SONATA FORM REVISITED:
TOWARDS A COGNITIVE THEORY OF FORMAL INTERFERENCE

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Abstract

Among the most ubiquitous of forms in Western art music, sonata form has long gripped the imagination of music scholars, leading to perhaps the most innovative sonata theory to date by James Hepokoski and Warren Darcy in 2006. However, while their theory is fruitful for interpreting the musical *structure* of sonata form, it can only tell us so much about the specific cognitive mechanisms that underlie a listener's experience as a work unfolds in real time. As such, this thesis seeks to reexamine Hepokoski and Darcy's sonata theory through the lens of music cognition. Namely, I draw upon schema theory, cognitive dissonance theory, and gestalt theory to develop a theory of formal interference. To do so, I build on Hepokoski and Darcy's notions of 'norms' and 'deformations' by proposing a third category, 'deformational norms,' to describe instances in which a deformation is cognitively perceived by a listener as a norm, accounting for ambiguities in sonata-form music of the late eighteenth- and early nineteenth-centuries. Although seemingly paradoxical, I argue that there is a sort of *double dialogism* taking place where the given formal event is both a *deformational token* in the context of a late-eighteenth-century Type 3 sonata and a *normative token* in the context of an early-nineteenth-century Type 3 sonata. Once a listener has constructed respective schemas for norms and deformational norms, I theorize that sonatas featuring both types engender an oscillation between these two contradictory schemas that results in cognitive dissonance.   In Chapter 1, I lay the groundwork for this theory of formal interference and place it in dialogue with the extant literature on musical form and music cognition. Chapter 2 takes a much deeper dive into the cognitive dimensions of formal interference and provides numerous musical examples to

illustrate how a listener cognitively distinguishes between deformations and deformational

norms. Finally, Chapter 3 concludes this project with an extended analysis of the first movement

of Schubert's Piano Sonata D.664 in A Major.

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CHAPTER ONE: WHAT IS FORMAL INTERFERENCE?

I.   Introduction

The impetus for this project began in the Fall of 2020 when I was analyzing the first

movement of Schubert's Piano Sonata D.664 in A Major through the lens of James Hepokoski

and Warren Darcy's robust model of sonata theory in *Elements of Sonata Theory: Norms, Types,*

and Deformations in the Late-Eighteenth-Century Sonata.[1] Through in-depth analysis, what

struck me most was the fact there was roughly an equal amount of what Hepokoski and Darcy

refer to as Type 3 'norms' and 'deformations' when evaluating individual action spaces. Before

continuing, let us first establish what is meant by these terms. While Hepokoski and Darcy's

concept of an 'action space' or 'zone' certainly correlates with the traditional concept of 'theme,'

they further define this term by the generic goals the sonata pursues within that particular space.

At the level of the piece as a whole, they distinguish between five "types" of sonatas, with the

"Type 3" sonata embodying the traditional "textbook" model of sonata form. The "Type 3"

sonata thus includes a standard two-part exposition that starts in the tonic and ends in the

dominant in major, what they describe as a "rotation" of the order of elements from the

exposition in the development, and a recapitulation that restates the expositional material in the

tonic key. Additional Type 3 norms in the exposition includes a clear establishment of the tonic

in the primary-theme zone (P); energy gains in the transition zone (TR) that include a "standing

on the dominant" and an increase in dynamics that often leads to "hammer-blow" chords at the at

a clearly articulated "rhetorical pause" on a half cadence, which they call a medial caesura

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[1] Hepokoski and Darcy (2006). Whenever I refer to Hepokoski and Darcy, I am referring specifically to the claims
they make in this co-authored text.

(MC),[2] separating the TR and secondary-theme (S) zone; and lastly, the achievement of a clearly articulated PAC in the secondary key that is the goal of the exposition (known as the Essential Expositional Closure or EEC).[3] A normative recapitulation contains all of these elements with the singular exception that the EEC is replaced with an Essential Structural Closure (ESC), defined as the ultimate goal of the sonata, which is normally the first satisfactory PAC in the home key in the recapitulatory S.

Furthermore, for some norms they lay out a system of "common options" of cadential goals that they call default levels. For example, the first-level default (most common) cadence for an MC is V:HC, the second-level default (second most common) cadence is I:HC, and so forth. Accordingly, Hepokoski and Darcy consider any third- or fourth-level default or anything that falls entirely outside of their default system to be a 'deformation'—that is, "the stretching of a normative procedure to its maximum expected limits or even beyond them – or the overriding of that norm altogether in order to produce a calculated expressive effect."[4]

For example, the first movement of Haydn's "London" Symphony No. 104 in D Major illustrates many of the Type 3 norms outlined by Hepokoski and Darcy. The approach to this movement's first-level default V:HC MC represents the classic "energy gain" outlined by Hepokoski and Darcy: the bassline ascent in mm. 56-57 from 4^-#4^-5^ supports a strong V6/5 of V approach to the dominant, the 5/3-6/4-5/3 neighboring motion in mm. 57-62 creates a prolongation of V/V, and the three hammer-blow chords in mm. 63-64 make it clear to a listener that an MC has arrived. As we will see in future examples, deformations arise through the

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[2] As defined by Hepokoski and Darcy (2006, 22-23), a medial caesura (often abbreviated as MC) is the rhetorical break that separates the first and second parts of a two-part exposition. MCs are often preceded by energy gains, dominant locks, and/or "hammer-blow" chords in TR leading to some sort of cadence (usually a half cadence, but not always). However, while MCs are often *associated* with a cadence, an MC is *not just* a cadence, but also the rhetorical pause that follows said cadence and opens up space for the launch of S.
[3] Ibid (2006, 14).
[4] Ibid (2006, 614-15).

absence, stretching, or outright defiance of these norms, such as a "de-energizing" TR zone that lacks any sort of the harmonic motion or hammer-blow chords described above, one ambiguous MC candidate, multiple ambiguous MC candidates, and so forth.

Example 1.1. Haydn, Symphony No. 104 in D Major ("London"), first movement, mm. 54-66[5]

Returning to my experience analyzing the first movement of Schubert's Piano Sonata D.664 in A Major, in addition to the roughly equal proportion of norms to deformations, I did not hear the deformations themselves as simply being anomalies (as they typically are in the works of Mozart, Haydn, and early Beethoven), but instead as being quite normative for Schubert's output. Additionally, I found myself in a state of unresolved cognitive dissonance, as each

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[5] See Hepokoski and Darcy (2006, 36-37), who discuss the same Haydn example in their discussion of Type 3 sonata norms.

action space alternated from featuring a Type 3 norm to one of Schubert's idiolects, and thus I had no way to anticipate what to expect next. Of course, it must be stated from the outset that my own modern-day experience is necessarily different from that of Schubert's contemporaries, but the vast literature on Schubert's sonata-form works—which collectively addresses both historical and contemporary listeners—overwhelmingly discusses the same types of formal ambiguities that I encountered.[6] However, this scholarship always approaches Schubert's sonatas from a strict norm/deformation binary standpoint, despite the remarkable consistency of many of Schubert's deformations across his output. This binary seems to be largely attributed to the fact that most of this literature takes an exclusively historical and/or structural approach to Schubert's sonatas, and not an explicitly cognitive one where the division between perceptual categories becomes murkier. As such, between my own personal experience and the extensive scholarship on Schubert's sonatas, I came to the conclusion that perhaps limiting the analyst's toolkit to a strict binary between only norms (whether Type 3 or newly created) and deformations becomes inadequate when analyzing sonatas of the early nineteenth century and beyond where the division between what constitutes a norm versus a deformation becomes significantly more ambiguous. Accordingly, this thesis argues that ambiguous sonatas of the early nineteenth century begin to complicate this binary, resulting in the need for an additional category, deformational norms, which, when colliding with Type 3 norms, result in the cognitive phenomenon of formal interference.

In addition to my personal experience with Schubert's D.664, however, it is also crucial to consider why—from a broader historical perspective—nineteenth-century sonatas did

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[6] See, for example, Beach (1993), Black (2009), Burstein (1997), Byrne-Bodley and Horton (2016), Denny (1988), Guez (2018, 2019, 2020), Hatten (2004), Hepokoski (2020), Hunt (2009), Hyland (2009, 2016), Mak (2006, 2015), Sly (2001), Webster (1968), and Wollenberg (2011).

not reconfigure into entirely new norms, but instead reused many of the deformations first deployed by late-eighteenth-century composers. Although the Romantic valorization in the nineteenth century galvanized composers to embrace their own creative "genius," they also had a sense of obligatory veneration for the music of their late-eighteenth-century predecessors due to the need to gain social prestige in historicist music circles that began to worship music of the past. Two main historical conditions occurred as a result: 1) there was a transformation in music economies from a patronage system (where composers were simply hired to write for church services, community events, etc. and thus were not necessarily striving for originality) to a more market-driven economy (where composers felt the need to be unique and avoid emulating their predecessors), and 2) there was a rise of both modern music conservatories and schools of music within universities that "preserved" old forms of music. Due to these changes, the age of "creative innocence" ended, and thus self-conscious theory—that is, a high consciousness of purpose and history—began to take flight.[7] Specifically, composers of the Classical period— namely Mozart, Haydn, and Beethoven—were essentially viewed as musical "saints" that nineteenth-century composers should seek to emulate. As a result, nineteenth-century composers faced a paradoxical dilemma in which they desired to be original while also feeling much social pressure to venerate their forebears, which was especially exacerbated after the triumphantly successful premiere of Beethoven's Ninth Symphony in 1824.[8]

However, while my personal experience and the historical underpinnings of these ambiguous formal events are critical to note, the underlying phenomenon I theorize is best examined through the lens of music cognition. While Hepokoski and Darcy's *Elements of Sonata Theory* has had a groundbreaking impact on scholarly approaches to sonata form, their

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[7] Taruskin (2004, 7-34).
[8] Bonds (1997).

theory is concerned primarily with the structural and hermeneutic aspects of sonata-form analysis that they argue generate expressive meaning. That being the case, at the end of the day, studying a work's hermeneutic underpinnings can only tell us so much about how a listener actually hears the piece, and thus it is ultimately our *phenomenological* experience that dictates how we perceive the work in real time. Thus, it became apparent to me that a more cognitively-oriented approach could further develop their hermeneutic framework by expanding it into more phenomenological territory.

