

**The Effects of Attentional Focus on Piano
Performance as a Performance Anxiety
Intervention – A Pilot Study**

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Introduction

Performance of a learnt motor skill can differ according to different attentional focuses (Wulf et al., 2001). Various studies report performance benefits when a performer directs their attention to the effects of their motor movements (having an external focus of attention) compared to directing their attention to the body movements needed to execute said motor movements (having an internal focus of attention) (Wulf, 2007; Wulf & Su, 2007; Chua et al., 2021). According to the constrained action hypothesis, having an internal focus of attention leads individuals to become more conscious of their movements, disrupting the fluidity and execution of automatic motor control processes which results in limited performance (Wulf et al., 2001). This is contrasted by an external focus of attention, which overrules conscious control processes and allows the motor system to ‘naturally self-organize (Wulf et al., 2001).

Performance anxiety is a phenomenon affecting multiple disciplines, ranging from sports to the performing arts. Kenny (2011) defines music performance anxiety (MPA) as the feeling of persistent anxiety during a musical performance that manifests through a combination of affective and cognitive factors. Categorized as a subtype of social anxiety disorder in the DSM-5, MPA has a larger impact on individuals in high-pressure circumstances which threatens one’s ego and perceived skill level (Kenny, 2011; American Psychological Association, 2013). MPA can also hinder musical performance, and if severe, can affect the wellbeing of musicians throughout their lives. Yoshie and colleagues (2009) reported that higher levels of cognitive anxiety in pianists significantly predicted lower technical accuracy during performances. This finding is supported by Passarotto and colleagues (2023), who also found that high levels of anxiety in pianists correlated with poorer performance quality.

In competitive situations, MPA is especially heightened, resulting in an internal focus of attention and individuals ‘choking under pressure’ (Baumeister, 1984). Choking can be defined as individuals executing their skill (hence, performing) at a considerably lower standard than expected due to heightened anxiety under pressure (Mesagno & Hill, 2013). It should be noted that there is a difference between choking and under-performance, and several factors such as the difficulty of skill, the performer’s skill level, as well as their anxiety levels should be considered before classifying a performance as ‘choking’. There are generally two attention-based theories of choking that try to explain the relationship between increased anxiety and subsequent lower performance execution: distraction theories and self-focus theories.

Distraction theories of choking suggest that a diversion of attention towards task-irrelevant stimuli (i.e., feelings of anxiousness) as opposed to task-relevant stimuli (i.e., skills required during performance) overloads the working memory capacity and results in poorer performance (Wine, 1971). The working memory system is comprised of multiple components, acting as a short-term memory capacity store. According to the distraction model, performance levels are diminished when feelings of anxiousness and self-consciousness over-occupy the attentional capacity store located in the working memory (Mesagno et al., 2015). This limits the attentional resources that could have been allocated to the performance skill, which depends upon working memory (DeCaro et al., 2011; Pozenatto, 2020). An example of a skill dependent on working memory is musical performance. Thus, distraction theories suggest that a lack of attention directed to the skill during performances is what causes choking. Neuroimaging studies support this model, reporting abnormalities in functional connectivity between the dorsolateral prefrontal cortex (which plays a role in regulating working memory) and the motor cortex (which manages fine-tuned, precise movements) during events of ‘choking’ (Lee & Grafton, 2015).

Similar to principles of the constrained action hypothesis, self-focus theories of choking state that automatic motor processes are disrupted as a result of individuals becoming self-conscious during pressure-inducing performances (Baumeister & Showers, 1986). Baumeister (1984) suggests that individuals have the cognitive realization that they need to do well whilst performing, leading to conscious attempts to try to control and monitor their behaviour. In the case of piano performance, this would be through trying to precisely coordinate finger movements according to the music score. This realization and state of self-consciousness is what hinders performance quality, inhibiting the automatic fine motor control processes developed through practice (Baumeister, 1984). Thus, self-focus theories argue that choking occurs due to too much attention being directed towards the performance skill. There is more support for self-focus theories compared to distraction theories, as reviewed by Hill and colleagues (2010). Direct comparison between self-focus and distraction theories also have shown this – Gucciardi and Dimmock (2008) found deterioration of performance when cues that increased self-consciousness were given, but no deterioration of performance when task-irrelevant cues were given.

