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"I Just Go with What Feels Right". Variance and Commonality in Metal Music Mixing Practice

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Abstract

Metal music is a genre defined by transgression, usually with the musical pursuit of heaviness. Interestingly, this commonly accepted genre-defining criterion, which can be considered as involving progress, conflicts with recent suggestions that the production of metal music is becoming more and more standardized, potentially hindering metal music's musical evolution. Based on interviews with eight leading metal producers, this study investigates the professionals' mixing approaches to determine whether they match the presumed standardization. The study finds common mixing approaches that result from the technical requirements of engineering fast, complex, and sonically dense music. However, there are significant alternatives between which producers choose to achieve the desired aesthetic outcomes. A multifaceted genre like metal with its diverse subgenres requires more than one production approach, and the unique combination and nuanced implementation of these approaches facilitate original results. With this in mind, the various production approaches, processes, and techniques appear to be evolving alongside the sub-genres and musical styles, supporting the genre's quest for transgression and heaviness.

Keywords*:* Popular music, metal music, mixing, record production, standardization, aesthetics

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"Simplemente voy con lo que me parece bien". Variedad y coincidencia en la práctica de las mezclas de música metal

Resumen

La música metal es un género que se define por la transgresión, generalmente mediante la búsqueda musical de la pesadez. Resulta interesante que este criterio comúnmente aceptado para definir el género y que implica la idea de progreso, entra en conflicto con las sugerencias recientes de que la producción de música metal se está estandarizando cada vez más, lo que podría obstaculizar su evolución musical. Este estudio, basado en entrevistas con ocho productores importantes de la música metal, investiga los enfoques de mezcla de los profesionales para determinar si coinciden con la presunta estandarización. El estudio encuentra enfoques comunes que resultan de los requisitos técnicos de la ingeniería de música rápida, compleja y sonoramente densa. Sin embargo, existen importantes alternativas entre las que los productores eligen para conseguir los resultados estéticos deseados. Un género polifacético como el metal, con sus diversos subgéneros, requiere más de un enfoque de producción, y la combinación única y la aplicación matizada de estos enfoques facilitan resultados originales. Teniendo esto en cuenta, se puede considerar que los diversos enfoques, procesos y técnicas de producción evolucionan junto con los subgéneros y estilos musicales, para dar apoyo la búsqueda de la transgresión y pesadez del género.

Palabras clave: música popular, música metálica, mezcla, producción discográfica, estandarización, estética

"Simplesmente vou com o que me parece bom". Variedade e coincidência na prática das mixagens do heavy metal

Resumo

O heavy metal é um gênero que se define pela transgressão, geralmente por intermédio da busca musical do pesado. Parece interessante que esse critério normalmente aceito para definir o gênero e que implica na ideia de progresso, esteja em conflito com as sugestões recentes de que a produção de heavy metal tem sido padronizada cada vez mais, o que é um obstáculo para a sua evolução musical. Esta pesquisa, com base em entrevistas com oito produtores importantes do heavy metal, estuda os enfoques de mixagem dos profissionais para determinar se coincidem com a suposta padronização. A pesquisa encontra enfoques comuns que são resultados dos requisitos

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técnicos da engenharia de música rápida, complexa e sonoramente pesada. No entanto, existem importantes alternativas entre as que os produtores escolhem para conseguir alcançar os resultados estéticos desejados. Um gênero polifacético como o metal, com seus diversos subgêneros, requer mais de um enfoque de produção, e a combinação única e a aplicação matizada desses enfoques facilitam resultados originais. Levando isso em conta, pode-se considerar que os diferentes enfoques, processos e técnicas de produção evoluem junto com os subgêneros e estilos musicais, para dar apoio na busca da transgressão e o pesado do gênero.

Palavras-chave: música popular, música metal, mistura, produção discográfica, padronização, estética

Introduction

The history of popular music is marked by the tension between established conventions and novelty (see Dale, 2016). For Theodor W. Adorno, novelty is one of the fundamental requirements of a capitalist market (see North, 2013, p. 19), such as the entertainment industry, which provides the framework for most forms of popular music. In order to attract audiences and sell, popular music must be, or at least appear to be, 'new.' Nevertheless, often due to nostalgic reasons (Reynolds, 2011), there is a strong tendency to hold on to traditions and conventions or tried and tested practices (Bennett, 2019, p. 76).

The relationship between novelty and tradition can differ significantly between the various genres within popular music, just like other related perceptions such as authenticity (Keightley, 2001). While metal music has long been regarded as a genre defined by transgression (Kahn-Harris, 2007), which implies the relevance of novelty, its strong traditional tendencies are evident in almost reactionary subgenres like heavy and power metal (Herbst, 2019, 2020) and frequent recourse to mythologies that date back centuries, if not millennia (e.g., Deeks, 2016; Herbst and Bauerfeind, 2021). One of the most apparent indicators that parts of metal culture are reluctant to musical change, despite the genre's forward-looking presentation, is the 'djent' style broadly not being recognized as a metal subgenre (Marrington, 2019). Djent is rejected partly because it often involves electronic music elements, which does not match many metalheads' conceptions of what metal is supposed to sound like (Marrington, 2019). Predominantly, metal music still adheres to the definition that Robert Walser (1993, p. 41) proposed in the early 1990s, according to which the "most important aural sign of heavy metal is the sound of an extremely distorted electric guitar. Anytime this

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sound is musically dominant, the song is arguably either metal or hard rock; any performance that lacks it cannot be included in the genre." The sound of the distorted guitar remains the mainstay of metal (Berger and Fales, 2005), augmented by drums, bass guitar, vocals, and, in some genres, and notably controversially perceived, keyboards (Wallach *et al.*, 2011). It therefore seems that metal is musically caught in a bind: it is supposed to be transgressive and strive for ever greater levels of heaviness as a genre-defining endeavor (Berger and Fales, 2005), but its possibilities to evolve are limited by the socially imposed confines within the genre.[1] Echoing Daniel Turner's (2009) earlier observations, Zachary Wallmark (2018) has argued that in contemporary death metal, one of metal's most extreme subgenres, greater levels of extremity require 'more than human' performances, which can only be achieved through technology. However, overly obvious technological mediation is not accepted by every metalhead and not in every metal subgenre, necessitating a balancing act between authenticity and fidelity. Fans expect maximum sonic impact (see Mynett, 2020) while remaining true to the romantic notion of human performance. Therefore, to avoid clinical "overproduction" (see also Thomas, 2015, pp. 227-229), especially in some subgenres such as thrash and black metal, a compromise between technically enhanced tightness and unmediated, authentic roughness must be struck.

