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Spiritual boredom: A longitudinal study on antecedents and effects of boredom
in the yoga context

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Abstract

Spiritual boredom, a relatively unexplored phenomenon, has emerged as a significant area of interest in understanding the emotional dynamics of spiritual practices such as yoga. This study investigates the longitudinality of the antecedents and longitudinal effects of boredom within the context of yoga practice, employing the Control-Value Theory (CVT) as a theoretical framework. Specifically, it examines how overchallenge, underchallenge, and valence influence the experience of boredom and its subsequent impact on motivation for future yoga sessions. Using an experience sampling method (ESM) approach, data were collected from 221 participants over multiple yoga sessions (956 observations). Results indicate in line with our hypothesis that underchallenge and low valence significantly predict higher levels of boredom, while overchallenge does not show a direct effect contrary to the hypothesis that overchallenge would lead to higher levels of boredom. Contrary to previous hypothesis boredom did not predict motivation for subsequent sessions. These findings highlight the importance of designing yoga practices that balance challenge levels and enhance perceived value to mitigate boredom and sustain motivation. This research contributes to the growing field of spiritual boredom studies and offers practical implications for yoga instructors and practitioners.

Zusammenfassung

Spirituelle Langeweile, ein relativ unerforschtes Phänomen, hat sich zu einem wichtigen Forschungsgebiet entwickelt, das darauf abzielt, die emotionale Dynamik spiritueller Praktiken wie Yoga besser zu verstehen. Diese Studie untersucht die Längsschnittlichkeit der Antezedenzen von Langeweile sowie Längsschnittwirkungen von Langeweile im Kontext der Yoga-Praxis und verwendet dabei die Kontroll-Wert-Theorie (CVT) als theoretischen Rahmen. Konkret wird untersucht, wie Überforderung, Unterforderung und Valenz das Erlebnis von Langeweile und dessen Auswirkungen auf die Motivation für zukünftige Yoga-Sitzungen beeinflussen. Unter Verwendung der Experience Sampling Methode (ESM) wurden Daten von 221 Teilnehmer*innen über mehrere Yoga-Sitzungen hinweg gesammelt (956 Beobachtungen). Die Ergebnisse stimmen mit unserer Hypothese überein, dass Unterforderung und geringe Valenz signifikant höhere Langeweile vorhersagen, während Überforderung keinen direkten Effekt zeigt, entgegen der Hypothese, dass Überforderung zu höherer Langeweile führen würde. Im Gegensatz zu früheren Untersuchungen sagte Langeweile die Motivation für nachfolgende Sitzungen nicht voraus. Diese Ergebnisse unterstreichen die Bedeutung der Gestaltung von Yoga-Übungen, die ein Gleichgewicht zwischen Herausforderungsniveau und wahrgenommenem Wert herstellen, um Langeweile zu verringern und die Motivation aufrechtzuerhalten. Diese vorliegende Forschung leistet einen Beitrag zum wachsenden Forschungsfeld der spirituellen Langeweile und bietet praktische Implikationen für Yoga-Lehrende und -Praktizierende.

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Introduction

“Yes that's what it is: an oratorio.

Thought it was a mass. That sort of thing belongs in church.

Besides, the advantage that church has, is that you can leave whenever you want to.

Wish I were sitting on the aisle! Steady, steady! Even oratorios end some time.

Perhaps this one's very beautiful, and I'm just in the wrong mood.

[...] I suppose he notices how bored I am and that I don't belong here.”

(Lieutenant Gustl by Arthur Schnitzler, 1901)

The research regarding boredom has leapt in the last one and a half decades. There are many reasons for this jump in research interest, which are connected to the adverse outcomes of boredom. Boredom affects physical and mental health and performance in various fields of life and reduces motivation. Boredom research has been happening in many fields of psychology research, but is now also moving to boredom in spiritual practices.

In many societies worldwide, spiritual practices have a long and rich history and are often deeply embedded into the culture (Knoblauch, 2010). Nevertheless, being bored during spiritual or religious practice hinders the positive effects of the practice and becomes a problem for many people looking for meaning (van Tilburg et al., 2019). Research regarding spiritual boredom is starting to develop and tries to find out why people get bored during a spiritual practice, even though they take part voluntarily in spiritual practices and seek deeper meaning in life (Goetz et al., 2025). According to the Control-Value Theory (CVT) proposed by Pekrun (2006, 2024), activities that are perceived as either overchallenging or underchallenging, or that are appraised as having low value, are likely to elicit boredom. Intuitively, spiritual practice was believed not to match any of those descriptions, but still, there is beginning to form evidence that boredom can occur in spiritual practice.

One spiritual practice that has surfaced in Western societies over the past few years is yoga, a practice rooted in India but practised worldwide (Cramer et al., 2016). Many practitioners, either students or teachers, adopt yoga for exercise, e.g. getting into shape, flexibility and stress relief. However, over time, for many teachers and students, those reasons shifted to a more spiritual approach. Park et al. (2016) found that 62 percent of students and 85 per cent of teachers changed their primary reason for doing yoga from the above-mentioned reasons to spirituality.

Looking at most yoga practices instructed by a teacher or some other form of outside input (e.g., YouTube videos), it becomes clear that yoga is often not individualised, which can

lead to being over- or under-challenged and consequently to boredom. Through repetition and memberships in yoga studios, value could decrease over time if the yoga practice becomes routine or the external obligation from a membership to a yoga studio or a gym, which could take away the initial value.

This research investigates how boredom, as conceptualized by the (CVT), is experienced during the spiritual practice of yoga, and whether its proposed antecedents—namely, non-optimal levels of control (i.e., overchallenge and underchallenge) and low value appraisals—are associated with the experience of boredom.. In addition, it is of interest to know how the relationship between boredom and motivation for the next yoga session is within the CVT framework. To better understand the relationship between boredom and motivation over time, this study uses a longitudinal experience sampling design to consider the longitudinal effects of multiple yoga sessions.

It can be assumed from previous research (Goetz et al., 2025) that during yoga practice, the environment could lead to the antecedents of boredom, which could further lead to spiritual boredom. A bad fit of the instruction material or the instructor of the yoga session with the skills of the yoga practitioners could lead to over- or underchallenge, as well as a reduction in value, primarily through repetitiveness. As previously mentioned, having a membership at a yoga studio can also influence motivation to attend additional yoga sessions. Both could lead to spiritual boredom and a loss of motivation for further yoga practice. Spiritual boredom hinders yoga practitioners in their search for meaning in life and prevents them from the multiple health benefits of yoga (Cramer et al., 2016; Domingues, 2018; Kamradt, 2017; Szaszko et al., 2023). Using intensive longitudinal methods combined with mediation analysis, this study aims to provide a clearer understanding of how boredom antecedents and the experience of boredom influence motivation for continued yoga practice. This study, as an extension of the spiritual boredom field established in early 2025, provides initial evidence that the CVT and boredom can also be applied to the context of spiritual practice (Goetz et al., 2025).

In summary, this master's thesis should provide further insight into the mechanisms of control and value on boredom and its impact on motivation for further yoga sessions. Yoga instructors could use the results to refine their practice, avoid creating spiritual boredom for the yoga practitioners, and keep them motivated.

Theoretical Background

Boredom as an Emotion

Boredom has captivated artists and philosophers for centuries and features prominently in many literary classics. From Seneca's reflections on the human condition (quoted in Danckert & Eastwood, 2020) to Goethe's Faust, who, despite attempts at spiritual practice, makes a pact with the devil to overcome his boredom (Goethe, 1808). In Arthur Schnitzler's *Lieutenant Gustl* (Schnitzler, 1901), which is referenced in the opening quote of this text, the protagonist experiences boredom during a church concert. This boredom leads him into escalating inner turmoil and eventually a serious conflict with another person. This example highlights how boredom is not merely a passive state of disengagement but can act as a catalyst for significant psychological and interpersonal consequences. These are only two examples of the vast body of works from the arts and humanities addressing boredom and its effects on humans. On the other hand, empirical research has long ignored boredom and its impact (Raffaelli et al., 2018; Smith, 1981) despite being included in empirical and theoretical work (e.g., Deci et al., 1994). This has changed over the last couple of years, with the foundation of the International Society of Boredom Studies, the launch of the *Journal of Boredom Studies*, and a vast body of research.

In this study, the focus is on the component process model of emotions, which states that emotions are best understood by the underlying processes (Lewis, 2000; Scherer & Moors, 2019). From this theory, boredom can be characterised by four components: affective (an unpleasant, aversive feeling), cognitive (altered perception of time, mind wandering), motivational (a desire to leave or change the current situation), and physiological/expressive (looking tired, low arousal in general) (Bieleke et al., 2024).

Emotions can also be categorised via the circumplex model of affect (Feldman Barrett & Russell, 1998; Pekrun et al., 2018) , which is depicted in Figure 1.

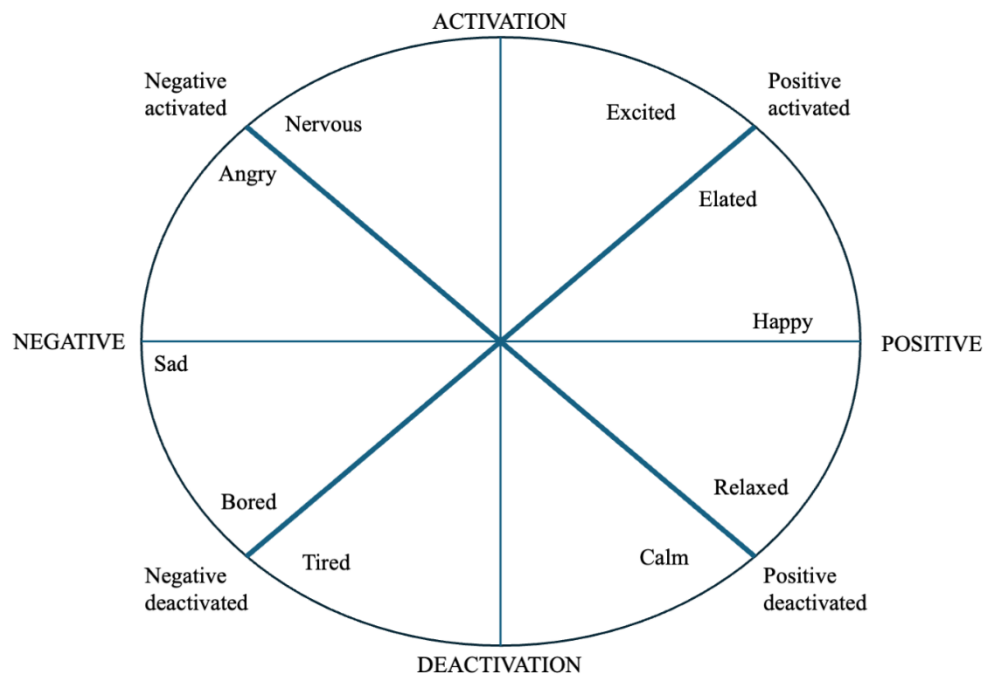


Figure 1 Affective circumplex adapted from Pekrun et al., (2018)

Affect refers to moods and emotions in the emotion research literature. Positive and negative affect contain positive and negative emotions, for example, excitement and joy for positive emotions, and anger and anxiety for negative emotions. Activation also plays a vital role in the categorisation of emotions. Activating emotions, such as anger, has a physiological component involving symptoms like increased heart rate, respiration, and sweating. These are all examples of physiological activating processes which prepare the body for quick reaction. In contrast, physiological deactivating processes prepare the organism for rest. A good example is boredom, which has a deactivating effect where the mind drifts away and the person has difficulty focusing on a task and staying awake (Pekrun et al., 2018).