Past literature often approaches attentional focus and performance anxiety as separate topics. The two are rarely combined in research. Mornell and Wulf (2018) found a correlation between

adopting an external focus of attention and enhanced musical performance. A questionnaire-based qualitative study has also been conducted, gathering musicians' experiences with their attentional focuses during different performance scenarios: performing under pressure, choking under pressure, and recovering from choking (Oudejans et al., 2016). Both studies conclude that an external focus of attention is beneficial during performances for reducing self-consciousness and hence, MPA. However, a study exploring the effects of an external focus of attention on MPA specifically, which combines both qualitative and quantitative measures (to this date) could not be found. Given this considerable gap, research regarding the potential benefits of shifting attentional focus on MPA is still lacking. Therefore, this study aimed to investigate whether an external focus of attention impacts MPA in piano performance using quantitative and qualitative methods. It was hypothesized that adopting an external focus of attention during performances would result in lower MPA levels compared to an internal focus of attention.

Method

Participants

We plan to recruit 20 students. So far, one student from the University of St Andrews participated in the study. The participant had the equivalent of a Grade 8 ABRSM piano qualification and was paid £10 for their participation. Informed consent was obtained from the participant before the study. Ethical clearance was obtained from the university (PS16526).

Materials

Participants were required to perform any J.S. Bach Invention (BWV 722-786) of their choice. Sheet music was provided to them at least two weeks prior to the study date.

Measures

Performance quality

Musical performance quality was assessed using pitch errors, corrections, and hesitations. Pitch errors were defined as any note a participant played that wasn't within the original score (i.e., a wrong note, or a correct note that was repeated). The correction of a previously wrong note according to the original score was deemed as a correction. Hesitations were defined as the participant pausing for at least half of the score's indicated note value, independent of whether the note was played correctly or wrongly.

Heart rate

Heart rate (HR) was recorded a total of seven times throughout the study. This included before and after practice, before and after each focus condition, and one final reading after filling out the questionnaires. Participants' HR was taken using a pulse oximeter (CMS50F wrist-worn model).

Self-reported questionnaires

Three self-evaluative questionnaires were used. The first questionnaire acted as an indication of how anxious participants felt after each focus condition. The questionnaire was presented on a Likert scale from 0-7, with 0 meaning not anxious at all and 7 meaning extremely anxious. The second questionnaire consisted of questions asking how participants felt during each focus condition and which condition they felt they performed better in. Questions about their general experiences combating performance anxiety as well as which hand they focused more on (if any) were also asked. Further information about their prior knowledge of attentional focus was also obtained. Lastly, the third questionnaire collected their personal information (age, gender, handedness), piano skill level, and general musical experiences. The first questionnaire was given immediately after performing in each focus condition. The second and third questionnaires were presented after participants had undergone both focus conditions.

Musical performance anxiety

An adapted version of the Kenny Musical Performance Anxiety Inventory (K-MPAI) was used as an MPA measure (Kenny, 2016).

Procedure

Participants were given a choice of the 15 J.S. Bach Inventions (BWV 772-786) to choose from, and a minimum of 2 weeks to practice their selected piece. After settling on a date and time, participants were informed they would be performing the piece in front of a small audience. Upon arriving, HR was taken, and participants were given 5 minutes to practice and warm up however they wanted. HR was taken after practice, and participants were given time to relax/get ready. Participants were then briefed on the fact they would have to play the piece twice under two different instructions. The order of the two focus conditions was randomized across participants to combat order effects. For the external focus condition, participants were given the instruction: "While you perform, I want you to focus on the melody line". For the internal focus condition, participants were given the instruction: "While you perform, I want

you to focus on the movement of your fingers.” HR was taken before these instructions were given. Participants then performed their pieces and HR was taken immediately after each focus condition. Audio of the participants’ performances was recorded for data analysis of performance quality, which they were made aware of. After each condition, participants were presented with the first self-reported questionnaire. After finishing the two focus conditions, participants were then asked to fill in the two other self-reported questionnaires along with the K-MPAI. Lastly, they were debriefed about the study and what we wanted to find through our research.

Initial findings

Given the limited sample size to date, statistical analysis has not been conducted yet. However, looking at the raw data, there are general trends which support our hypothesis.