The dilemma around producing contemporary metal entails that creative freedom may be restricted. Niall Thomas and Andrew King (2019), drawing on Thomas' (2015) extensive fieldwork, contend that the perceived pressure to conform to genre expectations has led metal music producers to adopt a standard production methodology, in turn resulting in an increasingly homogenized sound. This standard production approach, Thomas and King (2019) note, is underpinned by a socially accepted value system within the scene that most of their interviewed producers reject, yet adhere to, in order to stay in business. The extent and details of this presumed standardized methodology have yet to be examined, as Thomas and King (2019) only captured phenomenological aspects of producers' experiences and views, not technical details.

[1] On the difficulty of defining the aesthetics of rock based on its musical characteristics, see Filho (2010). Filho argues that performance and recording/production cannot solely explain the aesthetics of rock, as many scholars have previously claimed. Instead, the genre-specific listening habits would have to be considered to arrive at a holistic understanding of the aesthetics of rock. The aesthetics of metal are similarly complex and require a holistic analytical approach. This article investigates production as an understudied area of metal research, but we agree that aesthetic reception studies are necessary for a comprehensive understanding of the genre. Similarly, the notions of metal fans and practitioners would need to be considered. For a netnographic analysis of notions of "heaviness" amongst metal practitioners, see Herbst and Mynett (2022b).

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This article forms the last of three interrelated studies that aim to gain a deeper insight into the metal music production methodology that may have become standardized. The first study (Herbst and Mynett, 2021a) analyzed the mixing stage of production by comparing the video-recorded live mixes of fifty songs by thirty-seven producers accessed through the educational provider *Nail The Mix*. While the analysis revealed some variation in mixing approaches between producer generations and metal subgenres, the findings tended to support Thomas and King's (2019) hypothesis of standardization. However, there were indications that, rather than resulting from social pressures of convention, standardization resulted from acoustic laws within which the right balance of processing options must be found to create the desired combination of clarity, precision, sonic weight, and heaviness (Mynett, 2017). Individuality was found to improve a producer's competitiveness in the market, a distinct advantage over following rules. The main pressure stemmed from metal's essential quest for greater heaviness (Berger and Fales, 2005), which necessitated a balance between established best engineering practices and variations that push the limits of heaviness. The second article (Herbst and Mynett, 2021b) examined the recording phase and came to a rather different conclusion, documenting a range of approaches and a desire to experiment. Interviews with eight long-standing producers of international repute suggested the professionals believed that repeated workflows lead to boredom perceptible to the listener. Furthermore, to remain relevant and commercially competitive, the producers had a continuous curiosity in their search for novel approaches, thereby opposing Thomas and King's (2019) observations.

This article explores the mixing phase of metal music production to complement the previously investigated recording stage, using the same interviews with eight metal music producers (Herbst and Mynett, 2021b). Given the ambiguous findings in the various studies (Thomas, 2015; Thomas and King, 2019; Herbst and Mynett, 2021a, 2021b), it seems valuable to analyze the all-important mixing phase (Thomas, 2015, p. 221; Turner, 2009; Wallmark, 2018). To gain credibility and validity through the confluence of evidence (Creswell, 2013, p. 251), different methods and samples are employed as a means of triangulation. Therefore, the purpose of this article is to compare the mixing approaches of eight leading metal producers to determine whether their approaches match the presumed standardization (Thomas and King, 2019). The topics covered include: the particularities and challenges of producing metal; mixing approaches and philosophies; the mix processing of metal music's main instruments. As with the first half of the interview study (Herbst and Mynett, 2021b) that did not consider vocals because the producers insufficiently elaborated on recording and

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mixing them, vocals are not considered here. The previously analyzed mixes (Herbst and Mynett, 2021a) suggested that most producers process vocals similarly but with different (digital) tools.

This study finds that the interviewed producers constantly modify their workflows to progress their craft, which they consider to be equally technical and creative. The interviews revealed a range of workflows for technical and aesthetic requirements of individual productions but, in line with Thomas and King's (2019) observation, a largely consistent approach to mixing. The observation of a relatively uniform approach can be explained by the acoustic nature of recorded audio and the challenges that modern metal poses to the recording medium. A production is effective when contrasting qualities like clarity, precision, sonic weight, and heaviness are balanced, forcing producers to optimize their approach to achieve maximum impact within the acoustic limitations of the recording medium. The findings are in accordance with the previous two studies (Herbst and Mynett, 2021a, 2021b) in that producers are presented with technically functioning alternatives between which they can choose to achieve different aesthetic outcomes. Despite potentially involving standard approaches as tried and tested best practices, the unique combination and nuanced implementation of these approaches make original results possible. The article concludes that in a multifaceted genre like metal, diverse subgenres require far more than one production approach, and therefore the relevant production approaches, processes, and techniques evolve alongside the musical styles and changing aesthetics popular at a given time.

