRm** package (Mair, Hatzinger, & Maier, 2011), fixing $\alpha = 1$. This is parameterization of GPCM is equivalent to the Partial Credit Model.



Create fake data

```
1  sim.categorical <- function(person, item, discr, levels) {
2    pick <- rnorm(length(person), person - item, sd=discr)
3    return(apply(as.matrix(pick), c(1), function (p) { sum(p > levels) })))
4  }
5  sim.familiar <- function(person, item, discr) {
6    sim.categorical(person, item, discr, qnorm(c(.2,.8))) }
7  sim.context <- function(person, item, discr) {
8    sim.categorical(person, item, discr, qnorm(c(.05,.3,.7,.95))) }
9  cms <- data.frame(
10   notSense=sim.familiar(cms.latent$familiar, -2, .8),
11   possAny=sim.familiar(cms.latent$familiar, -1.5, 1.6),
12   possMyself=sim.familiar(cms.latent$familiar, -1, 1.1),
13   accident=sim.familiar(cms.latent$familiar, 0, 1.3),
14   intention=sim.familiar(cms.latent$familiar, 1, .6),
15   certain=sim.familiar(cms.latent$familiar, 1.5, .9),
16
17   cxReligion=sim.context(cms.latent$familiar, 0, 1.5),
18   cxSolving=sim.context(cms.latent$familiar +
19     unclass(cms.latent$edu)/3, 0, .8),
20   cxSpirit=sim.context(cms.latent$familiar, -.5, 1.3),
21   cxRelax=sim.context(cms.latent$familiar, 0, 1.5),
22   cxDaydream=sim.context(cms.latent$familiar, 1, .9),
23   cxMeditate=sim.context(cms.latent$familiar, -1, 1.5),
24   cxExercise=sim.context(cms.latent$familiar, 0, 1.7))
```



Demographics

Participants consisted of 200 fake Charlottesville residents with 24% having some training in meditation/yoga.

Education	
high school	54
college	72
graduate	74

Other demographic data were not fabricated.



Model fits

Subscales:

- ▶ Familiarity with complete mental silence

Conditional log Lik.: -424.5144 (df=11)

Single dimension, 1st eigenvalue of residual = 1.55³

- ▶ Context of complete mental silence

Conditional log Lik.: -1268.085 (df=27)

Single dimension, 1st eigenvalue of residual = 1.43

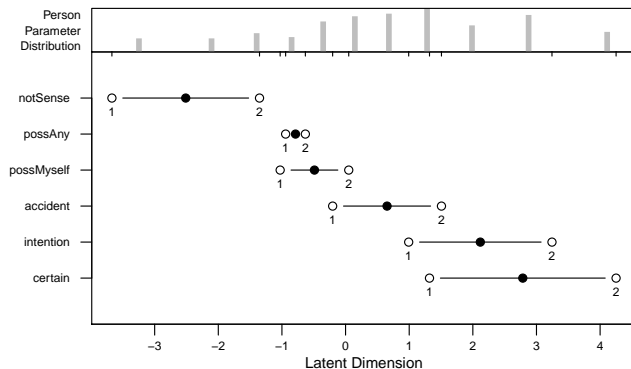
- ▶ Relationship to flow

Not simulated

³The threshold for 100 persons and 20 items is 1.74 (Raiche, 2005).



Familiarity with thoughtless awareness



Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-5.02	-1.00	-0.20	0.33	1.31	5.57

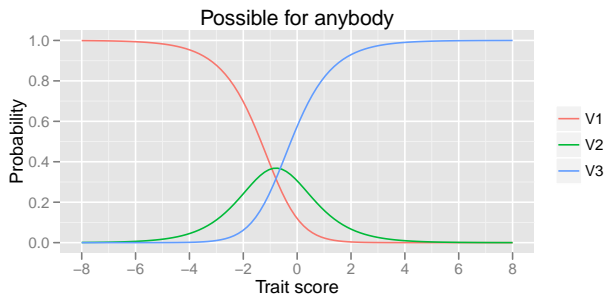


Item fit sorted by Infit MSQ.