In this thesis, I develop a cognitive theory of formal interference that accounts for perceptual ambiguities faced by listeners when encountering sonatas of the early-nineteenth century and beyond. Accordingly, in the following section, I introduce two proposed theoretical concepts that are at the heart of this thesis: deformational norms and formal interference itself. In my discussion of deformational norms, further elaboration will be provided to describe how listeners distinguish between deformations and deformational norms. In describing formal interference, examples of pieces will be provided to illustrate the formal interference ratio. The overarching goal of this section is to introduce the theoretical apparatus of formal interference and the role that deformational norms play in engendering this phenomenon.

However, before discussing the concepts of deformational norms and formal interference, it must be acknowledged from the onset that there are certainly limitations to using Hepokoski and Darcy's theory as a backdrop for this thesis. First and foremost, the highly narrow scope of composers covered in Hepokoski and Darcy's *Elements* has been widely scrutinized. Indeed, as William Drabkin has rightly pointed out, their book uses Mozart examples overwhelmingly more than any other composer, despite the fact that Mozart, along with Haydn and Beethoven, were

not necessarily the most popular figures in their age.[9] That being said, this critique does not negate the *theoretical* substance of the fundamental concepts of deformations and dialogic form, which, as they note, is rooted in genre theory, hermeneutic phenomenology, reader-response theory, among many other sources.[10] Thus, at a core level, their rooting of musical form (and sonata form specifically) in composers', performers', and listeners' ongoing dialogue with notions of norms and deformations remains unchanged by the critique of the limited repertoire. Additionally, scholarly work done since the publication of *Elements* that uses Hepokoski and Darcy's theory *has* covered a significantly wider range of composers, including Graham Hunt's work on Schubert, Jonathan Mitchell's work on Chopin, Seth Monahan's work on Mahler, Peter Smith's work on Dvořák, and David Orvek's work on Grieg, just to name a few. Thus, although Hepokoski and Darcy's initial 2006 text was very much limited in scope, scholarly work done since then has proven how wide-reaching and resilient their theory is when applied to other composers from the late-eighteenth-century and beyond.

Secondly, it also must be acknowledged that Hepokoski and Darcy only offer a theoretical model and the intent of this project is to use an experience-based analytic methodology. However, music cognition scholars have yet to offer any sort of significant empirical evidence for how listeners process sonata form. While scholars such as David Huron and Elizabeth Margulis have conducted listener-based experiments using *broad* patterns of musical repetition, empirical work on more specific forms such as sonata form remain to be done. Accordingly, this thesis uses Hepokoski and Darcy's model as a *starting point* and builds on their theory using empirical evidence on musical form by scholars such as Huron and

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[9] Drabkin (2007). See also, Gjerdingen (2007).
[10] (Hepokoski and Darcy, 603-621) For a discussion of these sources, see Hepokoski and Darcy's two appendices.

Margulis, as well as corpus-based and theoretical evidence on schema theory by scholars such as Robert Gjerdingen, Vasili Byros, and Janet Bourne.

II.   Deformational Norms and Formal Interference

In the description of my experience with the analytical ambiguities that arise in the first movement of Schubert's D.664 Piano Sonata in A Major, I proposed the term 'deformational norm' to describe such instances in which a deformation is cognitively perceived by a listener but analytically designated by the analyst as a norm. Although the term might at first seem paradoxical, deformational norms differ from deformations in that they occur with such consistency in a given historical period that a listener constructs a new schema to accommodate their regularity. Importantly, however, these 'norms' still retain their 'deformational' quality due to the fact they are still *in dialogue* with the norms of the Type 3 sonata. In this sense, I argue that there is a sort of *double dialogism* taking place where a given formal event is both a deformational token in a late-eighteenth-century context due to its anomalous nature, and a normative type in an early-nineteenth-century context due to its consistency. In other words, no composer is capable of constructing their "own" entirely unique, non-deformational norms, thus necessitating a need for the 'deformational' qualifier.   Of course, deformational norms can and do occur across a wide range of styles, forms, and historical periods, but for the purposes of this thesis I shall limit my focus to late-eighteenth-century Type 3 norms and nineteenth-century deformational norms.

Having established this new concept of deformational norms as a means of identifying Schubert's idiolects in D.664, I was still left with the larger issue of the potential cognitive dissonance that a stylistically competent listener experiences when listening to the

piece. In what follows, I argue that this cognitive dissonance results from the full activation of

two different *schemas* listeners construct for Type 3 norms and nineteenth-century deformational

norms, respectively. As cognitive psychologists Jean Piaget and Lev Vygotsky first theorized in

the early twentieth century, the way humans mentally organize phenomena in the first place is

through the construction of schemas, or organized units of knowledge that structure our

understanding of the world.[11] Furthermore, schema theory is not at all foreign to the field of

music theory as Robert Gjerdingen and Vasili Byros have drawn upon the schema concept

extensively in their work. That being said, their work focuses primarily on micro-level musical

structures within the parameters of harmony and voice-leading. However, Gjerdingen and Janet

Bourne have rightly acknowledged that schema theory operates at multiple levels and across a

very wide range of musical parameters.[12] As such, my usage of schema theory in this thesis

builds on the work of Bourne, Byros, and Gjerdingen by extending it to the study of musical

form.

　　Before continuing, it is crucial to clearly establish what I am defining as "a listener."

Of course, it must be acknowledged from the outset that there are a number of problems with the

notion of an idealized listener since the analyst/theorist necessarily brings their past experiences

to bear in their analysis and each individual listener has a unique developmental history from

others. However, there is unfortunately no way to avoid such a notion in a paper that attempts to

theorize stylistic norms and deformations through the lens of schema theory and music cognition

more generally. As such, this thesis *presupposes* that an idealized listener—taken for granted for

the sake of this paper—is primarily well-versed in Western art music and is thus stylistically

competent with regards to the norms and deformations of the late-eighteenth-century Type 3

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[11] McVee et al. (2005), 536-37.
[12] Gjerdingen and Bourne (2015).

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sonata and deformational norms of the nineteenth-century sonata. In other words, I am idealizing a listener who, through accumulative listening experiences with the sonata-form repertoire in question, has constructed respective schemas for Type 3 norms and deformational norms. Although an ability to read music and knowledge of music theory certainly strengthens said schemas, I argue that schemas for the perceptually salient aspects of sonata form (which are the ones I focus on in this thesis) are able to be constructed by the average concertgoer and professional musician alike.

In the case of the first movement of Schubert's Piano Sonata D.664 in A Major, with each subsequent action space shifting from Type 3 norms to deformational norms, both of a listener's schemas become fully activated, causing them to jump back and forth between the two to assimilate the formal features of each zone. In other words, these two contradictory schemas are *interfering* with one another such that a listener has no way to clearly distinguish between what is normative and what was deformational. Cognitive psychologists generally agree that one of the primary ways in which cognitive dissonance can be engendered is by the activation of two contradictory schemas.[13] As such, to account for this phenomenon in musical contexts, I devised the term 'formal interference' to describe the degree of juxtaposition between, for example, eighteenth-century Type 3 norms and deformational norms. In other words, the more equal the distribution of Type 3 norms (or whatever the type of non-deformational norms a sonata contains) and deformational norms, the stronger the activation will be between a listener's two schemas, and thus the greater the cognitive dissonance a listener will experience as a result. Of course, the anomalous nature of simple deformations themselves in both eighteenth- and nineteenth-century contexts causes them to remain as anomalies that are not assimilated into

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[13] For a general consensus on how cognitive dissonance can be produced via the activation of two contradictory schemas, see Cooper (2019), Harmon-Jones and Mills (2019), Telci et al. (2011), and Vaidis and Bran (2014).

either schema but instead remain in a listener's working memory, and thus they result in only minimal cognitive dissonance. The reason for this minimal dissonance is that only one schema and an anomaly are involved, as opposed to the interaction of two *schemas* (for Type 3 norms and deformational norms) themselves that occurs during formal interference.

An analogy of the experiential effects produced by deformational norms can be found in Lawrence Zbikowski's work on the perceived dichotomy between music and language. Using the Chinese form of storytelling *shuochang* ("speak and sing") as a case study, Zbikowski shows how, despite the obvious differences between music and language, their similarities blur the line that separates these two perceptual categories.[14] In such cases, we cannot assimilate the stimulus in a schema for music *or* language, but instead are left with an anomaly in between them, just as in the case of deformations falling in between our schemas for norms and deformational norms.

Figure 1.1 provides a visual illustration of how the hypothetical listener schematically organizes Type 3 norms, deformational norms, and deformations (for examples of deformational norms and deformations, see Section 2.2, where I offer musical examples to distinguish between these two categories). In reality, however, for most eighteenth- and nineteenth-century sonata-form works there is either a predominance of, for example, Type 3 norms (late-eighteenth-century sonatas) *or* the composer's set of deformational norms (nineteenth-century sonatas), and thus they have one single schema that is guiding their set of expectations as to what is "normative" and what is not throughout the duration of an entire work. What complicates this schematic binary, however, are the many sonata-form works by Schubert, Brahms, and middle-late period Beethoven, where there is often a roughly equal amount of Type 3 norms/deformations and early-nineteenth century deformational norms. Thus, my notion of

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[14] Zbikowski (2012, 125-29).

formal interference attempts to address and resolve the listener-based *cognitive issues* that arise in such formally ambivalent works of the early-nineteenth century that the current literature on musical form has inadequately addressed.