State versus Trait Boredom

Boredom can be categorized by the context in which it is experienced, as well as by the general tendency to be bored. The general tendency is referred to as trait boredom or boredom proneness, while the boredom experienced in the moment, which may not usually occur in a specific context, is called state boredom (Fahlman et al., 2013; Sung et al., 2021; Westgate & Wilson, 2018). Trait Boredom, which should be mentioned briefly even though it is not part of this research, is characterised as a tendency to be bored, independent of the situation. Although one could argue that stable boredom tendencies could be present in specific situations (Pekrun et al., 2010). Trait boredom has been studied in more detail and is

often described as a personality trait or a tendency towards boredom (Vogel-Walcutt et al., 2012). In recent developments, trait boredom has been categorised not as a proneness to boredom but rather as an attention or repeated self-regulatory failure, often leading to boredom. Also, trait boredom could come from the affective and behavioural consequences of experiencing life as boring (Bieleke et al., 2021). Trait boredom is also frequently connected to problematic behaviour, including a higher likelihood of addictive behaviours, gambling and the seeking of constantly new stimuli to avoid boredom (Struk et al., 2017; Sung et al., 2021).

Central to the current study is state boredom, which is directly tied to the situation one is currently experiencing. In contrast to trait boredom, state boredom is more likely to change within a given context and, therefore, harder to measure reliably (Vogel-Walcutt et al., 2012; Westgate & Wilson, 2018). State boredom can also be characterised as how boring a person experiences a situation (Mills & Christoff, 2018). A measure of state boredom might yield different outcomes depending on the context—for instance, evaluating how boring a yoga session seems (e.g., repeating a simple sequence of poses) versus how bored a person feels (e.g., not bored at all because they might find the session calming or use the time to reflect and practice mindfulness).

Control Value Theory and boredom

Two frequently used constructs in boredom research are inappropriate levels of perceived control (too much control and too little control) and lack of perceived value. These constructs are also essential to the Control Value Theory (CVT) (Pekrun, 2006, 2024), initially meant for achievement emotions and researched extensively in academic contexts (e.g., Goetz, et al., 2023). CVT is more and more becoming a general theory for explaining emotions and their antecedents (Pekrun, 2024). CVT established general assumptions about the antecedents of boredom, the perceived personal control, and the value of the activity, which are the most important antecedents identified by research surrounding CVT and boredom (Pekrun & Goetz, 2023). This generalisation and broadening of the theory from achievement emotions to a more general emotion theory makes it possible to assume that the antecedents of emotions are rather context-independent.

Nevertheless, it is important to note that the spiritual practice of yoga is quite different from the achievement contexts previously examined. However, it could still be argued that spiritual practices including yoga practice are similar to some academic settings that are not solely focused on achievement. For some people who practice yoga, there could be an achievement component when it comes to mastering the different postures, which can be

difficult. It can be presumed that the principles outlined in the CVT are also applicable to the context of yoga practice, despite the environmental differences compared to most academic settings.

Perceived control is the perceived causal influence over the situation a person is in (Skinner, 1996).

According to CVT, the relationship between control and spiritual boredom should be curvilinear; higher levels of boredom should be experienced when the perceived control is either high or low. This aligns with the initial spiritual boredom research (Goetz et al., 2025) and boredom research in general, which attributes boredom to an unfit environment for the person's skills (Cziksentmihalyi, 1990; Westgate & Wilson, 2018). Recent studies have shown that boredom can occur in situations with high and low perceived control.

Perceived value refers to a situation's meaning and relevance, including actions and outcomes (Pekrun, 2006). According to CVT, there is a negative relationship between value and boredom. Given the universality of CVT, we can also assume that this relationship is true in the context of spirituality. So it can be assumed that spiritual boredom during yoga is negatively related to all facets of valence (e.g., intrinsic, extrinsic; Gaspard et al., 2015). Previous studies showed in other contexts that boredom and various types of valence are negatively correlated (Goetz et al., 2006; Pekrun et al., 2010, 2011). Since yoga practice is visited voluntarily, the valence is usually perceived as high, either because one is searching for a higher meaning or wants to profit from other positive effects of yoga (Cramer et al., 2017; Yeun & Kim, 2021).

The effects of the experienced emotions are also part of the CVT (Pekrun, 2006). They are often described as a focus on the current activity or object, which leads to the experienced emotion. In academic environments, positive emotions can lead to the experience of a flow-like state (Cziksentmihalyi, 1990), which can be described as an optimal fit between a task's difficulty and a person's skills, leading to better performance (Pekrun et al., 2018). Inversely, the same happens with negative emotions that negatively affect performance (Pekrun et al., 2018). Since performance is typically not an important factor in yoga practice, another effect of emotions is far more interesting for the current research. Motivation also depends on the emotions experienced during a task or by an object. Positive emotions lead to higher motivation and help people to stay engaged with an activity for more extended periods of time, like in this case, yoga practice. Negative emotions decrease the motivation to stay engaged with an activity or the motivation to participate in the activity in the future (Pekrun et al., 2018).

These findings lead to direct applications for spiritual practice, which could either be experienced with positive emotions, which lead to higher motivation for further engagement with the practice, or if negative emotions are experienced, could lead to less motivation for further spiritual practice, for example, yoga practice.

Control in boredom studies is operationalised as overchallenge or underchallenge, which are both non-optimal control states. If either or both of those control appraisals are high, people experience boredom (Goetz, 2023). To avoid overchallenge or underchallenge, individualising a given task would reduce the mismatch of control and abilities.

Valence, which determines how much value a specific situation or task has for a person and how valuable the task or situation is perceived, has a different relationship to boredom.

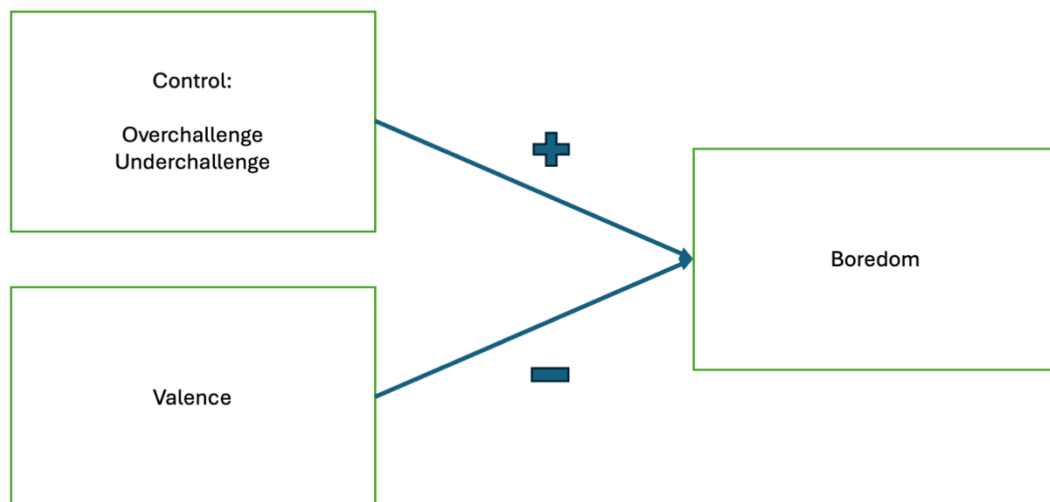


Figure 2 CVT model of boredom

Low valence leads to boredom, which makes boredom in regards to the CVT a special emotion because no other emotion has this relationship with valence (Pekrun, 2006, 2024).

To bring this into the context of yoga practice, a yoga session that is overchallenging or underchallenging would lead to boredom, and also, if there is no perceived value for the person participating in the yoga session, boredom would result.

Control and valence also have effects on each other regarding boredom. If valence is high, for example, the optimal fit of control is not that important anymore, and boredom can be avoided.

Additionally, regarding the antecedents of boredom, the CVT also explains the effects of boredom on motivation (Pekrun, 2006, 2024). As mentioned before, boredom can be explained by four dimensions, and one of them is the motivational dimension, which leads to the desire to leave or change the boredom-inducing situation (Bieleke et al., 2024). This avoidance behaviour also reduces the engagement with the situation and leads to less persistence in the task. Boredom also occupies cognitive resources that could otherwise be used to accomplish the task, so in achievement situations, boredom also negatively affects performance (Goetz, et al., 2023).

In summary, boredom emerges from two key characteristics of a situation or task: a perceived mismatch in the level of control and a low valence attributed to the situation or task by the individual, both of which contribute to the experience of boredom. If either of those characteristics is different, then there are optimal levels of control, or high valence boredom can be avoided. Not only is boredom a negative emotion which alone would lead to negative effects according to CVT, but boredom in itself leads to lower motivation for a situation and further avoidance of the situation.

Spiritual Contexts and Yoga

Spiritual boredom is a type of boredom which is experienced in spiritual contexts. The definitions of spirituality are quite different depending on the research field (Jütte, 2020). Also, the boundaries between spirituality and religion are still discussed in many fields, from theology to philosophy (Carey, 2018). A common element between all definitions and between religion and spirituality is the search and belief in something sacred that transcends the material world (Csikszentmihalyi & Csikszentmihalyi, 2006). Even though the Cambridge Dictionary states under its definition for spirituality “deep feelings and beliefs of a religious nature, rather than the physical parts of life”, yoga which is the focus of this study is intended to give control over body and mind (which is also part of the definition of yoga in the

Cambridge Dictionary) (*Spirituality*, 2025; *Yoga*, 2025). Yoga and spirituality are closely associated with each other and try to convey meaning in life. Many yoga practitioners seek insight, wisdom, an integrative worldview, peace, faith, and meaning (Csala et al., 2021). In addition to the search for meaning, many also practice yoga for physical motives, which also benefits the practising person. Scientific research has shown that yoga has many positive outcomes regarding mental health, psychotherapy, mindfulness, and stress (Kamradt, 2017; Snaith et al., 2018; Szaszko et al., 2023; Yeun & Kim, 2021).