Method

To allow informed comparisons concerning the extent and nature of standardization in engineering contemporary metal music production, this study is based on a similar research design to that of Thomas (2015) and Thomas and King (2019). Thomas interviewed seven internationally recognized metal producers from the UK, including Tom Allom (Black Sabbath, Judas Priest), Mike Exeter (Black Sabbath, Heaven & Hell), and Russ Russell (Napalm Death, Dimmu Borgir), all active in metal's formative phase, as well as established producers of the newer generation like Romesh Dodangoda and Ozz Craggs. The present study draws on eight metal producers of international standing who, in the 1990s and 2000s, have shaped the sound of metal and continue to do so today. In contrast to Thomas and King's (2019) study, the professionals come from several

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of the world's primary metal markets, such as the USA, UK, Sweden, and Canada, whose credits include:

1) **Bergstrand, Daniel** (b. 1974, Sweden): Behemoth, Dimmu Borgir, Meshuggah, In Flames.
2) **Bogren, Jens** (b. 1979, Sweden): Opeth, Arch Enemy, At the Gate, Soilwork, Dimmu Borgir, Amon Amarth.
3) **Hyde, Matt** (b. 1964, USA): Slayer, Children of Bodom, Monster Magnet, Hatebreed, Behemoth.
4) **Mader, Logan** (b. 1970, Canada): Five finger Death Punch, Gojira, Soulfly, Fear Factory.
5) **Nordström, Fredrik** (b. 1967, Sweden): At the Gates, Arch Enemy, Dark Tranquility, In Flames, Opeth.
6) **Raskulinecz, Nick** (b. 1970, USA): Evanescence, Korn, Halestorm, Mastodon, Rise Against.
7) **Robinson, Ross** (b. 1967, USA): Korn, Slipknot, Machine Head, Sepultura, Fear Factory.
8) **Sneap, Andy** (b. 1969, UK): Testament, Arch Enemy, Overkill, Judas Priest, Megadeth, and Annihilator.

These producers were interviewed with a semi-structured approach that addressed their general method and philosophy of mixing metal music. The focus was on technical details, allowing comparison of the individual approaches. These technical details further ensured that the analysis and comparison revealed aspects commonly overlooked. Research on music production usually either focuses on mythologized studio stories, which reinforce the notion of a magical aura rather than capturing the day-to-day activities of practicing recordists (see Bennett, 2019; Zak, 2001), or on roles in the recording industry (e.g., Martin, 2015; Anthony, 2017; Auvinen, 2017).

The interviews lasted 370 minutes in total, including information on the recording (Herbst and Mynett, 2021b) and mixing phases, with the latter being the focus of this article. To grasp the details of the individual experiences while clustering and interpreting them according to specific themes, the audio-recorded interviews were transcribed and analyzed following general principles of qualitative interview designs, such as open coding and iterative refinement of categories (Flick, 2010; Cresswell, 2013).

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Particularities and challenges of mixing metal music

A brief listen to metal music released in any decade since the genre's inception in the early 1970s immediately reveals a sonic evolution: from documenting a live performance –evident on Black Sabbath's self-titled and genre-defining debut album– to a hyper-real aesthetic in which recorded performances and their sonic presentation have become increasingly touched up and artificial (Mynett, 2020). In the pursuit of greater heaviness, there is a direct correlation between the evolution of music production technologies and how the new affordances are used to make the music more and more extreme (Herbst and Mynett, 2023). Mark Mynett has described the sonic properties of commercial metal music and the challenges of production:

> A majority of listeners want this style of music to present a dense and powerful yet clear sound. The artists usually want the same, as this translates and enhances the best aspects of their performances. These qualities are afforded through an effective balance between heaviness, sonic weight, clarity, and performance precision, with each having the potential to inform the other. Different productions need these characteristics emphasized in different ways; however, a production that is deficient in all four is inevitably weak (2017, p. 21).

Achieving such a balance is difficult because some of the properties are opposites (see Herbst and Mynett, 2022a). Whereas sonic weight revolves around low-frequency content, clarity requires a strong emphasis on middle and high-frequency representation where the attack transients, fundamental to clarity and punch, are contained. A similar challenge arises from the demand for an inherently loud and dense production, as this requires considerable dynamic range compression and brick-wall limiting, invariably at the expense of transients and clarity. Often directly related to performance speed and the details of arrangement, each metal subgenre broadly places a different emphasis on various sonic properties (Mynett, 2019a). In death and thrash metal, as particularly heavy subgenres, sufficient middle and high-frequency content is required to maintain clarity due to fast song tempi and speed of rhythmic subdivisions. By contrast, slow doom metal provides enough space for long wavelengths (low frequencies) to decay within, allowing for a more bass-heavy aesthetic (Mynett, 2019b, pp. 75-76). Regarding the arrangement, a higher number of sound sources and instruments with a full frequency spectrum, such as distorted guitars, synthesizers, and orchestral instruments, demand more drastic cuts in frequency content to avoid instruments masking each other

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(Mynett, 2016). This explains why orchestral black or power metal needs the instruments' frequency content to be restricted and heavily sculpted to avoid a loss of clarity. Creating space for each sound source is one of the main tasks of a metal producer, which is achieved through careful filtering, allocating sounds to different positions in the stereo field (panning), and effective use of spatial effects that provide a sense of space and dimension, but without softening the productions' sonic impact.

Another essential component of any metal production is dynamic range, which must be meticulously controlled for a dense yet punchy sound (Mynett, 2017, p. 220). Dynamic range processors like compressors allow shaping the waveform of a sound to make it denser and to heighten or attenuate the signal's attack transients (Mynett, 2017, pp. 220-225). Compression is crucial to allow percussive instruments like the drums to cut through sustained elements in the arrangement, like the wall of distorted guitars, one of the biggest challenges in producing metal music (Mynett, 2016; Herbst and Mynett, 2021a). However, an overly compressed production sounds lifeless and lacks punch and impact (Mynett, 2017, p. 336).

The interviewed producers were asked about the challenges of producing metal and, although highlighting different aspects as the most demanding, they confirmed the previously described challenges. Nordström cited loudness as the biggest challenge, emphasizing that each band member's desire to make their instrument or voice as loud as possible is not feasible, both technically and musically. Interestingly, this challenge is essentially less a musical or technical issue than a result of social interactions in the production process that are not determined by external dictates of convention, as Thomas and King (2019) describe, but are intrinsic to the band. Similarly, Raskulinecz explained that the challenges he faced were usually less technical than aesthetic, depending on the difficulty of getting "everybody on board with that kinda sound." As a common point of conflict when working with artists, he cited his personal preference for an "old-school sound" that emphasized sonic weight and heaviness over clarity and precision. This old-school sound was favored by all seven producers in Thomas and King's (2019) sample, all of whom disliked the hyper-real precision expected of modern productions.