As such, the purpose of this thesis is to develop a cognitive theory of formal interference to account for the explicit cognitive mechanisms at play when stylistically competent listeners (as explicitly defined earlier) engage with ambiguous sonata forms of the early-nineteenth century. In doing so, I theorize the concept of deformational norms to describe formal events that are both *deformational tokens* in a Type 3 eighteenth-century context and *normative tokens* in a Type 3 nineteenth-century context. The remainder of this introductory chapter wraps up with a discussion of how cognitive approaches complement historical and structural approaches, an examination of corpus-based formal interference ratios, and a literature review on musical form and music cognition. In Chapter 2, I take a much deeper dive into the cognitive mechanisms that underlie the phenomenon of formal interference. Finally, Chapter 3 concludes with an extended analysis of the first movement of Schubert's Piano Sonata D.664 in A Major to illustrate the large-scale cognitive dissonance one experiences over the course of an entire movement that embodies maximal interference.
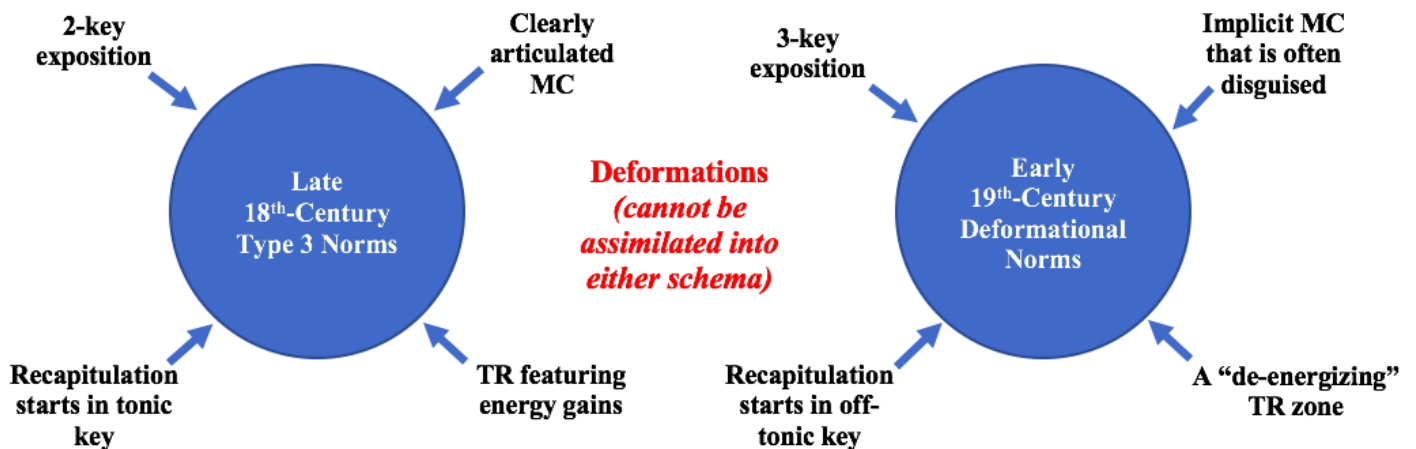
Figure 1.1. Illustration of the schematic binary between Type 3 norms and deformational norms.

From the onset, I want to stress that the current analytical and historical approaches to musical form need not depart from the literature in order for music cognition to be accounted for. In fact, such perspectives bring incredibly valuable insights in their own respective rights. For example, William Caplin's theory of "formal function"—that is, the specific role an individual formal unit serves in the overall temporal organization of a classical work[15]—has opened many doors for both analysts and music theory pedagogues alike. Similarly, James Hepokoski's theory of "dialogic form" has allowed for a new emphasis in formal analysis on a work's *expressive* meaning in addition to its musical structure.[16]

That said, accounting for cognition would simply *complement*, not undermine, the current literature on musical form, addressing individual listener-based differences in perception that cannot adequately be accounted for by current historical and structural approaches. While perception is certainly acknowledged *tacitly* in many (if not most) theories of musical form, more detailed, explicit explanations of the cognitive mechanisms underlying the perception of form could help enable scholars in music theory, cognitive psychology, and neuroscience to study and understand these processes at a much deeper and richer level. Although this project does not employ an explicitly empirical methodology, the sources I draw upon with regards to schema theory largely do, and thus my claims are made on the basis of these empirical findings. As such, this study follows in the same vein of scholarship as those music theorists such as Fred Lerdahl, David Temperley, Lawrence Zbikowski, Danuta Mirka, and Robert Gjerdingen, who have grounded their work in music cognition, but have taken a more *theoretical* rather empirical approach to their music-cognitive studies.

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[15] Caplin (1998).

[16] Caplin, Hepokoski, and Webster (2010).

Moving back to the concept of formal interference, recall that what constitutes a deformation versus a deformational norm for a listener is based largely on the formal events they find to be most perceptually salient, which is more specifically determined by their schematic weighting. As such, analysts should always take a listener's schematic weighting—which can obviously vary drastically from listener to listener—into account when distinguishing between deformations and deformational norms. Even though a given scholar's analysis often aligns with schematic weighting, explicitly acknowledging a listener's schemas can more richly inform our understanding of how a listener processes the piece in real time—assimilating each zone as normative or deformationally normative—and thus verify that the analysis does indeed align with a listener's schematic weighting.

For example, take Schubert, Brahms, and middle-to-late Beethoven, among three of the earliest composers to use the three-key exposition (or "trimodular block," to use Hepokoski and Darcy's term) in their sonata-form works.[17] An analyst can easily argue that a given work has a three-key exposition or not based on a given set of criteria, but ultimately it is a listener's *schematic weighting* of what constitutes a new key—based on their *cognitive* experience—that determines if they actually perceive a third key (and thus a deformational norm) or a mere instance of tonicization (and thus a norm/deformation). Furthermore, the nature of key perception has likely changed somewhat over time,[18] reinforcing the importance of schemas and present-day (*in addition* to historicist) cognitive approaches to sonata form.

From the above account of the value of cognitive approaches to form, I am clearly favoring a *descriptive* music theory over a *prescriptive* one, to use David Temperley's

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[17] Hunt (2009, 65-119).

[18] For a trenchant discussion of how key perception has evolved from the eighteenth century to the twenty-first century, see Byros (2012), who studies the reception history of Beethoven's Symphony No. 3 (*"Eroica"*) to illustrate this evolution in great detail.

terminology.[19] The reason for this is that, on the descriptive-prescriptive spectrum, most theories

of musical structure tend to lean more on the prescriptive end, aiming to elevate a listener to hear

aspects of a piece they are not always capable of perceiving on their own. While there is clearly

great value in such approaches from a pedagogical standpoint, it is also crucial to determine a

baseline level of how listeners initially make sense of musical structure *without* any form of

enhancement provided by an analyst, thereby enabling us to better devise prescriptive theories

that accurately reflect a listener's raw perception. Furthermore, the prescriptive approach

dominates the current scholarship on musical form, and thus a more descriptive approach can

only enhance this current literature, creating a greater balance between both prescriptive *and*

descriptive theories of musical structure. To be fair, Hepokoski and Darcy's sonata theory

holistically seems to lie somewhere in the middle of the spectrum between prescriptive and

descriptive. However, more explicit explanations of the cognitive mechanisms governing a

listener's experience could only help to bolster the descriptive elements of their theory, and

perhaps elucidate other perceptually salient musical aspects that their theory does not always

account for.

For example, according to Hepokoski and Darcy's criteria, a medial caesura (MC) MC

prior to *both* the second and third keys is required to constitute a "real" three-key, trimodular

exposition. Yet, in Beethoven's *Coriolan* Overture, there is no MC preceding the apparent third

key of D major that spans the last 24 measures of S (mm. 78-102). Now on the score itself, the

absence of a MC in D major will surely make any analyst reluctant to accept V/v as an actual

new key area. Proportionately, however, Beethoven spends roughly the same amount of time on

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[19] Temperley (1999). Temperley argues that a descriptive music theory as one that attempts to simply "describe"
some aspect of musical perception or cognition as it occurs naturally, while a prescriptive music theory seeks to
enhance this raw perception in some way, challenging a listener to learn to hear structures and relationships that they
cannot hear without some sort of aid.

V/v (mm. 78-102; 25 measures) as he does in III (mm. 52-77; 26 measures) and i (mm. 1-20; 20 measures). Thus, from the perspective of a listener's *perception*, is a MC actually necessary for them to process mm. 78-102 as a new key area? Ultimately, it boils down to both a listener's schematic weighting—and thus perceptual saliency—that they bring to any given hearing. If a listener's schema for a new key is based more heavily on the *statistical distribution*[20] of the number of pitches corresponding to a tonal hierarchy, they will place greater schematic weight on proportional duration than an MC, and thus assimilate D major as a third key. Conversely, if their schematic weighting places more significance on the presence or absence of an MC, proportional duration is rendered irrelevant and thus they will not assimilate D major as a third key.[21]

In other words, it is a listener's *schema* for what constitutes a legitimate key area that determines whether they will perceive and assimilate it as such, not necessarily a set of predetermined criteria designated by an analyst. For instance, a listener who has a great deal of experience listening to Type 3 sonatas with clearly articulated MCs is likely to place more weight on the presence or absence of MCs to determine what constitutes a new key area due to the schema they have constructed for Type 3 norms, whereas a listener who has little to no experience listening to such sonatas might (or might not) place more weight on the sheer statistical distribution of pitches (i.e., proportional duration) to make this assessment. Of course, analytical criteria and a listener's perception can and often do align with one another, but it still behooves the analyst to take a listener's schematic weighting into account in addition to the set

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[20] See Krumhansl (1990) and Temperley (2004, 2010).

[21] Huron (2008). In Chapter 9 ("Tonality") of this text, Huron presents empirical evidence demonstrating the variance among listeners for the schematic weighting of key determinants between statistical learning (i.e., the sheet number of pitches heard within a given key) and "qualia," or subjective feelings that accompany sensory experiences. In my discussion above, statistical learning is represented by the proportional duration of the key, and qualia are represented by the rhetorical dimensions inherent to the presence of an MC.

of criteria they are using in order to be prepared for exceptions like this Beethoven example. However, this does not necessarily mean that an analyst must poll listeners and collect empirical data when analyzing a piece, but rather that they should be highly cognizant of different schematic weightings that listeners might potentially bring to a given hearing, and perhaps offer multiple interpretations in their analyses to reflect this variation among listeners' perceptions.

P	TR	MC III:HC	S		Essential Expositional Closure (EEC) V:PAC	C
i			III	V/v	v	
m. 1	m. 22	m. 50	m. 52	m. 78	m. 102	m. 102

Figure 1.2. Chart illustrating the formal layout of Beethoven's *Coriolan* overture.