Spirituality and its practices are very different, and the type of boredom one can experience differs from other types of boredom. As stated in Goetz et al. (2025) spiritual boredom differs in the population which experiences it from other types of boredom; people who participate in spiritual practice are searching for deeper meaning in life and spiritual development. The person typically chooses the spiritual settings, and in the context of yoga, similar to other spiritual contexts, the setting is primarily silent or deactivating. Similar to other studies regarding boredom and motivation, spiritual boredom also reduces the motivation to practice spirituality and hinders spiritual growth and the search for meaning. In addition, low motivation, which is triggered by boredom, also hinders other positive effects of yoga practice or, in general, spiritual practice by leading people to avoid these spiritual situations (Domingues, 2018; Garssen et al., 2021).

Spiritual boredom and yoga boredom

As stated by Goetz et al. (2025) , there is not much research regarding spiritual boredom except the aforementioned. To see if there have been any changes to the research on spiritual boredom since the publication of the paper by Goetz et al. (2025) I also conducted a comprehensive literature search in PsycInfo, APA PsycArticles, PSYINDEX, and Web of Science with the search term (Boredom OR Bored) AND (Spiritual* OR Yoga). This search was focused on the spiritual context of yoga since this is the focus of this current research. Afterwards, I filtered the results to include only articles from March 26, 2024, to see if there had been any new research on the topic since the search by Goetz et al. (2025). The search was performed on April 15, 2025, and none of the articles had any new research regarding spiritual boredom. One preprint study from 2024, which investigated the effects of a yoga intervention on medical staff and students over three measuring points, only found positive effects of yoga and no reported boredom. This is one of the few studies which directly linked boredom and yoga, and even though they found no boredom in their final sample, it is essential for the interpretation that only 17% of participants practised yoga daily, and 20% of

the participants discontinued the yoga practice. In line with CVT and boredom theory outlined earlier, participants who quit the yoga practice reported a lack of motivation (Nausheen et al., 2024).

With this lack of empirical research on spiritual boredom and its longitudinal effects focused on CVT theory and boredom and motivation, this study tries to close this research gap and examine the effects of emotion antecedents on boredom and the effects of boredom on motivation for yoga practice.

In line with previous research (Goetz et al., 2025), which defines types of boredom regarding the context in which it is experienced (e.g., test boredom (Goetz, Bieleke, et al., 2023) and academic boredom (Goetz et al., 2024)), for this study, spiritual boredom, which is defined as boredom experienced in a spiritual context, is focused on the spiritual practice of yoga. Also, following previous research by Goetz et al. (2025) the primary antecedents of spiritual boredom are assumed to be the same as for boredom in general. These primary antecedents are attentional processes (Eastwood et al., 2012), cognitive appraisals (Pekrun et al., 2010), perceived meaning (Moynihan et al., 2021) and functional value (Bench & Lench, 2013), which are in accordance with CVT.

In the context of yoga, boredom may arise from a lack of individualisation, where participants perceive a mismatch between their abilities and the level of challenge presented, which would be the level of control one perceives. For instance, overly difficult yoga exercises might lead to feelings of being overchallenged, particularly for beginners or those who attend yoga sessions infrequently, resulting in boredom and a subsequent decline in motivation to continue practising. Conversely, too easy exercises could lead to a sense of underchallenge, especially for individuals who practice yoga more regularly. This lack of stimulation could similarly result in boredom and a reduced desire to engage in future sessions. A lack of valence for yoga practice would also lead to boredom and a lack of motivation, as the individual may neither perceive the activity as meaningful nor feel a sense of personal engagement or relevance, resulting in disengagement and a diminished willingness to participate. Building on these considerations, this study aims to explore the effects of perceived control (in terms of overchallenge and underchallenge) and valence on the experience of boredom and, in turn, on motivation. By employing a longitudinal design, the study seeks to capture the immediate relationships between these factors and how they evolve over time, providing a deeper understanding of the dynamic interplay between control, valence, boredom, and motivation in the context of yoga practice.

Research Question and Hypotheses

Building on the previously discussed theoretical insights into control, value, boredom, and motivation, the central research question of this study is: “*What are the antecedents and longitudinal motivational effects of spiritual boredom during yoga practice?*” To address this question, the focus is placed on the individual cognitive appraisal of yoga practice, particularly on the perception of control (overchallenge and underchallenge), the perceived value (valence), the resulting experience of boredom, and its impact on motivation. This investigation is conducted within the longitudinal framework of experience sampling to capture changes and dynamics in these factors over time.

The theoretical foundation of this study is the CVT by Pekrun (2006), which posits that boredom can arise from a mismatch in perceived control (e.g., overchallenge or underchallenge) as well as from a low perceived value of an activity, in this specific study, yoga practice. In this study, perceived control is operationalised through the level of overchallenge and underchallenge, while valence reflects the personal significance and relevance of the yoga practice for oneself. Based on these theoretical assumptions, the following mediation hypotheses were formulated:

H1: Overchallenge leads to boredom.

H2: Underchallenge leads to boredom.

H3: Low value leads to boredom.

H4: Boredom leads to lower motivation for the next yoga session.

Methods

To account for the longitudinal perspective, the perceived control, valence, boredom, and motivation from the previous yoga session were also included in the analysis. This approach allows for the examination of not only the immediate relationships between these variables but also their development and interactions over time. The final model, presented in Figure 3, incorporates these dynamics and provides a comprehensive overview for addressing the research question.

In accordance with standard mediation analysis terminology, the paths in the model are labelled as follows: the direct path from the independent variables (control, operationalized via overchallenge and underchallenge, and valence) to the dependent variable (motivation) is denoted as c' . The path from the independent variables to the mediator (boredom) is labelled

as a , and the path from the mediator to the dependent variable is marked as b . This model enables a detailed investigation of the mediating role of boredom in the relationship between control, valence, and motivation. It provides a robust foundation for understanding the antecedents and effects of spiritual boredom in yoga practice and its longitudinal impact on motivation.

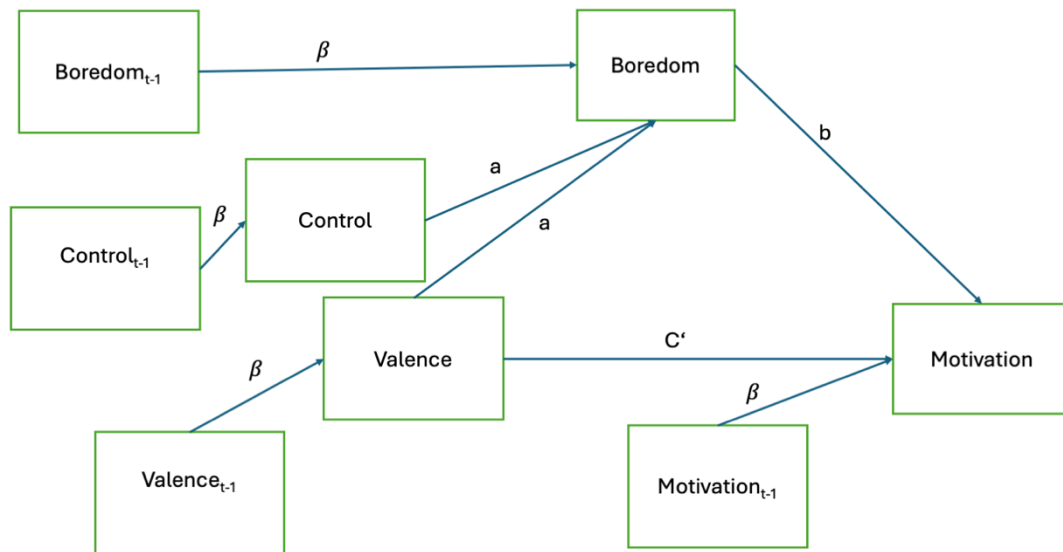


Figure 3 Longitudinal Spiritual Boredom Model with autoregressive paths

Ethical Approval

Before recruiting research participants, an application was sent to the institutional review board (IRB) of the Department of Developmental and Educational Psychology of the University of Vienna. The questionnaire provided by the IRB was completed, and an explanatory letter, the declaration of consent and the debriefing were sent to the board. All these documents were sent to the IRB on July 31, 2024, and were accepted on August 14, 2024.

All data for this research was collected anonymously via the ESMira App (Lewetz & Stieger, 2023), which automatically gave every participant an anonymous participant ID. For the reimbursement of participants, the questionnaire tool Sosci Survey (Leiner, 2024) was used to collect personal data, such as name, address and bank information, in a separate system. For this, the Sosci Survey Instance, which is hosted at the University of Vienna, was used to ensure maximum data protection by GDPR. The ESMira app also created a different ID (incentive ID) for reimbursement for every participant, making it impossible to connect the two datasets together and guarantee anonymity. After downloading the app and connecting to

the University of Vienna's server, participants provided their informed consent, which was a prerequisite for study participation. Participation was only allowed for participants 18 years or older at the time. The study was labelled as a study of emotions during yoga and was not directly advertised as a study examining boredom.

Preregistration

The study was also preregistered on osf.io on July 31, 2024. The preregistration included the hypotheses, a design plan, sample size and the variable which would be analysed (registration DOI: <https://doi.org/10.17605/OSF.IO/KA657>). The registration also included Prof. Götz and Dr. Jonathan Fries, who contributed immensely to the study and will be co-authors in future publications.

Timeframe of the study

Data collection started on August 21, 2024 and closed on May 30, 2025, for new participants.

Recruitment and reimbursement

Participants were recruited via a multitude of channels. An accompanying website was created (yoga.univie.ac.at) to promote the study, present key information about participation, and connecting the ESMira App to the server of the University of Vienna. This website was revised to optimise the recruitment process with support from the corporate communication department of the University of Vienna. In the first recruitment wave during the summer and fall of 2024, family and friends were asked to participate and social media posts on Facebook and Instagram were made. Facebook groups with a thematic focus on yoga and spirituality were targeted with appealing posts for the target audience.

Also, yoga studios in Austria and Germany were contacted to advertise the study to their members. This was done in 2024 via email communication and in 2025 via the snowball method from other participants, which led to better results. In 2024, only two yoga studios agreed to participate in the study, while several others, after initial communication, expressed no further interest in participating. The University of Vienna also organises yoga courses at its University Sports Institute, which was contacted and agreed to cooperate. Also, at the University of Vienna, a lecture was held about the philosophical foundations of yoga practice, where it was also possible to advertise the study. Furthermore, a cooperation with a local yoga

festival was organised, which unfortunately had to be cancelled due to extreme thunderstorms in Vienna. Incentives to participate in the study at that moment included support of research regarding yoga practice and getting access to the study results in an understandable way, parallel to the publication in a scientific magazine.

After all recruitment options were exhausted and the current incentives were not sufficient, the research unit of Educational Psychology under Professor Thomas Götz decided to fund the study and made reimbursement of participants possible. After careful consideration, the amount of 20 € was determined to be paid out for every participant who completed the start questionnaire and four questionnaires, one after each yoga session, which took most participants around four weeks, because they mostly practised yoga once a week. Because of budget limitations, the preregistered sample size had to be reduced to 150 participants. This incentivisation is a standard method in experience sampling studies to motivate participants to participate in this research (Giese & König, 2024).