Several other respondents of this study pointed to matters around the frequency spectrum as the main challenge. In line with Mynett (2016) and our previous findings (Herbst and Mynett, 2021a), Bogren stressed the dominance of heavily distorted guitars as one difficulty in mixing:

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> I suppose it's the density [...] especially the guitars. If you have quad-tracked guitars, they will take up everything in your frequency spectrum. And that's a challenge to get things cut through. If you have a nice-sounding drum kit with a nice-sounding room, and then you add these guitars, suddenly your drums sound like popcorn. Then you will have to start to mix it to still have that, for the drums to be able to cut through. That's a big difference –I've been doing gospel and jazz albums back in the day, and that was never an issue.

For Bogren, the guitar's extended frequency range affects the entire production, as distortion enriches the instrument's overtones and creates difference tones with low frequencies (Berger and Fales, 2005; Herbst, 2017a), causing the guitars to mask the other instruments (Mynett, 2016). Sneap also addressed the frequencies, and especially the low-end, as a problem area:

> It's really getting the low-end right. Be able to control that, especially with the faster stuff. If you can get to grips with blast beats and fast double kicks, then you can pretty much mix any type of rock. In fact, it makes it easy. When I'm mixing something like Accept [hard rock], after I have done an Exodus [thrash metal] record, it comes together really quick. You can appreciate the space you can get into those slower songs. The depth of the low-end you can get in where if you get that going on double kicks, you've almost got to figure out where you get your low-end from for the fast stuff. It can't be as fat. It's gonna be snappier kicks, snappier snares, less [re]verb –you gonna limit where you're going with it. I'd say the low-end and the compression is the main focus, really.

Largely informed by the speed of the relevant performance subdivisions, Sneap's statement illustrates the careful balance between spectral and dynamic properties that must be navigated in order to provide a production with controlled and effective sonic weight.

Thomas and King (2019) describe the pressure to achieve precision as one of the main reasons for standardization in metal music production and the assumed homogenized sound; audiences would expect clinical precision as a source of the music's power, which forced producers to edit performances and smoothen out performers' idiosyncrasies and tonal signatures when using drum samples or even programmed performances (see Herbst and Mynett, 2021a). This notion is reflected in Hyde's answer:

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> The amount of detail, the precision required in the rhythm. There is a tremendous amount of precision required in metal that doesn't come into play in other genres [...] In other genres, there is a certain amount of feel, and there is obviously a lot more space between musical events. In modern metal, there are four to six times as many musical events per song. So, you're managing all those events happening at a really high rate, so you have to deal with frequency and amplitude in a completely different way in a track that's 100 BPM versus a track that's 220 BPM. There are just far more attacks. But it's not just that; everything's gotta be super perfect. And then finally, in modern metal, we're dealing with tunings that are going lower, and lower, and lower, which means that we are dealing with fundamentals and frequencies that are slower and have bigger waveforms. So, you have the higher occurrence of slower events [...] We're trying to play super, super fast stuff at super, super low frequencies, and it's all supposed to be very tight and clear and precise and detailed.

Hyde underlines the complexity that arises from the interplay of the different components of a metal production and supports the challenge Sneap described of balancing the speed of performed rhythmic subdivisions, low-end frequencies, and dynamic impact in the form of punch (see also Mynett, 2019a). All but one producer, Bergstrand, agreed that mixing metal posed different challenges from other genres. For Bergstrand, metal producers dealt with band-based instruments, like many other genres, and "it's just the matter of the extra frequency thing." He acknowledged the spectral density of a metal arrangement but did not consider it a challenge particular to metal.

The producers were asked to comment on general challenges in metal music production. The answers were interesting insofar that all their statements referred to the mixing phase, plus editing-related matters. While the art of recording is essential, as described below and outlined in our earlier study (see Herbst and Mynett, 2021b), the producers' statements confirm the high relevance of mixing in creating the hyper-produced sound of contemporary metal (Turner, 2009; Thomas, 2015; Wallmark, 2018).

Mixing approaches and philosophies

Mixing is an essential part of any metal production, yet in itself, the mix stage is fundamentally dependent on the quality of the recorded audio. Mixing enhances the recordings, and for them to sound coherent and

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marketable, technical and aesthetic decision-making is required (Izhaki, 2013; Krotz and Hodgson, 2019). How a sound is captured in the recording (sound at source perspectives, microphone choice, placement, etc.) determines its frequency content and, to some extent, its dynamic properties (Zak, 2001, pp. 108-112). Producers can choose to record with or without processing (Moore, 2019). All interviewed producers subscribed to the traditional engineering approach of capturing the sound at source and having a vision for the finished product from the beginning (see Herbst and Mynett, 2021b). A representative quote comes from Bergstrand, who, in the context of recording, emphasized, "I'm mixing from day one, so I have a vision". All producers stated the importance of having a sound aesthetic in mind that they worked towards during the recording. Keen to simplify the mixing by committing to decisions, they modify the audio with filters and compression (printed processing), thereby reducing the amount of mix processing subsequently required. Further statements highlighted that recordings made without their involvement would sometimes require re-recording to avoid "fixing it in the mix" (Schmidt-Horning, 2013, pp. 185-191). This finding may be interpreted as contradicting the view of the metal production mixing phase being the most important (Turner, 2009; Thomas, 2015; Wallmark, 2018). Alternatively, it could simply reflect the age of the interviewed producers, all of whom subscribed to the old-school approach of capturing sound at source. Given the generational effects found in our earlier study (Herbst and Mynett, 2021a), the second explanation seems more likely.

Our previous study on mixing metal music (Herbst and Mynett, 2021a) had a quantitative component made possible by the large sample of fifty analyzed mixes. Concerning overarching mixing approaches, the observations revealed that producers spend the most time on drums (62%), leaving less than half of the available time for vocals (19%), guitars (10%), and bass (9%). Assumed reasons for this special attention to the drums were the typically large number of microphones to capture drums (see Herbst and Mynett, 2021a, 2021b) and the high importance of this instrument for the quality of a contemporary metal production. According to this implicit hierarchy, most mixes (96%) began with drums, followed by bass and guitars. Only two mixes started with guitars (see Herbst and Mynett, 2021a).