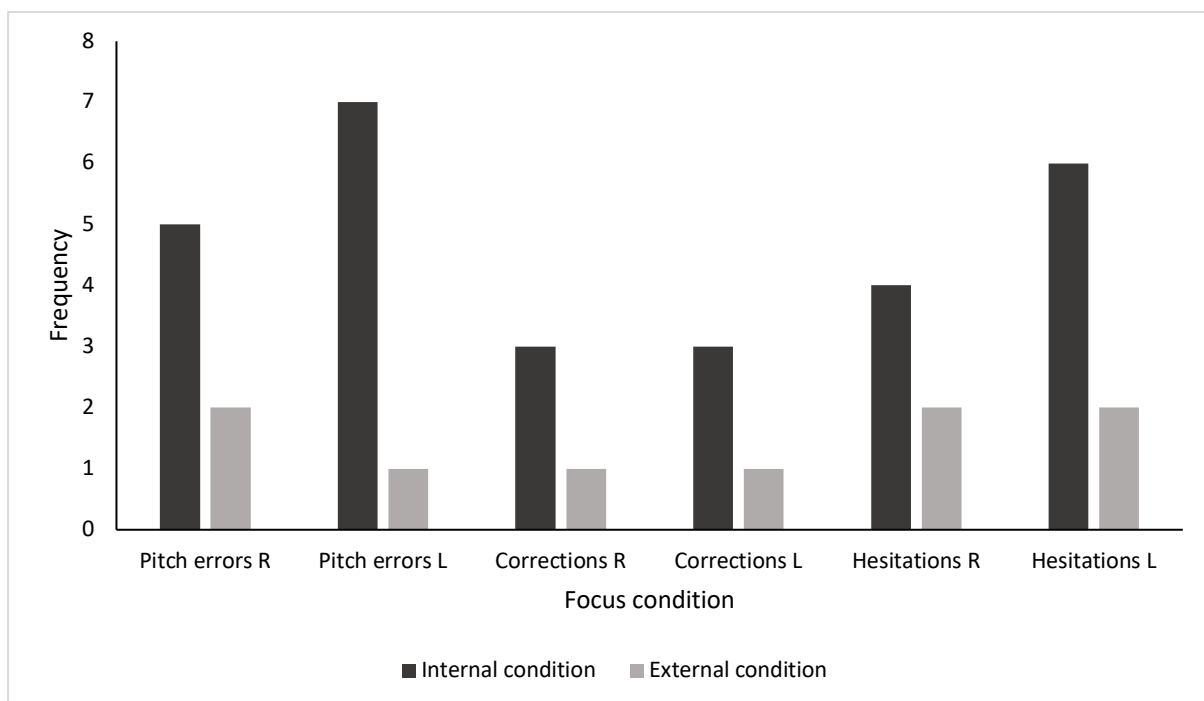


Figure 1. Number of pitch errors, corrections, and hesitations the participants made in each hand (L = left hand; R = right hand) whilst performing during the two focus conditions.