Subsequently, the study was promoted during the Educational Psychology lecture for undergraduate psychology students at the University of Vienna, which at the time had around 300 people in the audience and 800 enrolled in its online course, where the study was also advertised. In a second round at the beginning of 2025, the study was again advertised in the Educational Psychology lecture, which is open to every student at the University of Vienna, not just psychology students. Additionally, the study was promoted during lectures on Developmental Psychology and Biological Psychology as part of the bachelor's program in Psychology.. The study was also advertised in master's-level seminars, including *Educational Psychology, Advanced Seminar: Development and Education – Theoretical Foundations of Educational and Motivational Psychology*, and *Advanced Seminar: Development and Education – Emotions in the Museum: Adult Education*. Also, through contacts in the student body, a snowball effect could be observed in which friends and acquaintances of other students also took part in the study. After this second wave in 2025, the study was closed with 292 participants downloading the ESMira App and connecting to the university server. Of those 266 participants, 245 filled out at least one questionnaire.

Questionnaires

Two questionnaires were used, a start questionnaire which contained questions about the person in general, with no connection to the yoga practice. Participants had to enter their age, gender and country. The items can be found in Appendix A.

The main questionnaire, which was labelled in the app as “Please complete after each session”, contained questions regarding the emotions during the yoga session, the antecedents of the emotion and the motivation for the next yoga session. One item in the questionnaire asked participants about the yoga setting in which their completed session took place. Additionally, two other items were included to ensure that the focus of the research on boredom was not immediately obvious. This adjustment was made based on feedback from the yoga community to minimize the risk of study rejection. The connection between boredom and yoga was perceived negatively, particularly by individuals who practiced yoga professionally. The questions of the main questionnaire were derived from a previous master’s thesis (Porics, 2022), which was later used in a publication; the scale is called YBS-S (Goetz et al., 2025). The questions regarding spiritual boredom during yoga addressed the different parts of the most common yoga practices: physical exercises, breathing exercises, meditation, and relaxation. For example, an item to measure boredom was “I was bored with the relaxation phase.“. In the boredom, overchallenge, underchallenge and valence scale, there was also a question of whether the yoga session was boring, important, overchallenging, or underchallenging. To illustrate the types of items used to assess the constructs of valence, overchallenge, and underchallenge, participants were asked to rate statements such as "The physical exercises were important to me." (valence), "The breathing exercises overchallenged me." (overchallenge), and "The meditations underchallenged me." (underchallenge). The items can also be found in Appendix A. The motivation items were specially developed for this study to accommodate the intensive longitudinal aspect of this study. Examples for items of the motivation scale are “I'm looking forward to the next time I can practise yoga again.“ or “I would love to get back to practicing yoga as soon as possible.“. The questions were designed to assess the participants' motivation for attending the next yoga session after completing the current one.

The items were answered using a five-point Likert scale (1 = do not agree at all, 2 = rather disagree, 3 = partly agree, 4 = tend to agree, 5 = completely agree). Participants could only choose one of the options, and if a question did not fit the experienced yoga session, it could be skipped without answering.

Research design

To investigate the longitudinal effects of overchallenge and underchallenge as measures of perceived control, and personal valence on boredom, which subsequently impacts motivation, an experience sampling method (ESM) design was chosen. Experience sampling,

also known as momentary assessment, daily diary or ambulatory assessment, is an emerging research method in which individuals are measured in shorter time intervals than in classical longitudinal research. Experience sampling is a method for studying people in their everyday lives and makes it possible to measure what they feel, think and do (Larson & Csikszentmihalyi, 2014; M.Hektner et al., 2007). A standard method for experience sampling is using electrical devices like smartphones (Van Berkel et al., 2018) that prompt participants with questions or record physiological data multiple times during a given period, for example, numerous times during a studying session or a workday (Fang et al., 2024). In summary, experience sampling is designed to capture experiences in the real world and in real time by using self-reports in the context of the experience in question.

In contrast to experiments where emotions or behaviour are measured in a controlled environment, ESM measures emotions or behaviour directly in the real-world situation, mainly during the participants' everyday lives. Another difference is that researchers do not induce changes; ESM studies usually have no modulation, and alterations and effects happen naturally. ESM focuses on the natural flow of experiences, and is mainly done by measuring multiple times during the day, but it is also valid to do it at the end of the day or in this case, a completed yoga session (Myin-Germeys & Kuppens, 2022). One significant advantage to other forms of study design is that, due to the measurement in or directly after the situation of interest occurred, the retrospective bias (retrospective bias is the tendency to view past events inaccurately, influenced by current emotions, beliefs, or knowledge (Blome & Augustin, 2015)) of other methods is reduced in ESM methods (Stone et al., 2004). Emotional states have especially been shown to be susceptible to retrospective biases (Levine & Safer, 2002).

In this study, participants used the ESMira App developed by the Karl Landsteiner University in Krems, Austria (Lewetz & Stieger, 2023). This app is especially made for conducting ESM data collection and is designed to be hosted on the servers of the research facilities, so data is not shared with the Karl Landsteiner University. The app is also designed to collect data anonymously but with the possibility to track the individual answers of every person via a user ID, which is connected to the smartphone of the participant, so even if a participant uninstalls the app and reinstalls it again, the individual ID does not change. The ESMira app includes a module to manage the process of incentivising participants anonymously using a separate ID. Also, it offers the possibility to set how many questionnaires must be completed to unlock the module for the reward.

After downloading the ESMira App, participants connected to the server of the University of Vienna, where this study was hosted, and agreed to the declaration of consent if

that was what they wanted. Subsequently, participants were instructed to complete the start questionnaire at the beginning of the study, after which it was no longer accessible for the remainder of the study. After each yoga session, they were asked to fill out a brief questionnaire assessing the emotions they had just experienced, their motivation for the next yoga session, their perceptions of being overchallenged or underchallenged, and the valence of their experience. After completing at least four questionnaires and the start questionnaire, the incentive module was available to enter the incentive ID, personal data, and bank data into the external questionnaire to handle the incentive data. This ensured that questionnaire data was still anonymous.

Sample

Participants in this study were regularly practising yoga adults (inclusion criterion: at least 18 years old). A total of 266 participants were recruited to participate in this study. For final analyses, only the participants who filled out at least two questionnaires were considered, in total 221 participants. All further information refers to these 221 participants. Among the 221 participants, 86.88% ($n = 192$) identified as women, 11.31% ($n = 25$) as men, 0.90% ($n = 2$) as non-binary, and 0.90% ($n = 2$) opted not to disclose their gender. As the sample was based on convenience sampling, its composition has some heterogeneity; however, most participants were from Austria. Specifically, 205 participants were from Austria, 12 from Germany, two from Poland, and one participant each from Canada, Greece, and the United States of America. The age distribution of the participants was as follows: 75.11% ($n = 166$) were between 18 and 25 years old, 14.03% ($n = 31$) were between 26 and 35 years old, 4.52% ($n = 10$) were between 36 and 45 years old, 3.62% ($n = 8$) were between 46 and 55 years old, and 2.71% ($n = 6$) were between 56 and 70 years old.

Statistical methods

For this study, a mediation analysis was chosen because it best fits the hypotheses. The mediation model is an essential tool for investigating causal chains among an independent variable (usually denoted by X), a mediator (denoted by M), and a dependent variable (denoted by Y) (Baron & Kenny, 1986). If there is a part of the effect of X on Y that the mediation cannot explain, this is called the direct effect (denoted by c'). Mediation analysis can be used for cross-sectional and longitudinal data, and it has been done so in the past (MacKinnon et al., 2007; Preacher, 2015; Selig & Preacher, 2009). Especially considering

causal relationships over a time sequence like in this study, where X (Levels of Control, Valence) precedes M (Boredom) and M Precedes Y (Motivation for the next yoga session), previous research strongly recommends longitudinal analysis to establish this mediation effect (Cole & Maxwell, 2003; Maxwell et al., 2011; Maxwell & Cole, 2007).

Given the design of this study, participants were allowed to engage in yoga practice at their discretion, whether on a daily, weekly, or other self-determined schedule. Choosing the correct analysis method is essential for this kind of research. To analyse longitudinal data, a multilevel modelling approach must be taken. Still, time series modelling, structural equation modelling (SEM), and time-varying effects modelling (TVEM) are also necessary to analyse intensive longitudinal data. For many years, multilevel structural equation models (MSEM) have been used to analyse intensive longitudinal data (Preacher et al., 2011). However, this method has a couple of drawbacks, which make MSEM not the preferred analysis method. For one, MSEM does not handle time series analysis as it is needed for intensive longitudinal data; MSEM handles time series like cross-sectional SEM or multi-level methods. Furthermore, MSEM cannot take autoregressive effects into account, which describe the relationship previous time points have on a given time point in a time series (McNeish & Hamaker, 2020). To account for those shortcomings and analyse intensive longitudinal data to its full potential, dynamic structural equation modelling (DSEM) has been developed, which considers all four previously mentioned methods. One shortcoming of DSEM analysis is that it is not applicable if the time structure of the data points is a continuous time variable. A variant of DSEM, which is called residual dynamic structural equation model (RDSEM), takes time series and continuous time into the model and is the superior model for data with unequal time distances (Asparouhov & Muthén, 2024; McNeish & MacKinnon, 2022).

Regarding statistical analyses, R version 4.5.0 (R Core Team, 2025) was used for general data cleaning and preparation. For the RDSEM calculation, Mplus version 8.11 (Muthén & Muthén, 1998) was used with the combination add-on. The following R packages were used: MplusAutomation (Hallquist & Wiley, 2018), misty (Yanagida, 2025), ggplot2 (Wickham, 2016), lubridate (Grolemund & Wickham, 2011), dplyr (Wickham et al., 2023). All scripts used in this study can be found in Appendix B.

Results

Descriptive results appear in Table 1. Included in the table are the pooled within-person correlation, the mean, and the standard deviation, which are also pooled.

Variables	Mean	SD	Boredom	Valence	Overchallenge	Underchallenge
Boredom	1.78	0.77				
Valence	4.19	0.70	-0.37***			
Overchallenge	1.69	0.64	0.18***	-0.16***		
Underchallenge	1.82	0.82	0.30***	-0.15**	0	
Motivation	4.18	0.82	-0.39***	0.43***	-0.28***	-0.18***

*Table 1 Table 1 All constructs were assessed by using 5-point rating scales ranging from 1 (do not agree at all) to 5 (completely agree). +) $p < 0.10$; *) $p < 0.05$; **) $p < 0.01$; ***) $p < 0.001$*

The results of estimates and 95% credible intervals for RDSEM for overchallenge are presented in Table 2, and a graphical representation of the model and the results can be found in Figure 4. A mediation effect would be considered significant if the credible interval did not include zero, further abbreviated as non-zero. For overchallenge, neither the average mediation effect (IND = -0.032, 95% HPD credible interval = [(-0.095, -0.006)]) nor the direct effect (GAMA1=-0.017, 95% HPD credible interval = [-0.084, 0.056]) is significant (non-zero). The autoregressive effects for overchallenge and motivation are significant (Table 2). This indicates that overchallenge and motivation from a previous yoga session affect the overchallenge and motivation for the next yoga session. These findings do not support Hypothesis 1, which states that overchallenge leads to boredom.