The respondents of this study largely followed the same procedure. Only two professionals, Robinson and Raskulinecz, did not adhere to a strict routine. Robinson stressed the importance of intuition and following a feeling, "whatever that is". Raskulinecz similarly emphasized that every record

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was different and required an individual approach, yet he acknowledged that, like most producers, he usually began with either drums or guitars. Those producers starting with drums explained that they established a general context for evaluating the guitars (Sneap) and determined the success of an entire production (Nordström). Therefore, the drums needed to be right as the foundation for all other mix decisions. Only slight variance existed within the approaches to mixing drums. All producers stated that they start with the kick, except Mader, who built the whole mix around the snare. Bergstrand stressed the importance of the kick, "I can more or less picture the song just by hearing the kick", which supports the idea that the (kick) drum establishes the tonal and creative foundation of a mix for many producers. In line with the observed approaches of the fifty mixes (Herbst and Mynett, 2021a), all producers emphasized bringing in bass and guitars as early as possible to inform drum processing. They explained that guitars affected the whole frequency spectrum from the lows to the highs (see Mynett, 2016) and therefore all other instruments. Similarly, the bass was essential to making informed decisions about the low-end and the track's sonic weight.

Hyde is the producer who gave the most detailed insights into his workflow. While his overall approach was generally in line with the others, he highlighted the impact of the working environment, especially the perceived differences between analog and digital productions. When working on an analog console, he usually started with drums and built them up from the lowest to the highest instruments/frequencies before adding other instruments and tweaking the drum mix. The analog workflow would afford intuitive decisions and constant switching between processing and fine-tuning different instruments, rather than working on one instrument in isolation for extended periods. Working in a digital environment differed because the process was less tactile and allowed using templates (see also Herbst and Mynett, 2021a). In a digital production, Hyde usually created a rough mix of a song, of which a template for the whole record could be created. He expressed that:

> […] in metal, there is so much consistency. You don't usually record one song, you usually record the drums [for a whole album], and the drum sound is generally consistent throughout the record […] So, once I got a drum sound locked in for one song […], it's going to translate from song to song fine. And most of the balanced will translate from song to song fine. Then you must get into the specifics of each song.

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This statement suggests that the common practice of utilizing templates is one of the primary reasons why metal nowadays, in Hyde's opinion, sounds "consistent," one could say homogeneous (Thomas and King, 2019). Whether he considered this homogeneous sound a problem was unclear from his answer; in any case, he adhered to this widespread practice. Hyde saw the proliferation of digital music production as the cause of this development:

> Maybe I mix one song first to get the template tweaked so that the template sounds good for this album [...] That's the reason why things are a lot more consistent these days. Back in the day, when we were working in analog studios, we'd have to hit one song at a time and get it all the way to completion and run the versions, pair the board down, and you'd have the general setup, and then you'd move to the next song. Today I can work on ten songs in one day and jump back and forth between song to song.

Interestingly, Hyde felt ambivalent about this development. On the one hand, he seems to echo the producers in Thomas and King's (2019) study who bemoan the homogenization in contemporary metal production. On the other, he appreciates a digital workflow with convenient total recall of all routing and processing, allowing him to switch quickly and frequently between songs and maintain a fresh, objective perspective.

The routing of signals is related to the use of templates, as it determines the mixing workflow. The preceding mixing analysis (Herbst and Mynett, 2021a) found that 74% of the tracks employed 'top-down mixing,' which reverses the perhaps intuitive approach of starting to process individual instruments and instead begins with decisions that affect the whole arrangement. In its simplest form, top-down mixing could be a compressor inserted on the master buss, a technique long used in rock music production (see Herbst and Mynett, 2021a), yet it could also involve mixing through an entire mastering chain. Traditionally, mixing and mastering were separate processes, with mastering optimizing the mixed audio for various playback media and increasing the volume to competitive levels (Savage, 2014). In some previously studied mixes (Herbst and Mynett, 2021a), top-down mixing went so far that producers considered it merely 'detailing' when processing individual sound sources. They explained that mixing through a mastering chain gave a better idea of what the mix would sound like after mastering, which informed the mixing and provided clients, artists, and record label representatives with a sound closer to the finished product (Herbst and Mynett, 2021a).

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Albeit to varying degrees and for different purposes, all interviewed producers applied an element of top-down mixing. Hyde highlighted his approach of mixing through a limiter and compressor, yet in a way that adds subtle coloration rather than affecting dynamic range (see Moore, 2019). Robinson tried to limit the sonic effects of compression by using multiple instances that gradually and subtly condense the levels. He emphasized that he avoided compression as much as possible, preferring volume automation because it produced a "more heart-felt mix". However, he also acknowledged that "people's ears are tuned to the compression", suggesting a pressure to conform, consistent with Thomas and King's (2019) observation. Nordström similarly preferred to mix without master buss compression but emphasized it was sometimes required. For Bergstrand, Bogren, Mader, and Sneap, top-down mixing was the standard in their mixing approach, highlighting the function of master buss compression to glue sound sources together and be part of the mix's aesthetic. These views are consistent with other studies on metal music production to the extent that they provide technical details (Turner, 2009; Mynett, 2017; Thomas and King, 2019; Herbst and Mynett, 2021a).

Mixing instruments

Drums

The drums commonly receive the most attention in the mixing process (see Herbst and Mynett, 2021a), which seems to be no different in the interview sample, as the producers spent most of their time explaining their approach to mixing drums. Modifying the dynamic range through compression significantly impacts the drums' sound (Mynett, 2017, pp. 220-225). The interviewed producers took a fairly similar approach to compression, which differs from the previously observed approaches (Herbst and Mynett, 2021a). All stressed the avoidance of over-compressing the drums, which could easily occur when compressing individual drum tracks, as observed in the analyzed mixes (Herbst and Mynett, 2021a). Careful not to over-compress, the producers mainly compressed individual tracks to shape the waveform rather than reduce their dynamic range. Bergstrand explained, "I compress the snare but try to not do too much. I prefer to manipulate the waveform, so I'm trying to compress it that way instead. When it's not present enough, I will be enveloping it. All the way through the song; takes some time, but it's worth it." This explanation suggests that Bergstrand modifies his processing throughout a song, which not only demonstrates attention to detail but may also indicate that a standard mixing approach does not exist. To control loudness, some producers like

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Sneap used a limiter instead of a compressor. Nordström explained that too much compression on individual drum tracks amplified noise and other resonances in the drum room. This reasoning coincides with the approach of other metal producers (see Herbst and Mynett, 2021a).