	Outfit MSQ	Outfit t	Infit MSQ	Infit t
notSense	0.44	-2.35	0.62	-4.21
intention	0.62	-3.69	0.69	-4.99
certain	0.67	-2.68	0.73	-4.14
possMyself	0.7	-2.21	0.87	-1.81
accident	0.99	-0.11	0.94	-0.86
possAny	1.17	0.9	1.05	0.61
Mean (SD)	0.76 (0.26)		0.82 (0.16)	

Liberal acceptable range for MSQ 1.4-0.6





Data for this item had the most variance (and underfit), simulating an item that was not answered very consistently with respect to latent trait level.





Data for this item was the most overfit for both infit and outfit.



Summary of person parameters:

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-3.25	-0.35	0.68	0.79	1.99	4.11



Person fit sorted by Infit MSQ.

	Outfit MSQ	Outfit t	Infit MSQ	Infit t
P3	0.10	-0.46	0.14	-2.01
P34	0.10	-0.46	0.14	-2.01
P36	0.10	-0.46	0.14	-2.01
P44	0.10	-0.46	0.14	-2.01
P72	0.10	-0.46	0.14	-2.01
P40	1.92	1.93	2.31	2.82
P83	2.27	1.64	2.67	2.91
P195	1.31	0.86	2.72	2.66
P172	4.03	3.71	2.78	3.39
P197	2.12	1.46	3.62	3.51

Liberal acceptable range for MSQ 1.4-0.6. Clearly there are some crazy people here.



A likely response pattern:

	notSense	possAny	possMyself	accident	intention	certain
3	2	2	2	2	1	1

Some unlikely response patterns:

	notSense	possAny	possMyself	accident	intention	certain
121	2	0	2	2	0	0
40	2	2	0	2	0	1
83	2	2	1	2	0	2
195	2	2	2	2	0	2
172	2	0	2	2	1	1
197	0	2	0	0	0	0

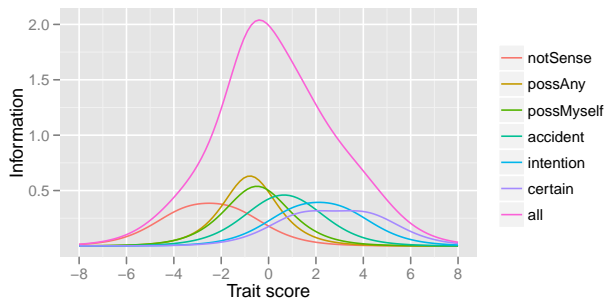


Participants with training in meditation were suppose to have somewhat higher trait scores.

Andersen LR = 10.47, $df = 9$, $p = 0.31$.

	without	with	with-without
possAny.c1	1.52	0.50	-1.02
possAny.c2	2.75	2.09	-0.65
possMyself.c1	1.53	1.41	-0.12
possMyself.c2	2.07	2.34	0.27
accident.c1	0.71	1.20	0.48
accident.c2	-0.02	0.03	0.05
intention.c1	-0.42	-0.04	0.38
intention.c2	-3.49	-1.82	1.66
certain.c1	-0.68	-0.67	0.01
certain.c2	-3.98	-5.04	-1.06

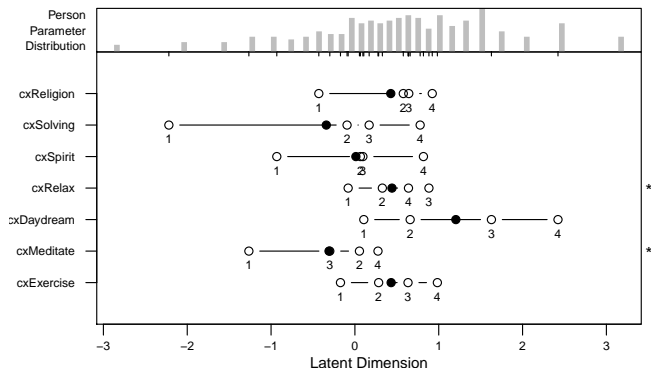




The information curve spans a reasonably wide range of trait scores.

