Exploring *Conceptual Simplification* as a Memorisation Method for Post-Tonal Music: Main Findings from a Study with Recruited Pianists

Laura Farré Rozada

Royal Birmingham Conservatoire, Birmingham City University, United Kingdom

laura.farrerozada@bcu.ac.uk

Abstract

This paper presents the main findings from testing some strategies of a method for memorisation of post-tonal piano music. The participants were conservatoire piano students and recent graduates, divided into a control group and an experimental group based on the results of a questionnaire that evaluated their musical and educational backgrounds, memorisation strategies, experience with perfect pitch and synaesthesia, sight-reading, emotions, sleep, and mental practice. Participants memorised four excerpts, either using their own strategies (control group) or following a series of instructions (experimental group), which recreated the implementation of Conceptual Simplification. Additionally, the study evaluated whether the suggested strategies could be helpful for the participants' daily performance practice, either as a new approach or in combination with their regular working methods. Finally, it also aimed at testing how the given instructions influenced the results of the experimental group in comparison to the control group; and how sleeping between recalls influenced the results. Participants were asked to perform from memory and audio-record all excerpts in three different recalls: 1) after practice and without sleep, 2) without practice and without sleep, and 3) without practice and with sleep. After each recall, participants were interviewed to evaluate their experience further. Thematic analysis was applied to the transcribed semi-structured interviews, and the audio recordings were assessed both qualitatively and quantitatively by the author. The most successful participants in the control group were those implementing Conceptual Simplification strategies on their own. However, since these participants had no instructions on how to memorise using Conceptual Simplification, they were more successful than their peers in the same group but less than those in the experimental group. The method's strategies worked well in combination with the participants' usual memorisation strategies, and most participants found it easier to recall the excerpts after sleeping.

Keywords: analysis, learning, memorisation, Conceptual Simplification, post-tonal piano music

Introduction

Most soloists, especially pianists, are required or expected to perform from memory during their studies and at a professional level, but memorisation is not a topic frequently taught or discussed at conservatoires (Jónasson & Lisboa, 2016). This is partly due to an existing gap in music performance, education, and psychology regarding how memorisation should be trained (Ginsborg, 2004; Mishra, 2005, 2010), but also, because research findings do not always transfer or are pedagogically implemented at conservatoires (Ginsborg, 2004; Jónasson & Lisboa, 2016; Mishra, 2010).

Similarly, existing research on musical memory is quite extensive, but it has mainly focused on observing how musicians practise and memorise, in order to determine whether some strategies are more efficient than others (e.g., Chaffin & Imreh, 1997; Chaffin et al., 2003; 2010; Fonte, 2020; Soares, 2015; Tsintzou & Theodorakis, 2008). However, the resulting theories, far from proposing a systematic method on how to memorise effectively, solely indicate general guidelines (e.g., Chaffin & Imreh, 1997; Chaffin et al., 2002; 2003; 2010). The literature is even scarcer for post-tonal music (Asimov & Murray, 2024; Fonte, 2020; Soares, 2015; Thomas, 1999; Tsintzou & Theodorakis, 2008).

Performance cue theory is the main approach for studying memorisation of tonal and post-tonal music (e.g., Chaffin & Imreh, 1997; Chaffin et al., 2002; 2003; 2010; Fonte, 2020; Ginsborg & Chaffin, 2011a; Soares, 2015). This theory describes practitioners' memorisation strategies and individual learning differences (Mishra, 2002; 2007) but fails to provide a memorisation method. Furthermore, even if musicians effectively develop a hierarchical retrieval scheme to articulate all these performance cues, such memory hints do not allow the performer to reconstruct or deduce the content to which these provide access. Evidence of this problem is provided by the same studies

applying performance cue theory, which report that memory is more reliable for section boundaries than other locations that tend to be poorly recalled or are forgotten (Chaffin & Imreh, 1997; Chaffin et al., 2002; 2010; Fonte, 2020; Ginsborg & Chaffin, 2011; Soares, 2015).