Thus, this example illustrates how expanding the analyst's toolkit to include descriptive accounts of a listener's cognition of form can more richly inform the way we account for a listener's perception. In this case, expanding from only considering the presence/absence of MCs to also considering proportional duration of key (which can, in some cases, be more perceptually salient than MCs based on a listener's schematic weighting) provides more nuanced interpretations that more explicitly account for a listener's perception. That is not at all to say that Hepokoski and Darcy's theory does *not* already account for listeners. To the contrary, theirs is one of the few theories of musical structure that does acknowledge listeners, but not always necessarily in a *descriptive* manner, as some of their proposed concepts (rotational form, dialogic form, etc.) are more prescriptive than descriptive in nature. As such, this example illustrates how accounting for the *variability* of a listener's raw perception—based on each individual's unique schematic weighting and perceptual saliencies—can help to expand the reach of Hepokoski and

Darcy's theory, more accurately reflecting how listeners *at large* make sense of sonata form. With this view of the value of bringing a cognitive perspective to the analysis of sonata form, I now turn to the question of how an analyst is to go about analyzing formal interference from a more pragmatic and tangible standpoint.

Although the variation of schematic thresholds among listeners makes analyzing formal interference an inherently subjective enterprise, it can be analyzed for an assumed stylistically competent listener by specifically defining what constitutes the given period's deformational norms. Of course, there is certainly overlap between nineteenth-century composers' deformational norms (i.e., Schubert and Brahms's shared predilection for the 3-key exposition), but there are also plenty of idiosyncratic norms unique to *some* nineteenth-century composers but not others. Thus, for analytical purposes we will refer to the second schema as "[time period]'s deformational norms" for convenience but must keep in mind that there will be some idiolects found in works by some composers that are not found in pieces by others from the same given time period. After clearly defining deformational norms, the analyst analyzes each action space individually, accounting for any Type 3 norms and deformational norms present. If there are only Type 3 norms and deformations present, the analyst should designate the zone as "Type 3 normative," but if any of the predefined deformational norms are present in the zone, it shall be labeled as "deformationally normative." From here, we can calculate an interference ratio to determine the proportionality of norms versus deformational norms found within the given work. Statistically, there is a positive correlative relationship between the proportional ratio of eighteenth-century Type 3 sonata norms/deformations and deformational norms, such that the more equal the distribution of Type 3 norms/deformations and deformational norms, the more likely that the work will be perceived to embody formal interference.

To illustrate this statistical relationship, Figure 1.2 provides examples of interference ratios in sonata-form movements by various composers from the late-eighteenth through the late-nineteenth centuries (see Appendix A for a step-by-step explanation of how I arrived at these ratios). Importantly, this list is *not* intended to serve as a formal corpus study by any means. Instead, it is simply a list of examples—nothing more, nothing less—that *suggests* a trend in terms of interference ratios. Figure 1.3 illustrates a hypothesis based on the data presented in Figure 1.2, speculating that maximal interference reaches its peak in the early-nineteenth century, whereas minimal interference generally characterizes the late-eighteenth and late-nineteenth centuries. As mentioned earlier, this trend can be explained by the fact that early-nineteenth century works characterize a period of historical transition where composers grappled with both being original while still venerating the formal practices established by their predecessors. However, it is important to reiterate that this historical timeline is specific to the transition between *Type 3 sonatas* of the eighteenth and nineteenth centuries. In other words, interference ratio trends for other types of sonatas (and, even more broadly, other types of musical genres) will vary. In addition, ratio trends between different *periods* of historical transition will vary as well.

Finally, I should stress that the interference ratio provides us with a quantitative measure for future statistically-based corpus studies and *not necessarily* a listener's real-time perception of individual works. In reality, most listeners do not hear sonatas (and musical works more broadly) in separable units but rather in an uninterrupted, continuous flow.[22] As such, we can only use interference ratios for corpus studies and thus must rely on the cognitive dimensions

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[22] Clarke and Krumhansl (1990, 213-51).

of formal interference to provide us with insights about how a listener actually make sense of the

piece as it unfolds in real time.

Year Composed	Piece	Composer	Approximate Interference Ratio (Type 3 norms/deformations: deformational norms)
1782	String Quartet No. 14 in G Major, K.387, first movement	Mozart	1:0
1788	Piano Sonata No. 16 in C Major, K.545, first movement	Mozart	1:0
1790	String Quartet Op. 64 No. 1 in G Major, first movement	Haydn	1:0
1795	Piano Trio No. 39 in G Major, Hob. XV/25, first movement	Haydn	1:0
1797	Piano Sonata Op. 10 No. 1 in C minor, first movement	Beethoven	1:0
1807	*Coriolan* Overture, Op. 62	Beethoven	1:1
1816	Symphony No. 2 in B♭ Major, D.125, first movement	Schubert	1:1
1819	Piano Sonata in A Major, D.644, first movement	Schubert	1:1
1853	Piano Sonata No. 1 in C Major, Op. 1, first movement	Brahms	1:1
1855	Piano Quartet No. 3 in C minor, Op. 60, first movement	Brahms	1:1
1865	Piano Sonata in E minor, Op. 7, first movement	Grieg	0:1
1876	Quartet Movement for Piano, Violin, Viola, Cello, and Piano in A minor	Mahler	0:1

1893	Violin Sonata in F Major, Op. 57, first movement	Dvořák	0:1
1888	Symphony No. 1 in D Major ("Titan"), first movement	Mahler	0:1
1895	String Quartet No. 13 in G Major, Op. 106, first movement	Dvořák	0:1

Figure 1.3. Examples of sonata-form movement interference ratios from 1782-1895.

Hypothesis on Interference Ratio Trends from the Late-Eighteenth to Late-Nineteenth Centuries
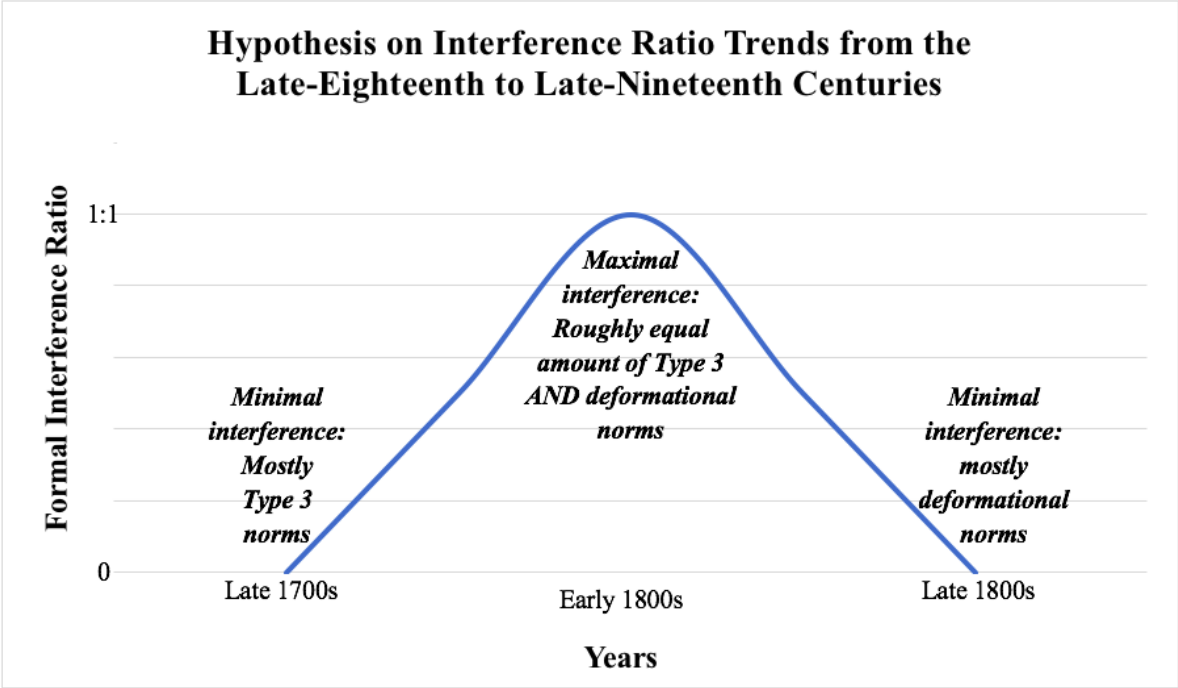
Figure 1.4. Graph illustrating a hypothesis on formal interference ratio trends from the late-eighteenth to late-nineteenth centuries.

III.   Literature Review

Given the stated aims, the overarching research question I seek to explore in this thesis is: what are the cognitive and phenomenological dimensions of a stylistically competent listener's experience that result in a perception of maximal formal interference (as opposed to minimal interference) with regards to sonata-form works? The extant literature that I draw on in answering this question—though briefly described in the previous section—will now be discussed in more detail and can be broken down into three distinct categories: theoretical/analytical, historicist-cognitive, and presentist-cognitive approaches to musical form.