The producers generally compressed all drum tracks together on a buss, except Robinson, who considered this a "lazy approach." Still, the approaches differed, with Bergstrand compressing the entire signal of the drum subgroup and Bogren blending the completely uncompressed drums with a 'parallel compressed' copy of them (Mynett, 2017, pp. 229-233). This approach preserves the attack transients required for punch but includes the dynamic consistency and full sound of a heavily compressed signal (Izhaki, 2013, pp. 318-322). Bogren highlighted using several parallel busses with different kinds of compression and distortion, fed by the individual drum instruments, more shells than cymbals. This level of sophistication in drum routing and processing is not only consistent with the previous mix study (Herbst and Mynett, 2021a) but also indicates some degree of variation in mixing approaches.

Another important part of mixing drums is dealing with noise and sound that a microphone captures from other drum components (Mynett, 2017, pp. 191-200). Removing noise and spill seems central to a contemporary metal production characterized by hyper-precision (Thomas and King, 2019). However, most interviewed producers rejected this aesthetic or at least took a nuanced approach when dealing with spill. Among those completely opposing the idea was Robinson. He elucidated that one of the few times he used a noise gate, a device that mutes or attenuates a signal when it drops below a certain volume threshold, was on the first, self-titled Korn record, which he regrets. Slightly esoteric reasons aside (see Herbst and Mynett, 2021b), Robinson felt something was missing when the background noise of the other instruments was removed. Likewise, Raskulinecz, Nordström, and Bogren favored the more natural sound without noise control, provided the microphone captured the right balance between signal and spill. They also stressed their preference for ghost notes as a reason they rarely removed spill. When it became a problem, they manually automated volumes or selectively cut waveforms to preserve the naturalness of the sound, which also contributed to "dimensionality", as Raskulinecz pointed out. Other producers like Sneap and Mader frequently used gates and waveform edits to obtain a cleaner signal, stressing that it varied depending on the source material and arrangement and between the drum kit's instruments. In terms of variation, Hyde explained that his philosophy changed over time and differed between projects, indicating that there is no standard

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approach, or if there were, it would evolve alongside general production trends and popular aesthetics of a given time.

Thomas and King (2019) contend that the pressure to enhance drums with samples is among the primary reasons for metal's homogenized sound and standardized production methodology. Our earlier analysis of metal mixes (Herbst and Mynett, 2021a) confirmed the importance of drum samples yet uncovered a range of different approaches and philosophies. For technical reasons, samples were found as a necessary means of enabling the drums to penetrate the guitar wall. However, there were other intentions behind using samples, such as achieving tonal consistency, reducing cymbal spill, or shaping the drum aesthetic. Most producers were careful to use samples as unobtrusively as possible. More variation existed in the choice of samples; some professionals created original samples for each album, and others used samples throughout their portfolio and did not mind using those of third parties (Herbst and Mynett, 2021a). Raskulinecz explained why samples are necessary in metal:

> No matter how hard you hit it, or equalize, or compress it, at the end of the day, going against all those other tracks just sonically, sometimes the drums need a little help, a push over the cliff. This doesn't have anything to do with the way they were recorded; it has to do with just giving them a little bit more power or clarity because of the wall of sound we've put on top of that.

The previously stated reasons for using drum samples were consistent with those given by the respondents of this study, above all, consistent volume, ability to cut through the wall of guitars, and replacing hits containing cymbal spill with a clean version. However, their views varied considerably about whether or when to use samples. Robinson was completely opposed and insisted he had not used any samples on his popular productions for Sepultura and Slipknot records. But since he liked adding sounds from electronic drum machines to acoustic kits, his refusal only concerned using samples in a conventional way to improve the recorded drum sound. Notwithstanding that metal fans widely reject electronic music elements (Marrington, 2019), productions sometimes contain electronic 808 kick samples to enhance the low-end and make it more interesting. Sneap justified this practice with the listener unable to recognize such an electronic sample. Among those emphasizing ethical reasons for not including samples in their mixes are Bogren, Nordström, Mader, Bergstrand, and Raskulinecz. They pride themselves on making the drums work only through recording and processing but admitted this was rarely possible.

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Other producers had no qualms about using samples. Sneap did not only use samples for technical reasons but also creatively, employing different samples in different sections to shape their aesthetics, create variation, and make the drum sound more interesting. Mader used a significant number of kick samples but none or only a few snare samples, which underlines his previously described mix aesthetic of building the entire mix around the snare that he tries to keep organic. Those who did not wish drums samples to be too obvious created samples from the recorded drum kit, in line with other producers (see Herbst and Mynett, 2021a). Contradictory or ambiguous statements were also given. Some producers, such as Bogren and Mader, stated that they rarely used these samples created from the drum kit during tracking in the mix, which raises the question of which samples they use. Raskulinecz elucidated that instead of taking samples from the acoustic kit, he used others from his own productions and therefore would not rely on third-party samples. Another example is Bergstrand. He stated that he primarily used samples from the recorded acoustic kit to achieve a more natural sound, but at the same time, revealed that "sometimes it's six or seven different kick drums from different kits", which could indicate a varied approach. Concerning how many samples are employed, the interviewees reported similar numbers to those observed elsewhere (Herbst and Mynett, 2021a), typically between two and six per instrument, but with some variation in the use of samples for individual instruments. While some producers like Raskulinecz and Hyde chose more samples on snares than kicks, others like Mader used many kick samples but only a few for the snare.

One challenge arising from recording an instrument with multiple microphones is that the phase cycles of individual waveforms do not align, resulting in frequency cancellation that tends to cause a weak and indirect sound (Izhaki, 2013, pp. 163-165). Phase correlation can be controlled by the placement of microphones and, in the mixing stage, by changing the temporal relationship of the recorded tracks, a process called 'phase alignment.' In our earlier study (Herbst and Mynett, 2021a), only 14% of mixes were phase-aligned. When they were, they came from older-generation producers like those interviewed in this study. Interestingly, none of the interviewees employed phase-alignment regularly, stressing the need to get the correlation right during recording. While Nordström, Raskulinecz, and Hyde emphasized preferring the traditional approach, others like Bogren, Sneap, and Bergstrand cited problems in the past that made them avoid digital phase alignment unless it was required to correct audible phase problems. Mader mentioned the undesirable "clinical" sound.