Consequently, memorisation of post-tonal music is still a taboo with which performers struggle, leaving musicians to find their own ways for achieving this goal (e.g., Chaffin et al., 2002; Farré Rozada, 2024; Fonte, 2020; Ginsborg, 2004; Soares, 2015). These approaches are, however, not always effective under pressure or within tight deadlines (Chaffin & Imreh, 1997; Chaffin et al., 2002; Fonte, 2020; Tsintzou & Theodorakis, 2008). This is one of the main reasons why post-tonal music is likely to be performed from the score, since regular memorisation strategies (namely, using traditional harmony and standard patterns) are not always applicable (Asimov & Murray, 2024; Farré Rozada, 2024; Fonte, 2020; Jónasson & Lisboa, 2016; Soares, 2015; Thomas, 1999; Tsintzou & Theodorakis, 2008). Thus, the Conceptual Simplification method tested and formalised in Farré Rozada (2024) aims to address this gap.

This paper presents the main findings of testing the effectiveness of Conceptual Simplification for memorising post-tonal piano music with recruited pianists of different backgrounds and performing experience. Therefore, the paper begins by providing a general overview of Conceptual Simplification and the aims of the studies presented; then, it outlines the main aspects of the research method (participants, materials, procedure, data analysis); and finally, it presents the main findings, discussion and conclusions.

Conceptual Simplification

Conceptual Simplification is a method that aims to scaffold the analysis, learning and memorisation of post-tonal piano music. Inspired by mathematics and computer science, this is thoroughly discussed in the PhD thesis by Farré Rozada (2024). In general terms, Conceptual Simplification involves three main steps, each with its own pool of strategies:

- **Triage:** This is the initial stage for becoming acquainted with the musical work and identifying strategies that could help address the challenges presented.
- **Simplifying layers of complexity:** This proceeds to slicing complexity into layers, reducing the level of difficulty of the musical score. A layer of complexity could be the range of octaves in which a single melody is displayed, the extended techniques involved in a piece, a repetitive pattern or figuration that cyphers a chord or progression, or any other secondary information that contributes to the music's complexity without being the primary source. This process is preferably done mentally using the piano, but it can be written down if that is more helpful.
- **Conceptual encoding:** this is the reverse process of simplifying layers of complexity, restoring layers of complexity, once a particular modified version of the musical work is successfully internalised.

Aims

These studies with participants aimed to test Conceptual Simplification and assess its effectiveness alongside participants' suggested strategies when memorising four post-tonal excerpts. Participants were divided into a control group and an experimental group. Both groups memorised the same excerpts, but the experimental group received a list of instructions for implementing Conceptual Simplification. Specifically, the Conceptual Simplification strategies tested were: simplifying pitch, simplifying octaves, simplifying chords, simplifying hands, simplifying rhythm, simplifying repetition, simplifying structure, simplifying preceding structure, interval conceptualisation, chord conceptualisation, *solkattu* verbalisation and pattern conceptualisation (see Farré Rozada, 2024). Alternatively, the control group memorised the excerpts using their usual procedures. Semi-structured interviews after each test allowed participants to comment on the strategies used, including their effectiveness. Therefore, this research aimed at testing the following:

- Whether the suggested strategies could be helpful for participants' daily performance practice, either as a new approach or combined with their regular working methods.
- How the given instructions influenced the experimental group's results in comparison to the control group.
- How a night's sleep influenced the results of the morning recall on the second day, as opposed to the afternoon recall, given that participants completed a morning memorisation test, an afternoon recall on that same day, and a next-day recall on the following morning.

Method

The studies with participants consisted in a pilot study followed by a main study, which allowed the author to assess the participants' performance in their usual working environment. The purpose of the pilot study was to validate the research methods used and collect feedback from participants to eliminate potential ambiguities in the questions and instructions provided. Furthermore, its purpose was to evaluate the time participants needed for completing each task and the challenges experienced; check whether the proposed excerpts were representative of the phenomenon being tested, identify participants' response to the excerpts, find out which memorisation strategies were used in both groups, and test the efficiency of data analysis with a small sample of participants. All these served as a baseline and helped in refining the main study.