Effect	Posterior Median	95% Credible Interval	
Boredom	1.745	(1.643, 1.842)	*
Overchallenge	1.657	(1.579, 1.732)	*
Motivation	4.439	(4.277, 4.677)	*
BETAXOC	0.311	(0.144, 0.470)	*

Effect	Posterior Median	95% Credible Interval	
BETAMBO	0.177	(-0.008, 0.359)	
BETAYMO	0.756	(0.566, 0.906)	*
GAMA1	-0.017	(-0.084, 0.056)	
GAMA2	0.131	(-0.008, 0.262)	
GAMA3	0.045	(-0.047, 0.159)	
TREND1	0.000	(-0.004, 0.004)	
TREND2	0.001	(-0.004, 0.005)	
TREND3	-0.002	(-0.009, 0.004)	
LOGV1	-2.002	(-2.233, -1.773)	*
LOGV2	-1.936	(-2.204, -1.664)	*
LOGV3	-2.018	(-2.322, -1.731)	*
IND	-0.032	(-0.095, 0.015)	

Table 2 * $p < 0.05$

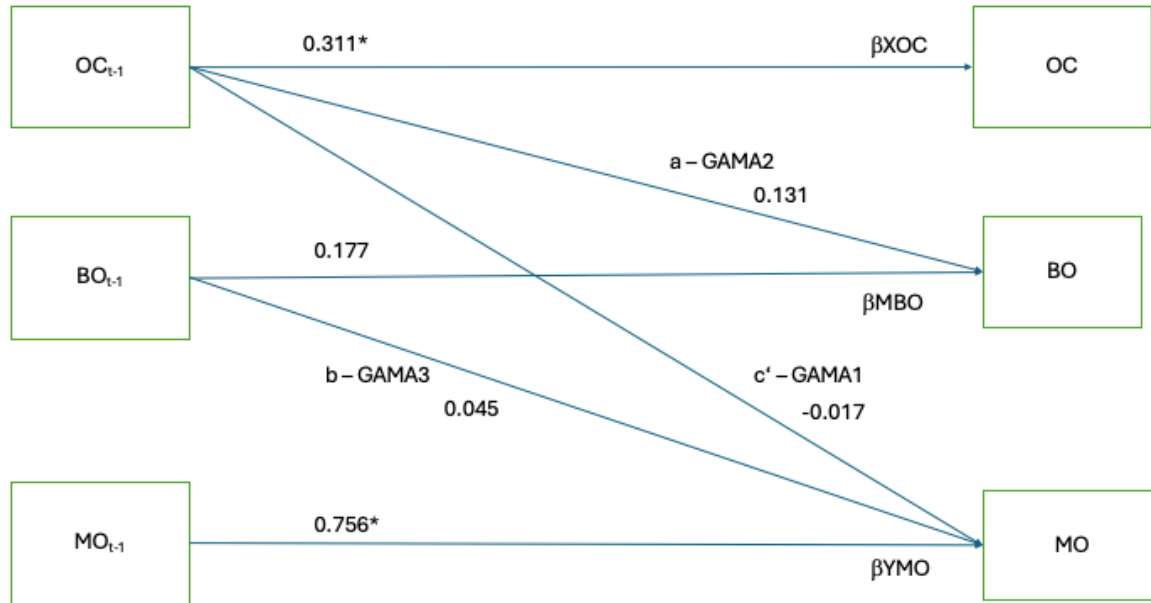


Figure 4 Path diagram and estimated parameters of overchallenge. * $p < 0.05$

The results of estimates and 95% credible intervals for RDSEM for underchallenge are presented in Table 3, and a graphical representation of the model and the results can be found in Figure 6. In the model with underchallenge as a predictor, neither the average mediation effect ($IND = -0.002$, 95% HPD credible interval = $[-0.038, 0.037]$) nor the direct effect ($GAMA1 = -0.036$, 95% HPD credible interval = $[-0.094, 0.016]$) is significant (non-zero). The autoregressive effects for underchallenge and motivation are significant (Table 3). This also indicates that underchallenge and also motivation are affected by previous yoga sessions. Also, the lagged effect of underchallenge on boredom is significant ($GAMA2 = -0.115$, 95% HPD credible interval = $[0.001, 0.228]$), which indicates that underchallenge from the previous yoga session has an effect on boredom reported after the following yoga session. This supports hypothesis 2, which states that underchallenge leads to boredom.

Effect	Posterior Median	95% Credible Interval	
Boredom	1.727	(1.629, 1.825)	*
Underchallenge	1.675	(1.561, 1.786)	*
Motivation	4.444	(4.283, 4.683)	*
BETAXUC	0.444	(0.274, 0.617)	*

Effect	Posterior Median	95% Credible Interval	
BETAMBO	0.162	(-0.016, 0.342)	
BETAYMO	0.745	(0.548, 0.906)	*
GAMA1	-0.036	(-0.094, 0.016)	
GAMA2	0.115	(0.001, 0.228)	*
GAMA3	0.031	(-0.050, 0.126)	
TREND1	0.003	(-0.001, 0.008)	
TREND2	0.000	(-0.004, 0.005)	
TREND3	-0.002	(-0.008, 0.004)	
LOGV1	-1.692	(-1.958, -1.422)	*
LOGV2	-1.933	(-2.211, -1.652)	*
LOGV3	-2.009	(-2.300, -1.728)	*
IND	-0.002	(-0.038, 0.037)	

Table 3 $p < 0.05$

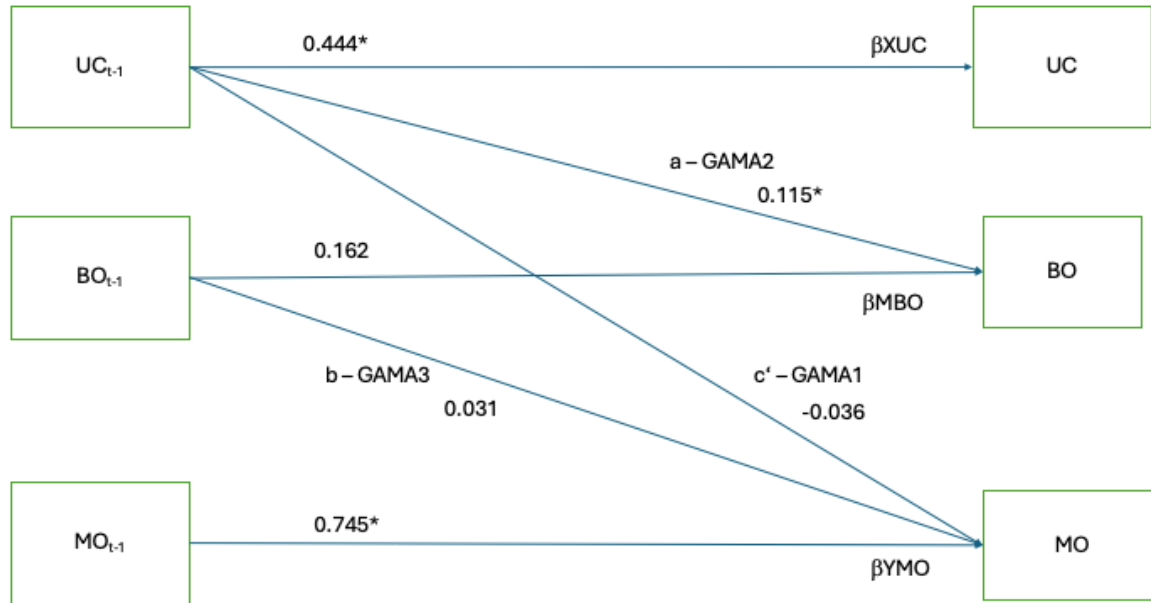


Figure 5 Path diagram and estimated parameters of underchallenge. * $p < 0.05$

The results of estimates and 95% credible intervals for RDSEM for valence are presented in Table 4, and a graphical representation of the model and the results can be found in Figure 6. For valence, also neither the average mediation effect ($IND=0.012$, 95% HPD credible interval = $[0.005, 0.176]$) is significant (non-zero). But the direct effect ($GAMA1=0.082$, 95% HPD credible interval = $[-0.094, 0.016]$) is significant (non-zero), indicating the relationship between the predictor valence from the previous yoga session and motivation. The autoregressive effects for underchallenge, boredom and motivation are significant (Table 4). Which indicates that underchallenge, boredom as well as motivation are affected by the previous yoga sessions, in this model with valence as a predictor. Also, the lagged effect of valence on boredom is significant ($GAMA2=-0.218$, 95% HPD credible interval = $[-0.329, -0.079]$), which indicates that valence from the previous yoga session influences the boredom reported after the following yoga session. This supports hypothesis 3, which states that low valence leads to boredom.

Effect	Posterior Median	95% Credible Interval	
Boredom	1.675	(1.565, 1.786)	*
Valence	4.374	(4.242, 4.494)	*
Motivation	4.442	(4.299, 4.624	*
BETAXVA	0.698	(0.412, 0.849)	*
BETAMBO	0.197	(0.016, 0.363)	*
BETAYMO	0.679	(0.486, 0.885)	*
GAMA1	0.082	(0.005, 0.176)	*
GAMA2	-0.218	(-0.329, -0.079)	*
GAMA3	0.031	(-0.058, 0.142)	
TREND1	-0.001	(-0.006, 0.004)	
TREND2	0.001	(-0.004, 0.006)	
TREND3	-0.002	(-0.008, 0.004)	
LOGV1	-1.866	(-2.111, -1.633)	*
LOGV2	-1.811	(-2.060, -1.553)	*
LOGV3	-2.008	(-2.302, -1.733)	*
IND	0.012	(-0.016, 0.050)	