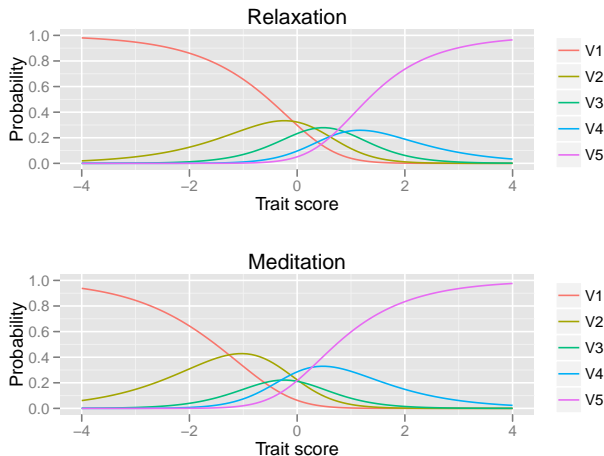


Context of thoughtless awareness



Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-2.31	-1.22	0.05	0.02	0.78	4.82





Thresholds are out of order. This is bad. If the same thing is seen in real data then there are too many response options or the item needs refinement.



Item fit sorted by Infit MSQ.

	Outfit MSQ	Outfit t	Infit MSQ	Infit t
cxSolving	0.65	-5.17	0.68	-5.57
cxDaydream	0.7	-4.73	0.72	-4.8
cxMeditate	0.81	-2.09	0.79	-3.04
cxRelax	0.98	-0.19	0.97	-0.45
cxSpirit	1.08	1.03	0.99	-0.12
cxReligion	1.09	1.14	1.04	0.68
cxExercise	1.15	1.92	1.06	1.02
Mean (SD)	0.92 (0.2)		0.89 (0.16)	

Liberal acceptable range for MSQ 1.4-0.6



Summary of person parameters:

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-2.84	0.08	0.64	0.62	1.16	3.17



Person fit sorted by Infit MSQ.

	Outfit MSQ	Outfit t	Infit MSQ	Infit t
P45	0.04	-5.38	0.04	-5.60
P180	0.08	-3.81	0.06	-4.25
P18	0.14	-3.26	0.11	-3.64
P175	0.17	-4.04	0.17	-4.00
P89	0.22	-3.40	0.20	-3.67
P96	2.15	2.23	2.00	2.03
P4	1.93	1.46	2.02	1.68
P82	1.82	1.85	2.14	2.49
P67	2.78	2.86	2.36	2.38
P116	3.07	3.74	2.52	3.11

Liberal acceptable range for MSQ 1.4-0.6. Again there are some crazy people here.



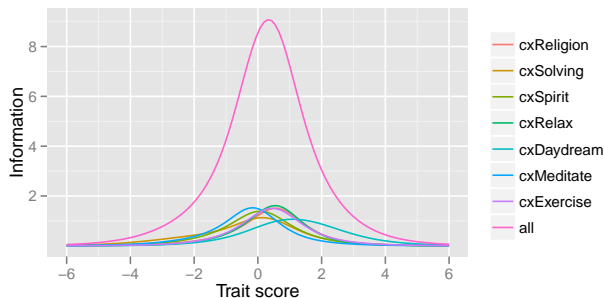
Some likely response pattern:

	cxReligion	cxSolving	cxSpirit	cxRelax	cxDaydream	cxMeditate	cxExercise
45	2	3	3	2	1	3	2
180	3	3	3	3	2	3	3
18	1	2	1	1	0	2	1

Some unlikely response patterns:

	cxReligion	cxSolving	cxSpirit	cxRelax	cxDaydream	cxMeditate	cxExercise
82	0	4	4	4	2	4	4
67	3	1	0	0	0	0	0
116	4	4	0	4	2	4	4





At least with this fake data, the information curve is somewhat compressed between -2 and 2. If this happens with real data, it may be worth considering other questions to better measure the extremes of the trait.



The next step: collect real data.



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