Participants

The 11 recruited participants consisted of two second-year BMus piano students, one bachelor's graduate, three master's graduates pursuing further postgraduate studies, one PhD student, two professional pianists, one organ tutor and piano accompanist, and one amateur with 15 years of piano playing experience. The pilot study was conducted with three participants and the main study with eight participants. Table 1 provides a summary of participants allocation between the control group and the experimental group for both studies.

Table 1. Comparison of the control and experimental groups by socio-demographical variables and musical skills.

	Control Group	**Experimental Group**
Participants	4	7
Gender	1 Female 2 Males	6 Females 1 Male
Education	1 Bachelor's student 1 Postgraduate student 2 Professionals	1 Amateur 1 Bachelor's student 1 Bachelor's graduate 2 Postgraduate students 1 PhD student 1 Professional
LRT	1 Less than 50% 1 Between 60-69% 2 More than 80%	1 Less than 50% 1 Between 50-59% 2 Between 60-69% 3 Between 70-79%
Performs from memory	2 Sometimes 2 No	5 Yes 2 Sometimes
Sight-reading	3 Yes 1 To some extent	2 Yes 3 To some extent 2 No
Synaesthesia	4 No	2 Sometimes 5 No
Perfect pitch	2 Yes 2 No	4 Yes 3 No
Uses emotions to memorise	1 Yes 3 No	3 Sometimes 4 No
Memorisation strategies	2 Yes 2 To some extent	2 Yes 5 To some extent
Sleep	1 Yes 1 Sometimes 2 No	1 Yes 3 Sometimes 3 No

Materials

Both studies involved a questionnaire, a logical reasoning test (LRT), and a memorisation test, consisting of a morning memorisation test (MMT), an afternoon recall (AR) and a next-day recall (NDR). Participants completed all memorisation tests on a piano on two consecutive days, following the schedule summarised in Table 2:

Table 2. Schedule of the memorisation test.

DAY 1	DAY 2
Morning: Morning memorisation test (MMT)	**Morning:** Next-day recall (NDR)
Afternoon: Afternoon recall (AR)	

The four excerpts selected for the study were:

- **Excerpt 1**, which consisted of the beginning of George Crumb's 'Primeval Sounds' from the piano cycle *Makrokosmos I* (1972). This involves a sequence of chords in the lower register of the piano, where pitches are less discernible, particularly aiming at challenging perfect-pitch possessors with a tendency to memorise by ear. Furthermore, understanding the pitch organisation in this excerpt was needed to engage conceptual memory rather than relying exclusively on hand positions. Participants were suggested a 15-minute indicative timing to memorise it.
- **Excerpt 2**, which consisted of bars 1-18 of David Lang's piece 'Cage' from the piano cycle *Memory Pieces* (1992). Participants were given a 30-minute indicative time to memorise it, since this excerpt presents multiple switches in melody, harmony, and octave changes within the context of a self-referencing texture.
- **Excerpt 3**, which consisted of bars 1-8 followed by bars 38-40 of Philippe Manoury's *Piano Toccata* (1998). Participants were expected to memorise it in 30 minutes. However, participants in the pilot study needed more time. Therefore, the indicated time for the main study was extended to 45 minutes. Excerpt 3 is based on a symmetrical pitch organisation, being particularly challenging in terms of rhythm and tempo.
- **Excerpt 4**, which consisted of bars 1-2 of Roger Redgate's *Trace* (1996), from the standard book of contemporary pieces ABRSM *Spectrum 1*. This atonal excerpt comprises two unrelated cells that lack discernible patterns, and participants were expected to memorise it in 20 minutes.

Procedure

Participants were allocated to a control group or an experimental group based on their responses to an anonymous questionnaire. The criteria were to seek a balance of profiles across both groups, while prioritising allocating more participants to the experimental group to assess Conceptual Simplification with the largest possible sample. The determining parameters when allocating participants were their level of education, results at the Logical Reasoning Test, and whether they

- always performed from memory,
- felt confident at sight-reading,
- experienced synaesthesia,
- had perfect pitch,
- consciously used their emotions to memorise,
- had explicit memorisation strategies,
- used sleep (e.g., regular naps), as part of their practice routine.