Table 4 * $p < 0.05$

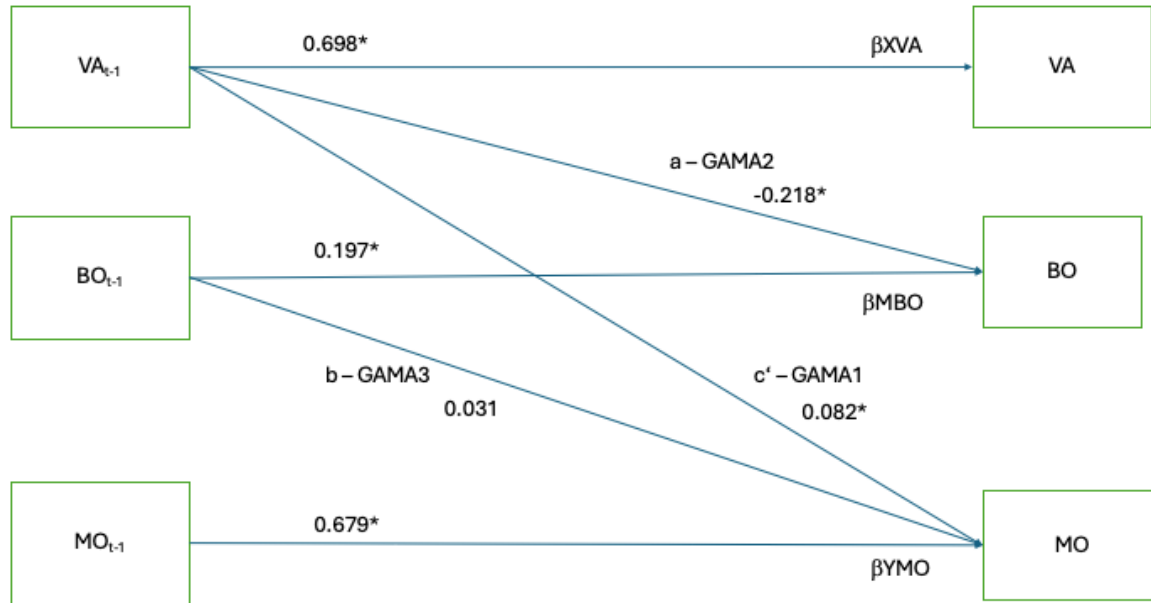


Figure 6 Path diagram and estimated parameters of valence. * $p < 0.05$

Regarding hypothesis 4, boredom leads to lower motivation for the next yoga session; none of the models could find a relationship between boredom in the previous yoga session and motivation for the next yoga session. So, this hypothesis is not supported by this data.

Discussion

In this research, I focused on spiritual boredom during yoga practices, a largely neglected type of boredom not investigated by previous boredom research. The aim was to gain insight into the longitudinal effects that the emotions' antecedents, overchallenge (Hypothesis 1), underchallenge (Hypothesis 2), and valence (Hypothesis 3), have on boredom and boredom has on motivation (Hypothesis 4) for the next yoga session based on CVT (Pekrun, 2006, 2024). The only comparable previous research found cross-sectional effects of boredom antecedents (control, valence) on boredom and the motivation for spiritual practices (the practices were yoga, meditation, silence retreats, sermons (as part of catholic services), and pilgrimage) (Goetz et al., 2025). But to date, there has not been a longitudinal study examining the relationship of emotion antecedents over a longer period of time on spiritual boredom and motivation for spiritual practices.

In the current research, the spiritual boredom antecedents overchallenge did not have an effect on either boredom or motivation for the next yoga session. But overchallenge from the previous yoga session could be traced to the current yoga session. This could indicate that overchallenge in the yoga context is not directly linked to boredom, at least not over a longer

period of time. This would be in contrast to previous studies in the context of academic boredom (Goetz, Bieleke, et al., 2023) or the previous study regarding spiritual boredom (Goetz et al., 2025), which found that overchallenge leads to boredom and also that boredom leads to loss of motivation. Maybe the overchallenge did not carry over time to create boredom, or the overchallenging aspects were experienced differently over time. This finding stands in stark contrast to hypothesis 1 and previous research.

Underchallenge also didn't show a significant effect on motivation, and the relationship between underchallenge and motivation for the next yoga session was also not mediated by boredom. But underchallenge from the previous yoga session had a significant effect on boredom. This is consistent with previous research in the academic context (Krannich et al., 2019) and the existing research in the spiritual context (Goetz et al., 2025). This could be explained by the fact that a monotonous or otherwise underchallenging yoga session has an impact on the experience of boredom for the following yoga session. Maybe it is also an indicator that people who are underchallenged during yoga practice, maybe generally experience yoga as something boring and not challenging; in contrast, overchallenging could be seen as something positive and a challenge which the person wants to face. As with overchallenge, underchallenge is stable over time, and if the previous yoga session has been experienced as underchallenging, the following yoga session will also be experienced as underchallenging. In the model with underchallenge, motivation was also affected by the previous yoga session. This was in accordance with hypothesis 2 and previous research.

Valence, which was the only emotion antecedent that had a direct significant effect on motivation for the next yoga session, also showed a significant effect on boredom for the current yoga session. This is also in accordance with previous research on academic boredom (Moynihan et al., 2021) and spiritual boredom (Goetz et al., 2025; Jütte, 2020; van Tilburg et al., 2019). In the model with valence also boredom, and motivation had autoregressive effects, so all three were affected by the previous yoga session. This suggests chronological stability and further underpins the importance of valence for motivation, also in spiritual practice. So more important than overchallenge and underchallenge, valence is driving the motivation for future yoga sessions. The reason could be that both over- and underchallenge are more associated with yoga practice and are maybe perceived as variable parts which could also change in the future whereas valence seems to be something stable which a yoga setting either has or has not. Thus, the absence of positive valence is not something that individuals practising yoga are inclined to passively endure or wait for to change. Valence in this context

could either be in the sense of a bigger meaning in life or personal fitness or health. Both are essential components of spiritual practice, including the search for meaning in life, as well as yoga, which often emphasizes fitness and health benefits. When these elements are lacking, it can lead to boredom and a decline in motivation. Since meaning is one of the bigger driving forces for motivating people to partake in spiritual practice, this finding is very interesting since it emphasises the importance of valence for the individual practising yoga. This gains further importance for yoga instructors and people who create yoga programmes to put valence into the centre of yoga practice and make sure that people practising yoga understand the personal value yoga has for their lives.

Limitations

Even though the study was designed to include a wide range of people practising yoga, due to problems with recruiting the sample, it ended up being a mostly female student sample from Austria between 20 and 30 years of age. This follows the research phenomenon of WEIRD (white, educated, industrialised, rich, democratic) samples in Psychology. Especially when considering the origins of yoga, which lie in Asia, with thousands of years of history and cultural integration, a more diverse sample would be desirable. Also, more men in the sample would help diversify this study and get another perspective or a broader picture. Since most of the sample was recruited in the university context, it can be assumed that most of the participants have a higher education, which further limits the diversity of the sample.

One of the bigger problems, apart from the sample composition, is the limited number of data points in the sample. Most participants only completed the four required questionnaires, compared to other studies, which use intensive longitudinal methods, or theoretical papers (Fang et al., 2024; McNeish & MacKinnon, 2022) which demand an even bigger sample and questionnaire count than the papers with applied use of RDSEM or intensive longitudinal methods. In the context of yoga, these demands are quite hard to fulfil since most of the participants only practice yoga once a week, and more data points would take a long time to come by. However, it is possible that the relationship between the antecedents of spiritual boredom (such as overchallenge, underchallenge, and valence), spiritual boredom itself, and the resulting loss of motivation requires more time to fully develop. Especially if one considers that many people practice yoga in a studio setting and are often bound by subscriptions to these studios and therefore are externally motivated to practice yoga. This became quite clear in the talks which were held during recruiting or at presentations of this master thesis.

In this study, no questionnaire was administered to assess trait boredom, as the primary focus was on state boredom, which was examined using the intensive longitudinal method. Consequently, the potential influence of individuals who are generally more prone to boredom (i.e., those with higher levels of trait boredom) could not be analysed in greater detail or accounted for in the findings. This limitation means that any variability in the results that might be attributed to differences in trait boredom remains unexplored.

Implications for further research

The study of boredom in the context of yoga, particularly through intensive longitudinal methods, opens up a range of opportunities for future research. While such studies provide valuable insights into the experience of state boredom during yoga practice, they also highlight several limitations and unanswered questions that could guide further research.

One important direction for future research is the integration of both trait boredom and state boredom into the study design. The focus on state boredom limits the ability to account for individual differences in boredom proneness. Future studies could incorporate validated measures of trait boredom, such as the Trait Boredom Scale (TBS) (Gorelik & Eastwood, 2024) or a trait boredom scale designed for the yoga context (Porics, 2022), alongside the intensive longitudinal method. This would allow researchers to explore how an individual's baseline susceptibility to boredom interacts with their momentary experiences after yoga practice. For example, are individuals with high trait boredom more likely to perceive yoga as monotonous? Addressing these questions could provide a more nuanced understanding of how trait boredom influences the experience of spiritual practices such as yoga.

A more long-term approach to spiritual boredom could also improve the research in this area, especially since in this study there was no relationship between boredom and motivation, contrary to previous studies. One approach could involve studying a smaller sample over an extended period to gain deeper insights into the relationship between boredom and motivation. Alternatively, a larger sample observed over a longer duration would be even more advantageous, though it presents significant challenges, such as participant dropout or the general difficulty of recruiting a suitable sample, alongside its potential benefits. The diversity of yoga styles presents another area for future research. Yoga encompasses a wide range of practices, from dynamic and physically demanding styles like Vinyasa or Ashtanga to slower, meditative forms like Yin or Restorative Yoga. It is plausible that different styles elicit varying levels of boredom depending on their pace, intensity, and focus. For instance,

individuals who are prone to boredom via a higher trait boredom might find fast-paced styles more engaging, while others might appreciate the introspective nature of slower practices. Comparative studies examining how different yoga styles influence boredom could yield practical insights for tailoring yoga practice to individual preferences and needs.

For individuals with high trait boredom, targeted yoga exercises could be developed to make yoga more engaging and accessible. For example, dynamic yoga styles or shorter, more varied sessions might be better suited for those who struggle with sustained attention. Researchers could also explore the use of technology, such as apps or virtual reality, to create more interactive and stimulating yoga experiences. These innovations could benefit individuals who might otherwise perceive yoga as boring or unengaging, as well as those practicing in an environment they find monotonous or unstimulating.

Finally, future research could incorporate neurophysiological methods to investigate the underlying mechanisms of boredom in yoga. Techniques such as Electroencephalography (EEG) or functional Magnetic Resonance Imaging (fMRI) could be used to examine how yoga influences brain activity related to attention, self-regulation, and emotional processing. This could provide a more objective understanding of how yoga affects the neural correlates of boredom and whether these effects differ between individuals with varying levels of trait boredom or even state boredom. Furthermore, it would be important to examine the role of boredom in other spiritual contexts, such as meditation, prayer, or pilgrimage, to better understand how boredom impacts motivation within these practices. Exploring whether boredom acts primarily as a barrier to engagement or as a challenge that practitioners must overcome could shed light on its role in shaping motivation and persistence in spiritual pursuits. Understanding these dynamics may help clarify how boredom influences the ability to remain committed to such practices over time.