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Overhead and room microphones, plus optional individual spot microphones, provide the cymbals in the mix. As these microphones also capture the room sound, they are important for the natural impression of a drum kit (Mynett, 2017, pp. 88-102). The interviewees processed these microphones in line with the other mixes observed (Herbst and Mynett, 2021a). Overheads and rooms were generally compressed, more so the rooms than the overheads. The experts differed in compressor settings depending on the desired sonic effect, which varied between songs and sometimes even between song sections. Further variation came from the alternatives to conventional compression with a classic 1176 compressor (Moore, 2019). Bogren revealed, "My trick is perhaps that I don't compress them so much, but I distort them like hell. Because by doing that, I get rid of a lot of the low-mid and boxy mid-frequencies, so even a poor room can sound much more expensive when you blend it into the kit." Several producers explained that compression and distortion were a means to simulate the impression of a larger room they wished to convey, which is consistent with the motivations of other metal producers (Herbst and Mynett, 2021a).

In terms of stereo width, and concurring with previous findings, the producers generally panned the overheads and rooms fully wide (Herbst and Mynett, 2021a). However, their panning would usually differ slightly in every mix. Bogren stressed that he often spent a whole day experimenting with the drums' stereo field, which was primarily determined by the recording technique and not so much a mixing consideration. The producers' interview statements about their recording practice (see Herbst and Mynett, 2021b) support the idea that the drum kit's spatial aesthetics are mainly shaped during recording.

Guitars

The guitars have been the foundation of metal since its inception, giving the genre its sonic signature (Walser, 1993; Berger and Fales, 2005; Herbst, 2017a). One could therefore expect producers to make considerable efforts to optimize the guitar sound in the mixing stage. However, according to both previous studies (Herbst and Mynett, 2021a, 2021b), the tone is shaped during recording, implying that the main objective when mixing guitars is to fit them into the overall arrangement without masking the other instruments and vocals. An effective way to prevent masking is to place the various rhythm guitar tracks at the far left and right ends of the stereo field, leaving the center free for the other essential sound sources: kick, snare, bass, and vocals. In the previously studied mixes, 94% of the guitars were panned fully wide (Herbst and Mynett, 2021a). Most interviewed producers did not follow such practice; only Bergstrand and Mader stated

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always to pan fully wide. Sneap and Nordström also panned guitars very wide, but just one left and one right when more than two guitars were available. If the guitars were quad-tracked, two per side, one pair was panned narrower, about 70 to 80 percent. Unfortunately, neither Sneap nor Nordström explained the rationale behind this approach, but it can be assumed that they aim for a more spacious, three-dimensional guitar sound (Mynett, 2017, p. 205). Hyde declared that he usually panned guitars only 90% wide to leave space for the overheads that form the outer boundaries of the perceived sound stage (Moylan, 2002, pp. 48-54), an aesthetic choice. Raskulinecz emphasized not having a standard approach to panning because it depended on the specifics of the arrangement and mix. He was the only producer who liked to work with three rhythm guitar tracks, the third one being placed in the stereo center.

The problem of masking is essentially related to spectral content, which is why filtering is important (Mynett, 2016). The producers did not provide details of their equalization, which can probably be explained by the fact that equalization depends on the recorded guitars' tonal qualities and the details of the mix (Izhaki, 2013). Regarding the question of standardization, the answers still provide some insights. Some producers, including Robinson and Raskulinecz, filtered the individual tracks, citing control as the reason, whereas Mader only processed the collective guitar group. Others like Nordström, Sneap, and Hyde filtered both the individual guitar tracks and their sum, correcting abrasive qualities on each guitar track as needed while creatively processing the entire guitar group. Raskulinecz further stressed that he did not have one single guitar routing, which might also be the case with other producers.

Guitars in metal music are sometimes compressed to control the dense frequencies that affect all other instruments (Mynett, 2016). Three approaches were observed in the mixes analyzed previously (Herbst and Mynett, 2021a): broadband compression and limiting –the latter causing less coloration– and multiband compression that only controls low-end frequencies, which can build up when guitarists play palm-muting technique (Herbst, 2017b). It is worth noting that Sneap popularized this multiband compression technique in the early 2000s (Herbst and Mynett, 2021a). Approaches to compression differed among the interviewees, just as they did in the analyzed mixes. Sneap revealed he had turned away from his signature multiband compression, feeling it made the guitars sound lifeless. That is why he only used it on two guitars when there were four and not at all when the guitars were only double-tracked. Now, he would apply gentle broadband compression to "give it a bit more in-your-face sound."

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Hyde similarly explained that some broadband compression created the "finalized sound". Nordström, echoing Sneap, noted that he had often used multiband compression in the past but rarely does so now. As with other mixing approaches, it appears that producers, who introduced and popularized approaches for several decades, have evolved their practice and continue to influence other producers. Such joint development does not preclude the existence of a standard methodology. Rather, it is further evidence that best practices change over time, making them less problematic when being considered contributing factors to a homogenous metal sound (Thomas and King, 2019), as practices and resulting sounds continue to evolve. Other producers, including Bogren, Mader, and Bergstrand, emphasized avoiding any compression wherever possible. Mader pointed out that distorted guitars had little dynamic range and rarely needed "taming", and Bergstrand preferred volume automation to control problematic parts.

Bass

Sonic weight is fundamental to heaviness, one of the primary sonic goals in metal production (Berger and Fales, 2005; Mynett, 2017, pp. 9-21). Notwithstanding that the bass guitar traditionally provides the low-end, its role is sometimes underestimated or undervalued (Mynett, 2019a, p. 309). Like in the earlier mixing study (Herbst and Mynett, 2021a), producers had different opinions about the bass. No one per se questioned the importance of the instrument itself. However, the views varied about how much the instrument's properties should be emphasized as opposed to limiting the instrument to the root notes supporting the guitars. These different views extended to the tone-shaping process. Producers like Sneap, who regarded the bass merely as a low-frequency extension of the guitars, recorded only a direct injection (DI) bass track, which he processed with digital plugins during mixing. Others like Nordström remarked that bass players increasingly have a personal tone that he was keen to capture when recording to create the sound at source rather than in mixing.