To begin with the broadest level of theoretical/analytical approaches to musical form, one of the most critical theories of formal analysis for repertoire of the Classical period has been devised by William Caplin, ranging from small-scale ideas and phrases to the large-scale structure of entire movements. Perhaps the most valuable concept introduced in Caplin's work is what he refers to as a "formal function," or the specific role an individual formal unit serves in structuring the temporal organization of a classical work. In theorizing formal functions, he demonstrates how each formal function is determined by multiple parameters—namely, harmony, tonality, grouping, and cadence.[23]

In contrast to Caplin's more structural approach, however, Hepokoski and Darcy construct a dialogical and hermeneutic model of the late-eighteenth century sonata that is readily applicable to sonata-form works by Mozart, Haydn, and the early and middle periods of Beethoven. In addition to hermeneutics, their theory is also heavily grounded in genre theory, phenomenology, reader-response theory, sociological theories, cultural materialism, and the theory of ideology and institutions.[24] Distinguishing between "defaults" and "deformations,"

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[23] Caplin, Hepokoski, and Webster (2010).
[24] Hepokoski and Darcy (2006, 604).

they provide an in-depth theory with many analyzed examples to demonstrate the most common compositional sonata-form practices during the given time period. In opposition to previously described notions of a rigid, formulaic, and overall "conformational" approach to musical form,[25] Hepokoski and Darcy champion what they refer to as "dialogic form," where compositional choices that make up an individual piece are constituted *in dialogue* with generic norms and expectations.[26]

Drawing on the work philosopher Theodor Adorno and musicologist Carl Dahlhaus, in addition to that of Caplin, Hepokoski, and Darcy, Janet Schmalfeldt has developed a theory of form in the process of becoming in which a listener's perception of musical form is constantly changing and evolving as a piece unfolds. In doing so, she theorizes the concept of "retrospective reinterpretation," whereby a listener initially perceives a given formal function in a certain way but retroactively changes their perception of that function as they encounter subsequent material. Using the first movement of Beethoven's "Tempest" Sonata as a case study, she demonstrates how a listener's initial hearing of what they perceive to be an introduction *becomes* the P zone via retrospective reinterpretation. [27]

Building on Hepokoski and Darcy's theory, Seth Monahan has identified deformations found in some but not all of Mahler's symphonies, enabling him to categorize Mahler's early- and middle-period symphonic works into three distinct types: "classical," "epic," and "incursive."[28] In a similar but even more specific vein, Graham Hunt has traced the evolution of the three-key exposition from its rare occurrence in late-eighteenth-century expositions to its much more frequent usage in nineteenth-century works by Schubert and Brahms. Also building

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[25] Bonds (1988).
[26] Hepokoski and Darcy (2006).
[27] Schmalfeldt (2011).
[28] Monahan (2015).

on the work of Hepokoski and Darcy, Hunt uses their same terminology and analytical

framework to elucidate how applicable their theory is to not only late-eighteenth but also early-

nineteenth century sonata-form works as well.[29]

While all of the aforementioned scholars bring deep insights with their respective

theories of musical structure,[30] structural theories alone can only tell us so much about how

stylistically competent listeners of the past and present make sense of the piece *cognitively*. The

one primary exception—Schmalfeldt—certainly provides rich insights into the

phenomenological dimensions of musical form, but even her theory can be enhanced by

accounting for the explicit cognitive mechanisms underlying form in the process of becoming.

As such, Schmalfeldt's work as well as all of the aforementioned studies could be further

developed and complemented by work from music cognition.[31] Without explanations of the

specific cognitive mechanisms underlying a listener's experience, there is always the potential

for a disconnect between the analyst's written analysis and a listener's aural perception. In this

context, I am using Peter Burkholder's conception of "analysis": an account which "builds or

proceeds from" a theory. [32] While this disconnect between analysis and perception is problematic

for analyzing musical form in general, that is especially the case when analyzing formal

interference, which is grounded in schema theory, Gestalt perception, and cognitive

dissonance—all of which are based entirely on a listener's perception.

However, that is not to say that an attempt to merge cognitive and historicist scholarship

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[29] Hunt (2009, 65-119).

[30] Whenever I use the term "theory" in this context, I am referring to Peter Burkholder's musical structure-based conception of the term: a framework for "how pieces in particular repertoires are structured" (1993, 12).

[31] Though the definitions of "cognition" vary throughout the music theory and cognitive science literature, I am using psychologist Howard Goldstein's conception of the term (which has become the generally accepted term used among cognitive scientists today): "the store of past experiences and their meanings which have become transposed into rules regulating how the person will interpret and respond to the particular input" (1982, 549).

[32] Burkholder (1993, 12).

together does not exist. To the contrary, Vasili Byros has used schema theory to argue that social and historical experience engenders knowledge structures that enable "a situated psychology of hearing and a context-contingent understanding of music."[33] In a similar manner, Robert Gjerdingen has also provided a detailed explanation of what constitutes a schema and how they function specifically in historically specific musical contexts. He does so by drawing parallels from linguistics and the cognitive sciences to show how instances of a given schema can vary greatly in appearance while still conveying the same meaning to the reader/listener.[34] That being said, both scholars rely solely on responses of listeners from the past, using documents abstracted from the reception history of the repertoire they are studying, and thereby taking a primarily historicist approach. Thus, future work could be further complemented by data from *present-day* listeners in order to compare them with responses from historical listeners, which might lead to even richer conclusions regarding the development of schemas throughout the history of Western music.

In terms of formal interference, human perception and cognition has evolved *drastically* over the past few centuries alone. As such, what constitutes a Type 3 normative schema versus a deformational normative schema for past and present-day listeners likely varies drastically, and thus this "presentist" perspective *in addition* to Byros and Gjerdingen's historicist perspective can give us a clearer picture of the transformation in the cognitive mechanisms underlying one's perception of formal interference. Additionally, both Byros and Gjerdingen explicitly acknowledge in their work that, even though schemas are found in both small- and large-scale musical structures, they are concerned exclusively with the former, focusing exclusively on harmony and voice-leading. However, at the end of the day, most listeners (as defined earlier),

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[33] Byros (2012, 273-346).
[34] Gjerdingen (2007).

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composers, and analysts—even the most stylistically competent ones—are likely to perceive

musical works in larger formal chunks as opposed to individual harmonic progressions,[35] and

thus my usage of schema theory in my discussion of the large-scale nature of formal interference

attempts to expand this cognitive theory's applicability to studies of musical form.

Once again, that is also not to say that there is a dearth of "presentist"-oriented music

cognition literature in existence. To the contrary, throughout cognitive science scholarship, there

has been a flourishing of music-based experiments conducted on present-day listeners ever since

the 1980s. For example, providing robust empirical evidence from studies that have employed a

wide range of Western and non-Western musics, David Huron specifically offers two

compositional strategies for keeping listeners engaged: the variation strategy—that is, repeating

the same passage with slight modifications upon each successive iteration, and the rondo

strategy—that is, interpolating a new passage of previously unheard music at irregular intervals,

such that a listener has no way to predict when these interpolations will occur. Yet every piece

of empirical data Huron collected was derived from twenty-first century listeners,[36] preventing

any potential point of comparison for how the perceptions of past and present listeners

made/make sense of the same piece. Similarly, adopting the perspective of cognitive science,

Elizabeth Margulis presents empirical studies on topics ranging from the structure of bird songs

to the psychology of rituals to the nature of infant-directed speech to the neural basis of hearing,

all illustrating how repetition-based music listening lies at the heart of daily human activity.[37]

Additionally, Jonathan De Souza and his colleagues have conducted empirical research based on

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[35] Clarke and Krumhansl (1990). Clarke and Krumhansl's 1990 empirical study found that the predominance of listeners perceives pitches in larger groupings as opposed to individual units.
Hashida et al. (2005). Hashida and colleagues reported similar results from their experiments, providing support for their central hypothesis that listeners process musical works using "grouping" schemas for organizing formal units in real time.
[36] Huron (2013).
[37] Margulis (2014).

corpus studies showing that sonata and rondo forms employ significantly different pitch heights, attack rates, dynamics, meters, and cadences. Accordingly, their work found that listeners—both experienced (with at least five years of formal musical training) and inexperienced (with six months or less of formal musical training)—are able to detect distinct stylistic and affective differences between these formal types.[38]

Once again, though, all of these scholars' empirical data is limited exclusively to present-day listeners. While this isn't necessarily a limitation, it is critical to remember that our present day understanding of form is historically and culturally conditioned in such a way that we must factor historicist approaches into cognition studies as well. This accountability for historicism is especially critical when analyzing formal interference, which hinges upon the double dialogism that allows for the creation and assimilation of deformational norms in the first place. As such, it is imperative that future cognition studies start taking a more balanced approach in considering both historicist *and* presentist understandings of musical form, which is precisely the approach I intend to take in this project.

IV.   Approach and Outline

The aim of this thesis is to build on the monumental work of Hepokoski and Darcy's sonata theory by accounting for the historical transition in sonata form that takes place from the late eighteenth century into the early nineteenth century through a phenomenon I refer to as formal interference. To do so, I reexamine sonata theory through the lens of music cognition to

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[38] De Souza, Roy, and Goldman (2020).

gain insights about listener-based perception that have traditionally not been given much attention by historical, theoretical, and analytical studies.

In Chapter 2, I elaborate on the cognitive mechanisms by which the perception of formal interference is engendered. First, I lay out the crucial role of schema theory in discerning what constitutes a Type 3 norm, deformation, deformational norm, and formal interference from the perspective of a listener's perception. I then conclude this chapter with a section devoted to analytical examples to provide further clarification and illustration of the distinctions being made among deformations and deformational norms.

In Chapter 3, I offer an extended analysis of the entire first movement from Schubert's Piano Sonata, D.664 in A Major. First, I begin with discussion of Gestalt theory and its crucial role in an analysis that prioritizes cognition in addition to theory. In the second section, I conduct the analysis itself, explaining how an analyst is to go about distinguishing between Type 3 norms, deformations, and deformational norms and calculate an interference ratio. In doing so, however, I also reiterate how such quantitative ratios should primarily be used for statistically-based corpus studies, and how schema theory (and hopefully future empirical studies) can account for how this interference is (or is not) actually being perceived from a listener's perspective. Finally, I end with a conclusion where I summarize the main findings of this thesis and suggest areas for future research regarding formal interference.

CHAPTER TWO: THE COGNITIVE DIMENSIONS OF FORMAL INTERFERENCE

I.   The Role of Schema Theory in Formal Interference

In the previous chapter, I argued that the concept of formal interference demands an account of a listener's perception and cognition. As such, the purpose of this chapter is to examine the explicit cognitive mechanisms underlying norms, deformations, deformational norms, and their interaction that gives rise to an experience of formal interference. In this section, I discuss how schema theory has been theorized by both music theorists and cognitive psychologists alike and explain its crucial role in conveying the perception of formal interference from a listener's perspective. In Section 2.2, I offer several musical examples as a means of illustrating how listeners schematically distinguish between deformations and deformational norms.   The overall goal of this chapter is to further theorize the cognitive mechanisms that, when fully activated and working in tandem, engender a stylistically competent listener's perception of formal interference.