Conclusion

This study examined the effects of perceived control operationalised as overchallenge and underchallenge, perceived value on boredom and its effects on the motivation for further yoga practice. This was done using the experience sampling method, where people who practice yoga completed a questionnaire after each yoga session. The results showed that overchallenge, even though stable over time, was not a predictor for either boredom or motivation, and also in this model, boredom did not predict motivation. This stands in contrast with hypothesis 1. Underchallenge predicted boredom and was also stable over time, which was in accordance with hypothesis 2. Valence predicted boredom but also had an effect on the

motivation for further yoga sessions. This was in accordance with hypothesis 3 and showed that valence plays an important role in boredom and motivation, also in spiritual contexts. A link between boredom and motivation could not be found in the current study, which stands in direct contrast to previous research findings showing that boredom has a negative impact on motivation. An important finding from this research is that avoiding underchallenge and a low sense of valence should be the goal for yoga instructors or people who plan yoga sessions. This research could show that underchallenge leads to boredom, which, even though it did not have an effect on motivation, is still a negative emotion which should be avoided. It also showed the importance of valence for yoga practices, valence leads to boredom but also directly influences motivation. Yoga instructors could leverage the findings of this research to modify their sessions, reducing under-challenging elements and enhancing the perceived value of the practice for participants.

This master's thesis did not identify all the anticipated relationships between the antecedents of boredom and their impact on motivation. However, it uncovered several important factors that contribute to boredom and a loss of motivation within the context of a longitudinal study. Further research is needed to gain a better understanding of the complex relationships between boredom antecedents, boredom, and motivation.

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Appendix

Appendix A – Questionnaires

Appendix B – Calculation scripts

Appendix A

Instructions

Dear participant,

This study, conducted by the University of Vienna, investigates thoughts and emotions when practicing yoga. You can participate in this study if:

You plan to practice yoga at least once a week over the next 4 weeks.

You are willing to install the app, ESMira, on your smartphone.

You are willing to complete a short questionnaire on the ESMira app after every yoga session for 4 weeks.

The questionnaire takes 1-2 minutes each time. You will be asked about yourself and questions about your yoga practice. There are no right or wrong answers - it is all about your personal assessment. Please mark the answer that best applies to you personally. It is important for the success of this study that you complete the questionnaire in full. However, if you are unable to answer one of the questions or if it does not apply to your situation, simply skip it. You can of course cancel the questionnaire at any time without giving a reason and this will have no negative consequences for you.

All data is collected anonymously, so it cannot be traced back to you personally and will be treated in strict confidence. If you have any questions, please contact me at lukas.kraiger@univie.ac.at.

Thank you for your support!

If you would like to take part in this study, please click on continue.

Conclusion

Thank you for your participation! If you have any questions or are interested in the results, please contact: lukas.kraiger@univie.ac.at

Instruktion

Liebe*r Teilnehmer*in,
im Rahmen dieser Studie an der Universität Wien untersuche ich Gedanken und Emotionen beim Praktizieren von Yoga. Eine Teilnahme an der Studie kommt in Frage, wenn Sie planen in den nächsten 4 Wochen voraussichtlich mindestens einmal pro Woche Yoga zu praktizieren und über 18 Jahre alt sind. Falls Sie an der Studie teilnehmen, bitte ich Sie, für 4 Wochen nach jeder absolvierten Yoga-Einheit über Ihr Smartphone die ESMira-App zu starten und danach den kurzen Fragebogen auszufüllen. Bei Fragen können Sie sich jederzeit melden unter lukas.kraiger@univie.ac.at.

Das Ausfüllen des Fragebogens dauert jeweils 1-2 Minuten. Über Ihre Teilnahme an der Studie würde ich mich sehr freuen.

Der Fragebogen umfasst Angaben zur eigenen Person und Fragen zum Erleben Ihrer Yoga-Praxis. Dabei gibt es keine richtigen oder falschen Antworten – es geht um Ihre persönliche Einschätzung. Bitte kreuzen Sie jeweils diejenige Antwortalternative an, die auf Sie persönlich am besten zutrifft. Für den Erfolg dieser Studie ist es wichtig, dass Sie den Fragebogen vollständig ausfüllen. Falls Sie jedoch eine der Fragen nicht beantworten können oder diese nicht auf Ihre Situation zutrifft überspringen Sie diese einfach. Ein Abbruch des Fragebogens ohne Angabe von Gründen ist natürlich jederzeit möglich und hat keine negativen Folgen für Sie.

Alle Daten werden anonym erhoben, sie können also Ihrer Person nicht zugeordnet werden und werden zudem streng vertraulich behandelt.

Vielen Dank für Ihre Unterstützung!

Falls Sie an dieser Studie teilnehmen möchten, klicken Sie bitte auf weiter.

Abschluss

Vielen Dank für Ihre Teilnahme! Bei Fragen oder Interesse an den Ergebnissen melden Sie sich gerne unter: lukas.kraiger@univie.ac.at

Start Questionnaire

Englisch

Age

Scale: 18, 19, 20,...99

Item	Item wording
SD02.1	Please enter your age (in years)

Sex

Item	Item wording
Question	Which gender do you identify as?
SD01.1	1 = female
SD01.2	2 = male
SD01.3	3 = diverse/non-binary
SD01.4	4 = prefer not to answer

Country

Item	Item wording
CO01.1	Which country do you currently live in?

German

Alter

Scale: 18, 19, 20,...99

Item	Item wording
SD02.1	Geben Sie bitte Ihr Alter an (in Jahren)

Geschlecht

Item	Item wording
Question	Welchem Geschlecht fühlen Sie sich zugehörig?
SD01.1	1 = weiblich
SD01.2	2 = männlich
SD01.3	3 = divers
SD01.4	4 = möchte ich nicht angeben

Land

Item	Item wording
CU01.1	In welchem Land leben Sie derzeit?

Spiritual boredom questionnaire

Literature: Adjusted on the work of Goetz et al. (2025)

Scale: 1 = do not agree at all

2 = rather disagree

3 = partly agree

4 = tend to agree

5 = completely agree

Sample size: participants

Item	Item wording
Question:	During the yoga session I just completed...
FQ01.1	I experienced joy.
FQ01.2	I was proud.
SB01.1	I was bored.
SB01.2	I was bored with the physical exercises.
SB01.3	I was bored with the breathing exercises.
SB01.5	I was bored with the meditation.
SB01.6	I was bored with the relaxation phase.
SB01.7	I was bored with the repetitive practice.

Scale: 1 = stimme überhaupt nicht zu
2 = stimme eher nicht zu
3 = teils-teils
4 = stimme eher zu
5 = stimme voll und ganz zu

Item	Item wording
Question:	Bei der gerade absolvierten Yoga-Einheit...
FQ01.1	erlebte ich Freude.
FQ01.2	war ich stolz.
SB01.1	langweilte ich mich.
SB01.2	langweilten mich die Körperübungen.
SB01.3	langweilten mich die Atemübungen.
SB01.4	langweilten mich die Meditationen.
SB01.5	langweilten mich die Entspannungsphasen.
SB01.6	langweilte mich der gleichbleibende Ablauf.

Valence appraisal

Literature: Adjusted on the work of Goetz et al. (2025)

Scale: 1 = do not agree at all

2 = rather disagree

3 = partly agree

4 = tend to agree

5 = completely agree

Item	Item wording
Question	Please rate the following statements in relation to the yoga session you have just completed.
VL01.1	The physical exercises were important to me.
VL01.2	The breathing exercises were important to me.
VL01.3	The meditations were important to me.
VL01.4	The relaxation was important to me.
VL01.5	The yoga session was important to me.

Valenz

Scale: 1 = stimme überhaupt nicht zu

2 = stimme eher nicht zu

3 = teils-teils

4 = stimme eher zu

5 = stimme voll und ganz zu

Item	Item wording
Question	Bitte bewerten Sie folgende Aussagen in Bezug auf die gerade absolvierte Yoga-Einheit.
VL01.1	Die Körperübungen waren mir wichtig.
VL01.2	Die Atemübungen waren mir wichtig.
VL01.3	Die Meditationen waren mir wichtig.
VL01.4	Die Entspannungen waren mir wichtig.
VL01.5	Die Yoga-Einheit war mir wichtig.

Motivation

Literature: Adjusted on the work of (Goetz et al., 2025)

Scale: 1 = do not agree at all
2 = rather disagree
3 = partly agree
4 = tend to agree
5 = completely agree

Item	Item wording
MO01.1	I am motivated for my next yoga session.
MO01.2	I'm looking forward to the next time I can practise yoga again.
MO01.3	I'm in the mood for my next yoga session.
MO01.4	I would love to get back to practicing yoga as soon as possible.

Motivation

Scale: 1 = stimme überhaupt nicht zu
2 = stimme eher nicht zu
3 = teils-teils
4 = stimme eher zu
5 = stimme voll und ganz zu

Item	Item wording
MO01.1	Ich bin motiviert für meine nächste Yoga-Einheit.
MO01.2	Ich freue mich auf das nächste Mal, wenn ich wieder Yoga praktizieren kann.
MO01.3	Ich habe Lust auf die nächste Yoga-Einheit.
MO01.4	Am liebsten würde ich so bald wie möglich wieder Yoga praktizieren.

Control appraisal

Literature: Adjusted on the work of Goetz et al. (2025) and (Krannich et al. (2019)

Scale: 1 = do not agree at all
2 = rather disagree
3 = partly agree
4 = tend to agree

5 = completely agree

Overchallenge

Item	Item wording
Question	Please rate the following statements in relation to the yoga session you have just completed.
CO01.1	I felt overchallenged.
CO01.2	The physical exercises overchallenged me.
CO01.3	The breathing exercises overchallenged me.
CO01.4	The meditations overchallenged me.
CO01.5	The relaxations overchallenged me.

Überforderung

Scale: 1 = stimme überhaupt nicht zu

2 = stimme eher nicht zu

3 = teils-teils

4 = stimme eher zu

5 = stimme voll und ganz zu

Item	Item wording
Question	Bitte bewerten Sie folgende Aussagen in Bezug auf die gerade absolvierte Yoga-Einheit.
CO01.1	Ich fühlte mich überfordert.
CO01.2	Die Körperübungen überforderten mich.
CO01.3	Die Atemübungen überforderten mich.
CO01.4	Die Meditationen überforderten mich.
CO01.5	Die Entspannungsphasen überforderten mich.

Underchallenge

Item	Item wording
Question	Please rate the following statements in relation to the yoga session you have just completed.
CO02.1	I felt underchallenged.
CO02.2	The physical exercises underchallenged me.

CO02.3	The breathing exercises underchallenged me.
CO02.4	The meditations underchallenged me.
CO02.5	The relaxations underchallenged me.

Unterforderung

Scale: 1 = stimme überhaupt nicht zu

2 = stimme eher nicht zu

3 = teils-teils

4 = stimme eher zu

5 = stimme voll und ganz zu

Item	Item wording
Question	Bitte bewerten Sie folgende Aussagen in Bezug auf die gerade absolvierte Yoga-Einheit.
CO02.1	Ich fühlte mich unterfordert.
CO02.2	Die Körperübungen unterforderten mich
CO02.3	Die Atemübungen unterforderten mich.
CO02.4	Die Meditationen unterforderten mich.
CO02.5	Die Entspannungsphasen unterforderten mich.