All producers except Sneap created the bass sound in the recording phase (see Herbst and Mynett, 2021b). They captured a minimum of two tracks, a clean DI and a more "colorful" track from an overdriven amplifier, recorded with a microphone. These tracks can be processed differently in the mixing phase to combine sonic characteristics, similar to using drum samples to expand the timbral spectrum of the recorded kit. Hyde explained, "You have to break the bass down just like the drums between functions, maybe heavy low-end, I need note definition, I need gain, and then I have a completely dry DI that I can re-amp later on". He emphasized the increasing trend towards down-tuning (see Herbst, 2017a) that resulted in the loss

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of note definition, which could be dealt with by blending different timbres. Hyde elucidated that, to combine low-end, note definition, and tone, he blends a clean DI, bass amplifier, and bass signal sent through a guitar amplifier, possibly other sounds too, "anywhere from four to six tracks". He usually creates these sounds during recording, but as mixing allowed the tone-shaping to be informed by the context of the arrangement and mix requirements, he and others sometimes shape tones in the mixing phase.

As with the guitars, the producers varied in their processing of individual bass tracks and the buss group, as well as in their approaches to compression and distortion. As several producers pointed out, since the low-end is one of the most challenging aspects of a metal music production (Mynett, 2017, pp. 9-21), the processing required differed from song to song, sometimes even from section to section. This finding is consistent with the analysis of fifty metal mixes (Herbst and Mynett, 2021a); although some common elements are used for shaping and mixing the bass, especially layering clean and distorted versions of the instrument, there is no single or standard approach evident.

Discussion and conclusion

This study examined the approaches of leading metal producers to mixing metal music to determine whether these match Thomas and King's (2019) hypothesis of standardization. The interviewed producers were not asked directly about a standard production methodology but rather to share insights into the technical details of their practices. This decision not to directly address the hypothesis of a standard production approach was taken to not influence the producers' answers through leading questions. When asked about the specifics of mixing certain instruments, most producers repeatedly stressed that there were no hard and fast rules. Their decisions would depend on the aesthetic vision, compositions, arrangements, and audio recordings of every band, album, and song. Sneap pointedly summarized, "I just go with what feels right. Have a mess around, there are no set rules. You can't just come in and say, 'this is this, this, and this.' One of the joys of recording is making mistakes and finding little tricks out." Just as the producers emphasized experimentation in recording (see Herbst and Mynett, 2021b), they also emphasized their interest in exploring novel approaches to mixing. Hyde expressed his disdain for routine quite clearly:

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> If it's gonna be the same stuff every time, I don't wanna do it. It's too boring. I try to walk into the studio and have a new experience every time. I want to learn, want to bump into something magical happening. When you ask me these questions, I can't say that I do these things all the time in the same way. These are certain places I start. Some of the things I might not use, sometimes I might need more. I might realize not only do I need a kick and snare buss, but I need two different snare busses for this one to do these two different effects, and this one turns off at this time, and this one comes on, because it just has to do with the problem that needs to be dealt with.

Hyde's quote is one out of several examples where producers highlight the value of constant experimentation and artistic curiosity. Probably as a result of constantly developing workflows helping avoid the boredom of routine, and allowing artistic progress, all interviewees have been at the top of their profession for several decades. In a music scene characterized by development, progress, and transgression, this unwavering curiosity and evolving production approach likely allowed these producers to remain relevant. Sticking to a tried and tested approach that may be imitated and thus become a kind of standard would hardly allow for a lasting career at the top level. What is needed is an evolution of production approaches in line with developing musical practices and subgenres.

Personal views and individual workflows should not distract from the fact that the interviewed producers follow a broadly consistent recording and mixing approach (Thomas and King, 2019). Potentially due to the required hyper-real aesthetic (Mynett, 2019b, 2020) predominantly being a product of meticulous mixing decisions, which limits the degree of creative freedom, the mixing phase appeared more standardized than the recording practices the producers described (Herbst and Mynett, 2021b). In contrast, recording audio allows for more experimentation in the choice and placement of microphones and other variables such as the recording room(s), the selection of instruments, and the shaping of sounds at their source (see Herbst and Mynett, 2021b).

This study examined the mixing phase of metal music production through interviews, which allows triangulating the findings with those based on a different sample and actual observation of mixing practices in a previous study (Herbst and Mynett, 2021a). Both studies found that top-level producers define standards of practice while creating a production aesthetic that is original and appropriate for each band. The commonalities evident in the outlined approaches can be explained by the acoustic nature

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of recorded audio and the challenges of modern metal production, which feature fast, complex, and hyper-real performances and bass-heavy timbres (Mynett, 2019a). Clarity, precision, sonic weight, and heaviness must be balanced for an effective and successful production (Mynett, 2017, pp. 9-21), requiring producers to optimize their approach to achieve maximum impact within the acoustic limitations of the recording medium. However, according to this and the two other related studies (Herbst and Mynett, 2021a, b), there tend to be technically functioning alternatives between which producers can choose to achieve the desired aesthetic result. Hence, several best practices –one could say standard approaches– likely exist for producing individual instruments (and vocals) and incorporating them into the context of the mix. Unique and nuanced combinations of these approaches enable original results not featuring a wholly homogeneous sound (Thomas and King, 2019). In a genre like metal that encompasses numerous stylistically and aesthetically diverse subgenres, too many factors interact –from composition, arrangement, instrument choice, and performance characteristics to audio recording and processing– for there to be just one standard production approach. Instead, metal music production tends to be marked by the constant search for novel creative solutions to technical problems involved in engineering an ever-evolving music genre.

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Data access statement

The interview transcripts of the eight producers who participated in the study can be accessed at this location: https://doi.org/10.34696/av1p-7631.

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