As described in detail by music theorist Marc Leman, listeners over time build schemas, or organized units of knowledge, that enable us to make sense of a given piece or section as it unfolds. In other words, the more listening experience a given listener has accumulated, the greater their schematic knowledge will be.[39] As such, the theory of formal interference *presupposes* that the idealized listener—taken for granted for the sake of this paper—is primarily well-versed in Western art music and is thus stylistically competent with respect to the norms and deformations of the late-eighteenth-century Type 3 sonata and deformational norms of the nineteenth-century sonata. Thus, my definition of "a listener" is not one who was innately born

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[39] Leman (1995, 40).

with schematic knowledge of Type 3 and deformational norms, but rather has constructed these schemas over time through accumulative listening experiences. While this study is not intended to be historicist *per se*, taking this idealized stance is necessary for practical reasons, as most prior work done on this repertoire has only explored schemas within Western classical music from this period rather than across cultures and musical genres. In this section, I seek to describe the explicit cognitive mechanisms that distinguish norms, deformations, and deformational norms from one another through the lens of schema theory.

As theorized by cognitive psychologists Jean Piaget and Lev Vygotsky and discussed extensively by Mary B. McVee and her colleagues, any piece of knowledge is connected with an experience, and whenever there is a repetition of the same or similar experience, we begin to mentally categorize said experience into its own respective schema. In other words, a schema is a category of knowledge we construct to mentally organize identical or similar stimuli we perceive.[40] The aforementioned process is what Piaget and Vygotsky refer to as *assimilation*, in which the new experience aligns with a previous schema and thus can be categorized or "assimilated" as such. In contrast, when an experience is significantly different and thus does not align with any preexisting schemas, the individual must form a new schema to accommodate this new experience, through a process Piaget and Vygotsky refer to as *accommodation*. Importantly, however, just as in assimilation, the new schema created is only as strong as the number of similar experiences the individual has that can be assimilated. Finally, it should be noted that the schematic processes of assimilation and accommodation occur at an unconscious level, such that we do not voluntarily assimilate or accommodate, but rather the human mind does so involuntarily.[41]

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[40] McVee, Dunsmore, and Gavelek (2005, 532-36).
[41] Ibid.

As described by cognitive psychologist Norbert Seel, not every piece of processed information falls within an extant schema. When this occurs, a listener experiences cognitive dissonance, or an uncomfortable internal state that occurs when new information fails to coincide with preexisting schemas. As such, this new information is cognitively perceived to be an anomaly—that is, something that exists in reality but is schematically incomprehensible. When such anomalies arise, the individual activates their extant schemas to define what is "known" and then actively seeks other known anomalies to test and update the known by potentially creating a new schema (if there are enough similar anomalies) to accommodate this information, thereby reducing their state of cognitive dissonance. However, if the anomaly is found to be dissimilar to any preexisting anomalies, or if there are not enough consistent anomalies to warrant the formation of a new schema, it will remain as an anomaly until enough additional similar anomalies are encountered to enable the construction of a new schema.[42]

In terms of the perception of formal interference, this means that once a listener has accumulated significant experience engaging with the norms of the late-eighteenth-century Type 3 sonata, a Type 3 normative schema is constructed to accommodate their consistency. As noted earlier, I am defining "a listener" as any individual—with or without an ability to read music or knowledge of music theory—who has consistently engaged with Type 3 sonatas in their listening, whether it be on the radio, in a concert hall, as a performer, or through score study. Once again, it must be reiterated that Hepokoski and Darcy's approach is not rooted in a conception of the "piece" itself, but instead entails a dialogical conception of form between a listener's background knowledge of norms and what is experienced.[43] Consequently, there is no way of avoiding the concept of an idealized listener even if each individual's experience is

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[42] Seel (2012, 365).
[43] Hepokoski (2010).

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obviously going to vary based on their prior experience and individual context. Accordingly, whenever said listener encounters a Type 3 norm, it is always (unconsciously) assimilated into their Type 3 normative schema. Of course, the threshold for the amount of listening experience that warrants the formation of a new schema is an inherently subjective boundary that will vary drastically from individual to individual based on their own set of cognitive capacities.[44] Returning to the relation between these schemas and formal interference, these schemas are constructed as attempts to reduce cognitive dissonance, as without new schemas to organize sets of norms, the mind would enter into a sort of anomalous "overload" of formal events that could not be categorized into any schema. Phenomenologically, this overload would give rise to an experience of incoherence—one where a listener is not able to schematically organize aural stimuli into a coherent perception. Of course, this incoherence can and does arise for other musical elements in addition to form, such as phrase types, harmonic hierarchy, overall shape, and so forth, but the scope of this thesis is limited to how it arises with regards to form.

In contrast, Type 3 deformations do not fall within any schema, for their anomalous nature is, in part, what allows them to be phenomenologically experienced by listeners as expressively significant in the first place. Cognitively, although deformations by definition cannot be assimilated into any schema, they are still encoded and thus will remain and *accumulate* within our working memory for (at least) the remaining duration of the given piece, creating minimal cognitive dissonance. Through this accumulation of deformations, the human mind seeks to find enough similar deformations to warrant the formation of a new schema to minimize cognitive dissonance. If this threshold is not reached, the deformation will remain as an anomaly in a listener's working memory until a new similar deformation is encountered for

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[44] Ibid.

further comparison. Such simple deformations result in the perception of a work as being partially disjointed due to a listener's inability to assimilate these formal events.

Although Hepokoski and Darcy's sonata theory taxonomically ends here with a strict binary between norms and deformations, I argue that beginning with early-nineteenth century sonatas (namely in the works of Brahms, Schubert, and middle-late Beethoven), certain deformations occur with as much regularity as Type 3 norms, and thus there is enough consistency in these anomalies to warrant the designation of an entirely new schema for what I refer to as *deformational norms*. However, here lies the central paradox: how does a listener experience a formal event as both a norm *and* a deformation simultaneously? Cognitively, this paradox means that a listener experiences a state of ambivalence when encountering deformational norms, as they are not able to fully assimilate the deformational norm into a new schema, but instead must leave it partially unassimilated to account for its anomalous nature within the schema that has been ingrained into their working memory. Even so, although deformational norms are not able to be fully assimilated, they are assimilated *enough* to prevent the production of cognitive dissonance.

An analogy to this paradoxical schema is what educational psychologist Alex Bertrams refers to as the *schema model of self-control*. As Bertrams demonstrates, the concept of self-control is inherently contradictory in that it has two opposing forces at play: 1) mental desires (working against emotional desires) based on long-term goals that are assimilated into a schema, and 2) emotional desires (working against mental desires) based on short-term instincts that are not assimilated into a schema.[45] Thus, to activate the self-control schema, an individual must assimilate an event that *fulfills* their mental desire but works *against* their emotional desire. For

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[45] Bertrams (2020).

example, an individual on a diet (mental desire) who restrains themselves from eating a cupcake to cope with their hungriness (emotional desire) would be seen as exhibiting self-control. In this example, the act of restraining themself would be partially—but not fully—assimilated into their self-control schema, as they have actively worked *for* their mental desire but *against* their emotional desire.

Relating this analogy back to sonata form, Bertrams's notion of "mental desires" (acts geared toward achieving long-term goals) would most closely map onto norms while "emotional desires" (acts geared toward alleviating short-term, emotion-based impulses) map onto deformations. As stated earlier, norms inherently are fully assimilated into schemas, while deformations are not at all assimilated. Thus, the assimilative abilities of norms and deformations correspond directly to those of mental and emotional desires. Furthermore, when paired together, both acts of self-control and deformational norms cannot be fully assimilated into their respective schemas, as they each contain a property that cannot be assimilated (emotional desires for self-control and deformations for deformational norms). Thus, there are three different *levels* of assimilation at play in each of these phenomena: 1) *full* assimilation for Type 3 norms and mental desires, 2) *partial* assimilation for deformational norms and self-control, and 3) *no* assimilation for deformations and emotional desires. Of course, it must be acknowledged that this proposed mapping is clearly extending across two different disciplines—psychology and music theory. Nonetheless, as Seel notes, his description of schema theory is intentionally left broad at the level of "knowledge" so that it can be translated to any applicable domain.[46] Figure 2.4 summarizes the mental process that a listener undergoes when processing a previously unheard deformation that is not able to be readily assimilated into an extant schema.

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[46] Seel (2012, 365).
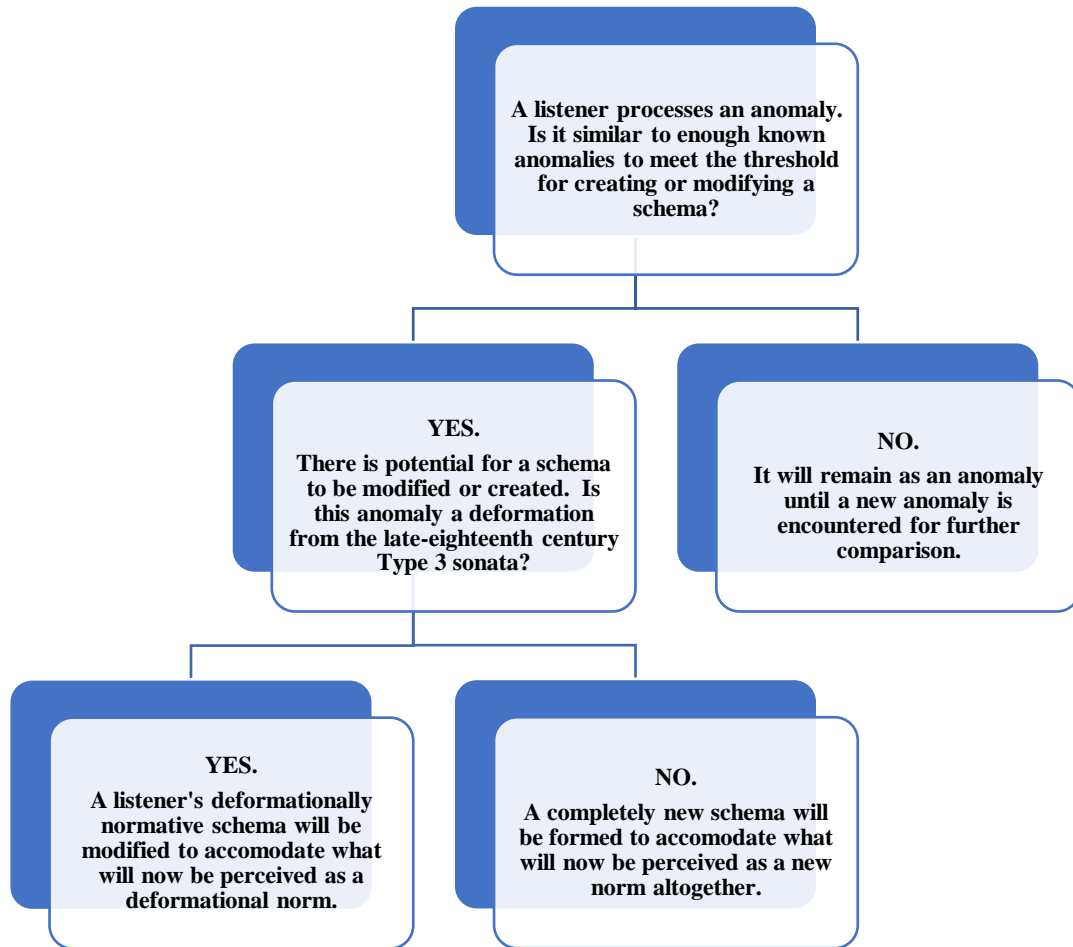
Figure 2.1. Chart illustrating the mental process a listener undergoes when encountering an anomaly.