Appendix B

R Scripts

Preparation.r

#libraries

misty::libraries(misty, MplusAutomation, flextable, dplyr, lubridate)

Lade die Daten

start_df <- read.data("Start questionnaire.csv")

esm_df <- read.data("Please complete after each session.csv")

#Exclude admin Testuser

start_df <- start_df[start_df\$userId != "Fnek-5SRz-zkHU",]

esm_df <- esm_df[esm_df\$userId != "Fnek-5SRz-zkHU",]

start_df <- start_df[start_df\$userId != "RRhM-KfF9-rV7S",]

esm_df <- esm_df[esm_df\$userId != "RRhM-KfF9-rV7S",]

#cleaning Data under 2

esm_df_filtered <- esm_df |>

group_by(userId) |>

filter(n() >= 2) |>

ungroup()

start_df_filtered <- start_df[start_df\$userId %in% esm_df_filtered\$userId,]

Abstände zwischen den Messzeitpunkten (in Tagen), erster Messzeitpunkt = 0

esm_df_neu_2_intervals <- esm_df_filtered |>

arrange(userId, responseTime_formatted) |>

group_by(userId) |>

mutate(

interval_days = ifelse(is.na(lag(responseTime_formatted)),

0,

as.numeric(difftime(responseTime_formatted, lag(responseTime_formatted),

units = "days")))

) |>

ungroup()

#Mittelwertskalen bilden

esm_df_neu_2_scale_intervals <- esm_df_neu_2_intervals %>%

rowwise() %>%

mutate(

BO = mean(c_across(starts_with("SB01.")), na.rm = TRUE),

VA = mean(c_across(starts_with("VL01.")), na.rm = TRUE),

OC = mean(c_across(starts_with("CO01.")), na.rm = TRUE),

UC = mean(c_across(starts_with("CO02.")), na.rm = TRUE),

MO = mean(c_across(starts_with("MO01.")), na.rm = TRUE)

) %>%

ungroup()

```

# Daten in MPlus schreiben: Abstände zwischen Messzeitpunkten
esm_df_neu_2_scale_intervals <- esm_df_neu_2_scale_intervals[, c("userId", "SB01.1",
"SB01.2", "SB01.3", "SB01.4", "SB01.5",
"VL01.1", "VL01.2", "VL01.3", "VL01.4",
"VL01.5",
"MO01.1", "MO01.2", "MO01.3", "MO01.4",
"CO01.1", "CO01.2", "CO01.3", "CO01.4",
"CO01.5",
"CO02.1", "CO02.2", "CO02.3", "CO02.4",
"CO02.5", "interval_days",
"BO", "VA", "OC",
"UC", "MO")]

esm_df_neu_2_scale_intervals_ordered <-
esm_df_neu_2_scale_intervals[order(esm_df_neu_2_scale_intervals$userId,
esm_df_neu_2_scale_intervals$interval_days), ]

df_MPlus_scale_intervals_ordered <- esm_df_neu_2_scale_intervals_ordered[, c("userId",
"BO", "VA", "OC",
"UC",
"MO", "interval_days")]

df_MPlus_scale_intervals_ordered[, -1] <- round(df_MPlus_scale_intervals_ordered[, -1], 2)
prepareMplusData(df_MPlus_scale_intervals_ordered, filename =
"./01_data/deskriptiv_MPlus.dat")

# Daten in MPlus schreiben: Abstände zwischen Messzeitpunkten
prepareMplusData(df_MPlus_scale_intervals_ordered, filename =
"./01_data/MPLUS_scale_ordered_intervals.dat")

```

Mplus Scripts

Overchallenge.inp

TITLE: Overchallenged - Mediation analysis using DSEM according to Fang et al.

DATA: FILE = "../01_data/MPLUS_scale_ordered_intervals.dat";

VARIABLE:

```

    NAMES = userId BO VA OC UC MO days;
    USEVARIABLES = userId BO OC MO time;
    WITHIN = time;
    LAGGED = MO(1) OC(1) BO(1);
    CLUSTER = userId;
    TINTERVAL = days(1);
    MISSING=.;

```

DEFINE:

```

    time=days;

```

ANALYSIS:

```

    TYPE = TWOLEVEL RANDOM;
    PROCESSORS = 8;
    ESTIMATOR = BAYES;
    BITERATIONS=90000 (49000);

```

MODEL:

```
%WITHIN%
BETAxoc | OC^ ON OC^1; !autoregressive effect
BETAambo | BO^ ON BO^1; !autoregressive effect
BETAymo | MO^ ON MO^1; !autoregressive effect
GAMA1 | MO^ ON OC^1; !lagged-1 effect c'
GAMA2 | BO^ ON OC^1; !lagged-1 effect a
GAMA3 | MO^ ON BO^1; !lagged-1 effect b
trend1 | OC ON time; !time predicts overchallenge (X)
trend2 | BO ON time; !time predicts boredom (M)
trend3 | MO ON time; !time predicts motivation (Y)
LogV1 | OC; !residual variance of overchallenge (X)
LogV2 | BO; !residual variance of boredom (M)
LogV3 | MO; !residual variance of motivation (Y)

%BETWEEN%
[OC];[BO];[MO]; !average individual means
[BETAxoc]; [BETAambo]; [BETAymo]; !average autoregressive effect
[LogV1]; [LogV2]; [LogV3]; !average residual variance
[trend1]; [trend2]; [trend3]; !average of residual variance
[GAMA1]; !mean of lagged-1 effect c'
[GAMA2](a);
[GAMA3](b);
OC;
MO;BO;
BETAxoc;
BETAambo;BETAymo;
GAMA1;GAMA2;GAMA3;
LogV1;LogV2;LogV3;
trend1;trend2;trend3;
GAMA2 WITH GAMA3(cab); !covariance of GAMA2 and GAMA3
```

MODEL CONSTRAINT:

```
NEW(ind); !generate new parameter for mediation effect
ind=a*b+cab;
```

```
OUTPUT: tech1 tech8 cinterval(hpd) standardized (cluster);
plot: type=plot3;
```

Underchallenge.inp

TITLE: Underchallenged - Mediation analysis using DSEM according to Fang et al.

DATA: FILE = "../01_data/MPLUS_scale_ordered_intervals.dat";

VARIABLE:

```
NAMES = userId BO VA OC UC MO days;
USEVARIABLES = userId BO UC MO time;
WITHIN = time;
LAGGED = MO(1) UC(1) BO(1);
CLUSTER = userId;
TINTERVAL = days(1);
MISSING=.;
```

DEFINE:


```

time=days;
ANALYSIS:
  TYPE = TWOLEVEL RANDOM;
  PROCESSORS = 8;
  ESTIMATOR = BAYES;
  BITERATIONS=90000 (49000);
MODEL:
  %WITHIN%
  BETAxuc | UC^ ON UC^1; !autoregressive effect
  BETAmbo | BO^ ON BO^1; !autoregressive effect
  BETAymo | MO^ ON MO^1; !autoregressive effect
  GAMA1 | MO^ ON UC^1; !lagged-1 effect c'
  GAMA2 | BO^ ON UC^1; !lagged-1 effect a
  GAMA3 | MO^ ON BO^1; !lagged-1 effect b
  trend1 | UC ON time; !time predicts overchallenge (X)
  trend2 | BO ON time; !time predicts boredom (M)
  trend3 | MO ON time; !time predicts motivation (Y)
  LogV1 | UC; !residual variance of overchallenge (X)
  LogV2 | BO; !residual variance of boredom (M)
  LogV3 | MO; !residual variance of motivation (Y)

  %BETWEEN%
  [UC];[BO];[MO]; !average individual means
  [BETAxuc]; [BETAmbo]; [BETAymo]; !average autoregressive effect
  [LogV1]; [LogV2]; [LogV3]; !average residual variance
  [trend1]; [trend2]; [trend3]; !average of residual variance
  [GAMA1]; !mean of lagged-1 effect c'
  [GAMA2](a);
  [GAMA3](b);
  UC;
  MO;BO;
  BETAxuc;
  BETAmbo;BETAymo;
  GAMA1;GAMA2;GAMA3;
  LogV1;LogV2;LogV3;
  trend1;trend2;trend3;
  GAMA2 WITH GAMA3(cab); !covariance of GAMA2 and GAMA3

MODEL CONSTRAINT:
  NEW(ind); !generate new parameter for mediation effect
  ind=a*b+cab;

OUTPUT: tech1 tech8 cinterval(hpd) standardized (cluster);
plot: type=plot3;

```

Valence.inp

TITLE: Valence - Mediation analysis using DSEM according to Fang et al.

DATA: FILE = "../01_data/MPLUS_scale_ordered_intervals.dat";

VARIABLE:

NAMES = userId BO VA OC UC MO days;
USEVARIABLES = userId BO VA MO time;
WITHIN = time;
LAGGED = MO(1) VA(1) BO(1);
CLUSTER = userId;
TINTERVAL = days(1);
MISSING=.;

DEFINE:

time=days;

ANALYSIS:

TYPE = TWOLEVEL RANDOM;
PROCESSORS = 8;
ESTIMATOR = BAYES;
BITERATIONS=90000 (49000);

MODEL:

%WITHIN%

BETAxva | VA^ ON VA^1; !autoregressive effect
BETAmbo | BO^ ON BO^1; !autoregressive effect
BETAYmo | MO^ ON MO^1; !autoregressive effect
GAMA1 | MO^ ON VA^1; !lagged-1 effect c'
GAMA2 | BO^ ON VA^1; !lagged-1 effect a
GAMA3 | MO^ ON BO^1; !lagged-1 effect b
trend1 | VA ON time; !time predicts overchallenge (X)
trend2 | BO ON time; !time predicts boredom (M)
trend3 | MO ON time; !time predicts motivation (Y)
LogV1 | VA; !residual variance of overchallenge (X)
LogV2 | BO; !residual variance of boredom (M)
LogV3 | MO; !residual variance of motivation (Y)

%BETWEEN%
[VA];[BO];[MO]; !average individual means
[BETAxva]; [BETAmbo]; [BETAYmo]; !average autoregressive effect
[LogV1]; [LogV2]; [LogV3]; !average residual variance
[trend1]; [trend2]; [trend3]; !average of residual variance
[GAMA1]; !mean of lagged-1 effect c'
[GAMA2](a);
[GAMA3](b);
VA;
MO;BO;
BETAxva;
BETAmbo;BETAYmo;
GAMA1;GAMA2;GAMA3;
LogV1;LogV2;LogV3;
trend1;trend2;trend3;
GAMA2 WITH GAMA3(cab); !covariance of GAMA2 and GAMA3

MODEL CONSTRAINT:

```
NEW(ind); !generate new parameter for mediation effect  
ind=a*b+cab;
```

```
OUTPUT: tech1 tech8 cinterval(hpd) standardized (cluster);  
plot: type=plot3;
```