The memorisation test involved a memorisation session in the morning of Day 1 (morning memorisation test - MMT), followed by a memory recall in the afternoon without practice (afternoon recall – AR); and a second memory recall without practice in the morning of Day 2 (next-day recall – NDR). Participants were expected to complete the MMT in 2 hours and 30 minutes. This involved memorising and performing the four given excerpts and audio-recording themselves, without the researcher being present. Both groups memorised the same excerpts, but the experimental group received a list of instructions for implementing Conceptual Simplification. Participants were advised to sleep for 8 hours between Day 1 and Day 2.

The given timeframe for the MMT was divided into indicative timings for each excerpt (see Materials), allowing participants more time if necessary. After the MMT, a 30-minute semi-structured interview followed. Similarly, for both the AR and NDR, participants had 30 minutes to recall all excerpts from memory and audio-record themselves, followed by a 10-minute semi-structured interview. The author interviewed each participant individually following Gibbs' (1988) reflective cycle, asking them to reflect on how Conceptual Simplification's approach could be merged with their learning styles and usual working methods. Hence, these semi-structured interviews were organised according to the following stages:

- description of the experience
- feelings and thoughts about the experience
- evaluation of the experience
- analysis to make sense of the situation
- conclusion on what was learned and what could have been done differently
- action plan for how the participant would deal with similar situations in the future, or general changes that might be appropriate

Data analysis

Each participant provided 12 audio recordings: three for each excerpt, corresponding to the MMT, the AR, and the NDR. The author analysed these performances using the following protocol, explicitly developed for this purpose:

1. Qualitative analysis: Recordings were listened to twice: first, without the score, and then with the score. This permitted capturing the performance's expressive component and identify possible hesitations to establish the participant's overall confidence. The benchmarks used were Royal Birmingham Conservatoire's (RBC) performance marking criteria for Principal Study (Years 1-2) and RBC's recital marking criteria for BMus3 and BMus4. This provided a well-established assessment measure. However, as participants had limited time for memorising the excerpts, the marking criterion simply prompted a suitable selection of parameters: technical control, stylistic awareness, fluency, and convincement.
1. Quantitative analysis: Recordings were reviewed while assessing a bi-dimensional measure (pitches, durations). For each excerpt, two scales were established: from 0 to p for pitches; and from 0 to d for durations. Accordingly, p was the total number of pitches, and d the pitches' duration. Therefore, if (p, d) is the maximum score, each recording was punctuated with (x, y), where $x \leq p$ and $y \leq d$.

Then, interviews were transcribed using the AI-software Otter. The resulting transcriptions were revised while listening to the audio recordings. Stuttering and unnecessary words were removed and replaced with '…'. Words added for clarification were written inside square brackets. Finally, confusing statements were highlighted in red, so participants could clarify these. Transcriptions were coded, using both inductive and deductive approaches. A thematic analysis was completed on all transcriptions and questionnaires, following Braun and Clarke's (2012) six-step procedure. The questionnaire's closed questions were analysed quantitatively. Finally, the logical reasoning test was scored according to its sheet of solutions, resulting in either a pass or fail.

Main findings

The main findings were that the participants reacted differently, conditioned by experience, background, abilities, and learning style. Unexpectedly, perfect-pitch possessors and kinaesthetic learners found Conceptual Simplification useful.

No scientific background is required to effectively implement Conceptual Simplification, as demonstrated by the results of the logical reasoning test and the memorisation test. Nonetheless, the experimental group did not implement Conceptual Simplification's three-step procedure on their own but only followed the given instructions that guided them through the process.

The most successful participants in the control group were those implementing Conceptual Simplification strategies on their own. This suggests that this method is the most effective for memorising the excerpts. However, since these participants received no instructions on memorising using Conceptual Simplification, they were more successful than their peers in the same group but less successful than participants in the experimental group who followed the method.

Conceptual Simplification strategies worked well in combination with the participants' usual memorisation strategies. The most efficient Conceptual Simplification strategies were those based on conceptual memory. Amongst these, a substantial effective strategy for memorising complex rhythms was found.