Now let us turn to the phenomenon of formal interference, where a listener experiences a rapid shift between the assimilations of Type 3 norms and deformational norms that results in cognitive dissonance. Unlike deformational norms themselves, which only involve one schema and are thus not a temporally bound phenomenon, formal interference involves the oscillation of *two* schemas (Type 3 normative and deformationally normative) and thus *is* very much concerned with the in-time experience of pieces. As mentioned earlier, formal interference can and does occur between two sets of norms themselves (without the presence of deformational

norms). However, the inherently contradictory nature of Type 3 norms and deformational norms

represents the clearest instance of interference and is thus what I shall limit my discussion to for

the purpose of this thesis. With two fully activated schemas that contain *contradicting*

information regarding what is normative (e.g., a 2-key exposition versus a 3-key exposition), a

listener has no way to distinguish between what is actually a norm and what is not. As a result,

they find themselves jumping back and forth from one schema to the other trying to determine

whether the piece contains a predominance of features from a single schema in order to resolve

their cognitive dissonance. However, in a work that is perceived to embody maximal

interference, this cognitive dissonance never truly resolves.

An analogy to this schematic oscillation can be seen in the work of media psychologist

John Velez and his colleagues, who have found that when dealing with artificial intelligence, we

switch back and forth between two opposing schemas: 1) a human schema for interacting with

other humans, and 2) a nonhuman schema for interacting with virtual agents. As their study

demonstrates, while humans show significant levels of prosocial behavior when their human

schema is activated, they show a significant drop in prosocial behavior when their nonhuman

schema is activated. Over time, we develop a sort of "mindlessness" from growing tired of this

oscillation between human and nonhuman schemas that prevents us from fully relying on one

schema or the other.[47] While "mindlessness" describes the phenomenological state of

incoherence we experience when shifting between these two opposing schemas, it cognitively

translates into cognitive dissonance. Accordingly, the shorter the duration of timescales spent

assimilating into our human and nonhuman schemas, the more rapid the oscillation, and thus the

more cognitive dissonance we experience. When we encounter situations where we are engaging

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[47] Velez et al. (2019, 335-352).

with both a virtual agent and another human at the same time, the timescales between these two

schemas can be as short as a matter of seconds. In contrast, when we engage with virtual agent

alone and then later return to interacting with humans alone, the timescales between these

schemas are much longer.[48]

Relating this analogy to sonata form, the two contradictory schemas oscillating in

formal interference are Type 3 norms and deformational norms, resulting in the production of

maximal cognitive dissonance. As with human and nonhuman schemas, the timescale of

oscillations between our Type 3 normative and deformationally normative schemas can vary

from a matter of seconds to minutes, depending on the length of action spaces in the given

sonata. Physiologically, such extreme cognitive dissonance can certainly result in headache,

fatigue, and other detrimental effects.[49] For the purposes of this thesis, however, we will focus

more on the music-theoretical and cognitive (rather than the physiological) dimensions of formal

interference. In the next section, specific musical examples will be provided to further elaborate

on the distinction between deformations and deformational norms.

II.   Cognitively Distinguishing Between Deformations and Deformational Norms

While the previous section served to lay the theoretical groundwork for formal

interference, let us now turn to musical examples as a means of illustrating the distinction

between deformations and deformational norms. As described in Chapter 1, the broadest

distinction between deformations and deformational norms is determined by their regularity and

consistency of type (deformational norms) or lack thereof (deformations). In other words,

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[48] Ibid.
[49] Cash (2014, 4-5).

deformational norms are characterized by a double dialogism in which they are *deformational*

tokens of a Type 3 sonata prototypical of the late-eighteenth century and in dialogue with the

type of an early-nineteenth-century deformational *norm*. Suffice it to say, knowing the historical

context of both the composer and piece is *critical* when discerning what constitutes a Type 3

norm versus a deformational norm. Cognitively, what ultimately distinguishes deformations and

deformational norms are the levels of cognitive dissonance a listener experiences. While

deformational norms are assimilated into a schema and thus prevent any production of cognitive

dissonance, deformations cannot be assimilated and thus do produce cognitive dissonance.

Phenomenologically, however, deformational norms differ from Type 3 norms in that a listener

still experiences a state of ambivalence, as they cannot fully accept the given formal event as a

new norm due to how deeply it has been ingrained into their memory as a deformation. The

overall goal of this section is to describe the cognitive and phenomenological differences

between deformations and deformational norms through music analysis.

Let us begin by comparing the works of Haydn (a late-eighteenth-century composer) and

Schubert (an early-nineteenth century composer). When listening to a Type 3 sonata by late

Haydn, a listener is likely to have an expectation of hearing a clearly articulated MC. Yet in the

first movement of his String Quartet Op. 64, No. 4 in G Major, the MC is anything *but* clearly

articulated.   The 4^-♯4^-5^ bassline ascent on beats three and four of m. 13 creates a canonical

ii^6-vii^{o7}/V-V cadential progression in the new key, strongly indicating that a dominant lock is

imminent.   After this anticipated dominant lock is heard in mm. 14-15, the first and only MC

candidate can be found on beats three and four of m. 15, but the highest pitch of G5 in the first

violin on the third beat of m. 15 that steps down to F#5 strongly suggests the conversion of this

harmony to V^7. More importantly, there is no real break following this MC candidate, which

again weakens its potential candidacy. The harmonic rhythm of mm. 15-16 does create a half-cadence in m. 15 but there is no real "pause" following this cadence before the onset of S. Of course, the motivic material found in mm. 15-16 is transposed as a replication of the start of P, so there is no question that a listener hears m. 16 as the start of S, but it remains unclear where the real MC is found prior to m. 16. As such, once a listener reaches S, they realize that what they initially perceived to be a potential candidate never materializes due to the lack of any "break" following the cadence. Thus, this deformation actually arises from an MC that *never* appears as opposed to the presence of two legitimate candidates. Of course, one might argue that this exposition is simply in dialogue with a Type 2 continuous exposition rather than a Type 3 one, but this sonata features a return of all of the expositional material in the recapitulation, and thus defies the lack of a complete recapitulation that defines a Type 2 sonata. Additionally, the point being made here is not that this exposition *lacks* any type of MC candidate at all (as is the case in most Type 2 continuous expositions), but rather that the MC candidate is not clearly articulated. If, for example, the Violin 1 part had an eighth-note descent of A-G-F#-E while the other three parts dropped out on the last two beats of m. 15, this MC candidate would be much more easily discernable as a true MC for a listener.

Example 2.1. Haydn, String Quartet Op. 64 No. 4 in G Major, first movement, mm. 12-20

Thus, this Hadyn String Quartet is a classic example of an implicit MC that is not clearly articulated and therefore represents a classic example of deformation in the sense of Hepokoski and Darcy. However, this was far from deformationally normative for Haydn as, although he delighted in invoking deformations, there is no real consistency in the types of deformations he employed, and he certainly did not make a regular habit of avoiding the clear articulation of his MCs. To the contrary, most of Haydn's Type 3 sonata-form works actually contain clearly enunciated MCs (see Section 1.1 for an example using the first movement of his "London" Symphony No. 104 in D Major), or the very clear absence of an MC altogether in his continuous expositions. Thus, when a stylistically competent listener processes this MC deformation in the context of a work *by Haydn*, they will likely process this as a deformation, and thus it will not be assimilated into any type of schema, but simply remain as an anomaly in their working memory.

As a result, a listener will likely experience minimal cognitive dissonance and thus seek out other similar deformations to warrant the construction of a deformationally normative schema.

In striking contrast, one of Schubert's most idiosyncratic predilections is to blur the line as to where the real MC lies, or to "tease" a listener with one or more potential MC candidates that fail to materialize. A classic example of the latter case can be found in the first movement of his Symphony No. 2 in B♭ Major, D. 125. The thunderous opening to TR in m. 23 is every bit as energetic as a typical Classical TR zone and leads to a half cadence, "hammer-blow" chords, and a whole-measure break lasting from the fourth beat of m. 47 through the entirety of m. 48. However, this potential ii:HC MC candidate is followed not by a confirmative S zone but rather an MC decline and continuation of TR. In this continuation of TR, a listener expects for the real MC to be articulated but no potential MC candidate ever presents itself. Instead, Schubert uses a "de-energizing" remainder of TR—another one of his most commonly used deformational norms[50]—in mm. 49-79 that wanders aimlessly into the onset of S in m. 70 without any sort of "energy gain" characteristic of the previous Haydn example.