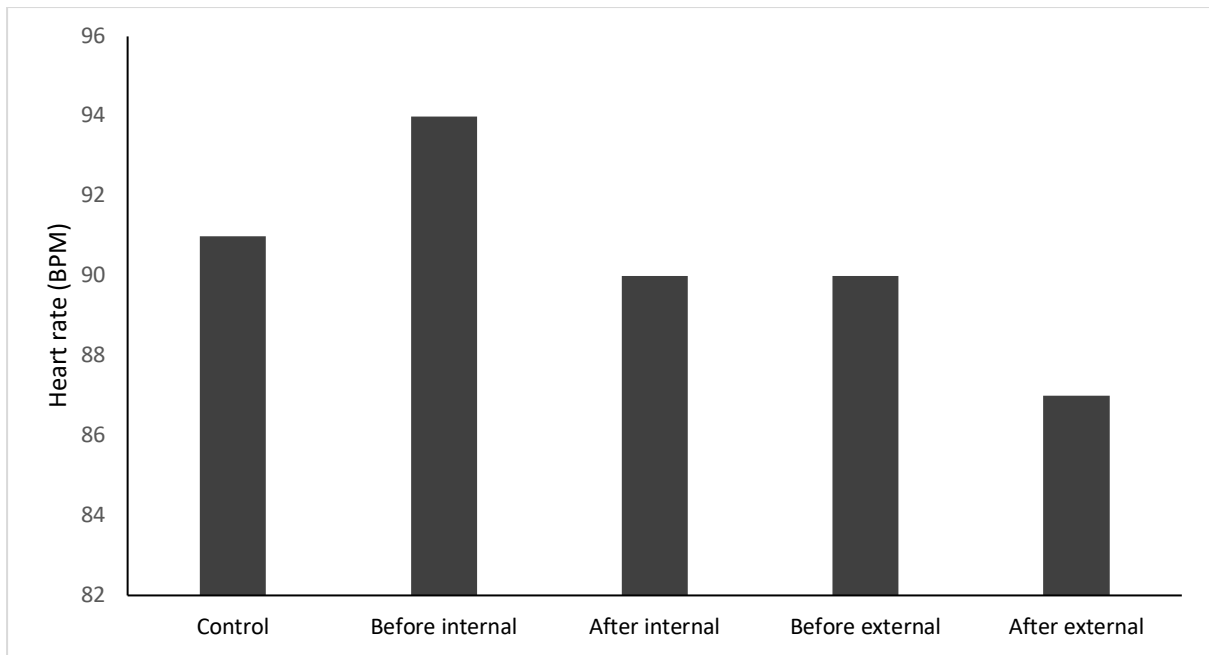


Figure 2. Heart rate of participant throughout the study. The control BPM was calculated by averaging the mean heart rate before and after practice.

On a scale of 0-7, the participant reported their level of anxiety as 4 after the internal condition and 2 after the external condition. This supports our hypothesis that adopting an external focus of attention results in less anxiety compared to an internal focus of attention during performances. Data from assessing the participant's musical performance also supports our hypothesis. Figure 1 shows that the quality of performance (as measured by pitch error, corrections, and hesitations) is better in the external condition compared to the internal condition. A higher starting BPM indicating higher anxiety levels was also recorded before the participant started playing in the internal condition, compared to their BPM before playing in the external condition as shown in Figure 2. These results support the hypothesis that an internal focus of attention evokes a higher level of MPA than an external focus of attention.

Reflections

It is too early to draw a conclusion from this initial pilot study conducted. However, the study was able to demonstrate that there are grounds to support an external focus of attention as a MPA intervention, providing a plausible framework for further investigation.

Several limitations posed problems for this study. Firstly and most importantly, the lack of participants meant that no statistical analysis could be conducted to date. It should be noted

that this study was conducted during the summer break when most students were no longer physically present at the university. Another factor contributing to the small sample size was the niche requirements we had when recruiting participants. To participate, individuals had to have a qualification of Grade 8 ABRSM in piano or equivalent. Given the varying literature on whether attentional focus is dependent on an individual's skill set (Duke et al., 2011; Perkins-Ceccato et al., 2003), this requirement was set to rule out the factor of skill level when analysing performance quality between the two focus conditions.

The choice of piece could also have impacted our sample size. J.S. Bach's Inventions may have been too difficult for participants to fully commit to when practising. However, we decided upon this piece because Inventions are often used as a staple piece when training young pianists, and it was assumed that preparation for this study would be revision of the piece (Kahlstorf, 2002). J.S. Bach's Inventions have also previously been used as exam pieces for the Grade 5 ABRSM piano repertoire, indicating that the pieces' difficulty levels would be lower than the participants' skill level. However, given that the piece is relatively long, it may not have been suitable to be used in an experimental context. Moreover, from an analytical point-of-view, Baroque pieces are easier to work with (for both researchers and participants) as they usually have very clear-cut melody distributions, a consistent tempo, as well as a very 'clean sound'. The Bach Inventions in particular have a distinct melody line and a non-melody line, which transitions between both hands throughout the piece. It is therefore easier to instruct participants to 'focus on the melody line' and thus, the music as a whole when attempting to evoke an external focus of attention. The transference of the melody between both hands also diminishes the issue of handedness as a potential extraneous variable. It ensures that there is no bias towards one particular hand as there would be with simple pieces like Twinkle Twinkle Little Star, where the right hand plays the melody, and the left hand plays the accompaniment (which is the non-melody). Additionally, a consistent tempo and 'clean sound' are especially helpful during the analysis of a participant's performance quality, as pitch errors, corrections, and hesitations become easier to code for and identify.

One thing can be drawn from this study, however – there is potential for an external focus of attention to be useful as a MPA intervention. Previous literature and the raw data collected suggest that an external focus of attention does indeed help with MPA in pianists. Though it is acknowledged that the raw data collected remains statistically insignificant, it acts as a general overview of statistical trends. This poses many positive implications not only for music

education but also for various fields that require individuals to perform under high pressure, such as public speaking and sports.

Future work expanding on this field of research will be continued. We aim to reflect upon our limitations to make the study more robust. This study acts as a step towards providing a definitive intervention for MPA.

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