Most participants found it easier to recall the excerpts after sleeping.

Due to the scope of this paper, the discussion of the main findings listed above shall focus on the main results concerning pattern identification, perfect pitch and sleep.

Discussion

During the memorisation test, not all participants in the control group identified the same patterns, while only some in the experimental group noticed additional patterns not included in the instructions. Unexpectedly, this outcome did not always correlate with their expertise in post-tonal music, contrary to findings reported in existing literature (Fonte, 2020; Soares, 2015; Tsintzou & Theodorakis, 2008). Furthermore, participants' ability to detect patterns conditioned their effectiveness in encoding and retrieving the excerpts (Farré Rozada, 2024; Fonte, 2020). This result suggested that Conceptual Simplification strategies were effective in increasing the efficient translation of visual input into meaning, boosting pattern recognition and understanding. This was reported even when participants were

unfamiliar with the style and inexperienced with post-tonal music.

Conceptual Simplification was initially expected to be more useful for relative-pitch possessors, who do not memorise by ear (Ginsborg, 2004), thus having a greater need for alternative memorisation methods. Nevertheless, the study concluded that Conceptual Simplification could also benefit perfect-pitch possessors, allowing them to chunk more musical parameters at once (e.g., pitches, rhythm, harmony, dynamics) than when solely using perfect pitch (e.g., Deutsch, 1970; 2013). By simplifying the music into different manageable layers, they could hear the main melody better, which otherwise was tangled within the musical texture. This downsized aural complexity into memorable musical threads, enhancing their perfect-pitch ability. Consequently, despite Conceptual Simplification being an initial obstacle for perfect-pitch possessors, at presenting an unusual analytical approach to memorisation for them, this eventually ensured long-term retention, as opposed to the rapid decay of kinaesthetic or aural memories (Ginsborg, 2004; van Hedger et al., 2015). Moreover, while previous studies evaluated the influence of detailed instructions on the memorisation of tonal music (e.g., Rubin-Rabson, 1937), they did not focus on the role of perfect pitch, and not all of them recruited pianists or used real-world examples. Moreover, post-tonal music was not considered either. Consequently, this study contributes to an under-researched area of memorisation, perfect pitch, both tonal and post-tonal music.

Furthermore, the AR's and NDR's main purpose were testing the participants' retention without and with sleep respectively, by spacing the tests across two consecutive days. Participants were not allowed to practise between the tests or look at the scores, forcing them to rely exclusively on offline learning (Carter & Grahn, 2016). Additionally, the excerpts required engaging conceptual memory and could not be confidently memorised through perfect pitch or kinaesthetic memory. Still, participants found the most challenging excerpts easier to recall after sleeping, and equally or even more difficult during the MMT and AR. This result coincides with van Hedger et al. (2015), who found that conceptual errors could significantly decrease after a night's sleep.

Finally, those participants in the control group who identified the patterns and devised their own encoding principles recovered the music faster in subsequent recalls. Likewise, the experimental group was generally capable of replicating the instructions from memory and confidently retrieve the excerpts, including filling gaps in their memory. This process was even more effective after a night's sleep since several participants recovered forgotten information in previous recalls and found it easier to substitute their usual strategies for a new approach after sleeping (Robertson, 2009). All these findings suggest that interspersing sleep with practice is an effective strategy for learning and memorisation, confirming what was anticipated in a non-musical context (e.g., Mazza et al., 2016) and for procedural musical memory (e.g., Simmons, 2011).

Conclusions

The results of these studies suggested that Conceptual Simplification:

Provides an effective method for memorisation.

1. Simplifies complexity, not necessarily proceeding linearly.
1. Is flexible, allowing each strategy to be used on its own, or in combination with others.
1. The method's implementation does not require prior expertise in a specific musical genre or composer.

It presents a novel approach to musical memorisation, building on certain areas of mathematics and computer science to enhance human memory and musical performance. However, it does not require any previous scientific training to be successfully implemented and works for different learning styles and types of complexity.

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