Thus, the juxtaposition of this Schubert example with the aforementioned Haydn example illustrates how a stylistically competent listener's expectations are based in large part on historical context and the listener's deformationally normative schema. The very same formal feature—the lack of one single clearly articulated MC—is perceived as a deformation in Haydn due to its rare nature whereas it is perceived as a deformational norm in Schubert due to its regularity of occurrences. In other words, whether a formal feature is perceived as a deformation or deformational norm ultimately boils down to a listener's level of stylistic competency (and

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[50] For other examples of Schubert's "de-energizing" TR zones, see the first movements of his Piano Sonatas D.575, D.566, and D.664. The first two of these sonatas will be analyzed in Section 3.2 and the third one will be analyzed extensively in Section 3.3.

thus the breadth of their schematic knowledge), which determines whether the feature is assimilated into a schema or designated as an anomaly. Because the boundary between deformations and deformational norms is, in part, located in a listener's experience, the role of analysis here then is clearly concerned with a *hypothetical* listening experience used to illustrate cognitive processes. Cognitively, the experiential difference between the Haydn and Schubert examples is striking: what was deemed as a simple deformation kept in a listener's working memory in the Haydn has now been assimilated into a deformationally normative schema as a means of reducing cognitive dissonance. That being said, ambiguous MC candidates in Schubert (in this case, an ambiguous ii:HC MC candidate) are not *fully* assimilated into this schema, however, as listeners have so deeply ingrained this formal event as a deformation (in works such as the Haydn) that its anomalous nature cannot fully be forgotten by a listener, even with the construction of a new schema to accommodate its regularity. Instead, while a listener experiences no literal cognitive dissonance, they experience a sort of phenomenological ambivalence where their mind cannot entirely accept the deformational norm as a norm due to their prior listening experience.

Example 2.2. Schubert, Symphony No. 2 in B♭ Major, D.125, first movement, mm. 45-50

Another set of examples illustrating the critical roles of historical context and a listener's

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schema in discerning what constitutes a deformation versus deformational norm can be found in off-tonic beginnings to the recapitulation. As Hepokoski and Darcy outline in *Elements*, the fundamental role of the recapitulation is to resolve the tonal tension created by the off-tonic ending of the exposition by restating the P material in the tonic (just as it was heard in the exposition), followed by a restatement of the subsequent expositional material modulated to the tonic.[51] However, this pure tonic tonal resolution becomes obscured when the recapitulatory P itself is not even restated in the tonic. Similar to the ambiguous MC candidates described above, off-tonic recapitulatory beginnings were *highly* unusual for the late-eighteenth century Type 3 sonata. Thus, their rare nature in eighteenth-century contexts (i.e., works by Mozart, Haydn, and early Beethoven) causes them to be perceived as deformations.

A clear example of this formal feature perceived as a deformation can be found in the deceptively simple first movement of Mozart's Piano Sonata No. 16 in C Major, K.545. As its title suggests, the expositional P (mm. 1-4) is stated in the key of C major and TR (mm. 5-13) modulates to the dominant of G major as one would expect in a Type 3 sonata. In the recapitulation, however, instead of restating P (mm. 42-49) in C major, Mozart uses F major (IV)—the subdominant—and then recomposes and lengthens the recapitulatory TR (mm. 46-58) in order to modulate up a fifth back to the tonic of C major. Needless to say, this highly unusual recapitulatory start absolutely warrants the designation of being a deformation in Mozart's sonata-form output.[52] The off-tonic recapitulatory start example of a deformational norm raises a

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[51] Hepokoski and Darcy (2006, 17).

[52] Wen (2002, 364-68). As Wen trenchantly argues, the submediant start to the recapitulation in this movement makes this formal feature veer far away from the prototypical eighteenth-century Type 3 sonata. He presents this argument as a rebuttal of Sly and Laufer (2001), who previously argued that the F-major start to the recapitulation is a mere incidental occurrence that prolongs the dominant from the end of the exposition. To do so, he uses a detailed Schenkerian analysis to illustrate how this highly non-normative feature is *far* more than a mere prolongation but rather impacts the large-scale key relations and structure of the piece as a whole. Furthermore, Wen notes how this off-tonic recapitulatory start differs from literally every other piano sonata Mozart composed in which he starts the recapitulation in the tonic. Needless to say, even

critical issue in that unless a listener has perfect pitch or some other rare aural ability, large-scale

key relations are not easily discernible even by the most experienced listeners.   As such, this

example (and the one to follow directly below) illustrates how certain types of norms and

deformational norms are only relevant for determining the interference *ratio*, while others have

potent perceptual salience (and are therefore more relevant for this study). As such, while

someone highly trained in aural skills might find this off-tonic recapitulation to be perceptually

salient, a listener who does not have absolute pitch might not. Nonetheless, for the purposes of

analyzing formal interference, one should still designate any type of structural deformational

norm as such while bearing in mind that a listener may or may not actually be aurally capable of

perceiving it as such. In terms of schema theory, presupposing that a listener *is* indeed capable

of hearing and processing this formal event as a deformation, they will experience the same type

of minimal cognitive dissonance as in the Haydn example. As a result, as a listener continues to

accumulate deformations in their working memory, they will search for enough of the same type

to warrant the creation of a deformationally normative schema.

Example 2.3. Mozart, Piano Sonata No. 16 in C Major, K.545, mm. 1-9

though Wen's article was published four years before Hepokoski and Darcy's *Elements* (2006), it is more than clear from
Wen's discussion that he views this off-tonic recapitulatory P as a clear example of a "deformation."

Example 2.4. Mozart, Piano Sonata No. 16 in C Major, K.545, mm. 42-49

In contrast to the off-tonic recapitulatory beginning being a deformation in the context of

Mozart's (and other late-eighteenth-century composers') sonatas, this becomes a deformationally

normative sonata-form option in the early nineteenth century and beyond. Just as in the

deformational to deformationally normative shift witnessed from Haydn to Schubert with respect

to the ambiguous MC candidates, the same shift can be witnessed when juxtaposing the Mozart

example with the first movement of Schubert's Piano Quintet D.667 in A Major ("Trout").

Following a lengthy introduction in mm. 1-24, Schubert begins P in m. 25 with a clear

prolongation of the tonic. Due to this clear articulation of the tonic at the beginning of P, we as

listeners are likely to expect (due to past assimilations using our Type 3 normative schema) that

the recapitulation will begin in the tonic as well. However, instead of setting up A major as the

tonic in the shift from the retransition to the recapitulatory P, he uses it functionally as a

dominant starting in m. 203, ultimately resulting in a PAC in D major (the subdominant of A

major) in mm. 209-210. Thus, we are left with a recapitulatory P (starting in m. 210) in the

subdominant, followed by a recapitulatory TR (starting in m. 236) that transposes back to the

tonic, just as in the previous Mozart example. Unlike its anomalous nature in the Mozart,

however, this was far from irregular for Schubert who, as will be discussed more extensively in Chapter 3, delighted in beginning his recapitulations in off-tonic keys, particularly the subdominant. As such, while off-tonic recapitulations are simple deformations in a late-eighteenth-century context, they become deformational norms in an early-nineteenth-century context due to their regularity.

Nevertheless, just as in the Mozart example, a listener without absolute pitch still might not find this off-tonic recapitulation to be perceptually salient. As such, in the context of an early-nineteenth-century sonata, the analyst should designate this formal feature as a deformational norm for the purposes of the interference ratio, even though this feature may or may not actually be perceptually salient to a listener. Presupposing that a listener is able to hear and process this off-tonic recapitulation as a deformational norm, a listener will assimilate this formal event into their deformationally normative schema given its consistency throughout Schubert's output. However, just as in the earlier Schubert example, it will only be able to be partially assimilated due to how ingrained off-tonic recapitulations are in a listener's mind as deformations in late-eighteenth-century contexts. While this partial assimilation will prevent any literal production of cognitive dissonance, it will once again result in a phenomenological state of ambivalence, as a listener attempts to reconcile the normative nature of the event in a nineteenth-century context with its anomalous nature in a late-eighteenth-century context.

Example 2.5. Schubert, Piano Quintet D.667 in A Major ("Trout"), mm. 24-35

Example 2.6. Schubert, Piano Quintet D.667 in A Major ("Trout"), mm. 207-219

While the aforementioned excerpts provide clear examples of isolated deformational norms and deformations in various pieces, formal interference itself can only be realized when looking at two or more formal features within the same given piece, as it is a *temporal* phenomenon occurring in real time. A clear example of what a listener may perceive to be interference at play can be found in the exposition of the first movement of Schubert's String Quartet D. 810 in D minor ("Death and the Maiden"). This movement's structure is quite unique for Schubert in that it embodies strikingly clear examples of both a three-key exposition with two MCs—a nineteenth-century deformational norm—yet the clearly articulated *nature* of each MC is very much a Type 3 late-eighteenth-century norm. In contrast to the latter, Schubert's typical deformational norm is to use a three-key exposition but to create much ambiguity as to where the real MCs lie. Furthermore, not only are the MCs clearly articulated harmonically and rhetorically, but there is only a single real MC candidate for each key, eliminating any possibility of ambiguity on behalf of a listener's perception. In the case of the first MC, m. 60 features a dramatic build-up in m. 58 leading to a viiº6/5 of V in III in m. 59, which leads to a III:HC in m. 60, followed by three beats of silence. Of course, m. 59 contains this same silence, but the diminished quality of this chord makes it aurally quite obvious that it is not any kind of cadence and thus not an MC.

Example 2.7. Schubert, String Quartet D.810 in D minor, first movement, mm. 53-65

The second MC is every bit as harmonically clear as (if not clearer than) the first one, with the fourth beat of m. 96 creating a Fr^{+6} chord that resolves to the dominant of the dominant (V/V), thereby resulting in a classic V:HC MC. Rhetorically, the rhythm of the subsequent measures reinforces this MC with only downbeat quarter notes in the bass and several beats of rest in the viola and cello parts in mm. 97-98 leading to complete silence in mm. 99-100 as Schubert prepares the commencement of TM^3.

Example 2.8. Schubert, String Quartet D.810 in D minor, first movement, mm. 93-100

A stylistically competent listener will surely hear and recognize mm. 60 and 97 as unequivocal MCs. As such, they will assimilate the first MC into their eighteenth-century Type 3 normative schema. On the other hand, the second MC is literally resulting in a third key, which is a deformational norm for Schubert. In other words, as Hepokoski and Darcy's theory clearly articulate, the mere presence of a second MC is inherently deformational. Thus, a listener will assimilate the second MC along with the three-key exposition it creates into their nineteenth-century deformationally normative schema. However, just as with all deformational norms, this formal event can only be *partially* assimilated into a schema, as there is still a part of a listener's experience that cannot fully accept it as a new norm, given how deeply they have encoded its anomalous nature into their memory from late-eighteenth-century works. In other words, a listener is likely grappling with two opposing thoughts with respect to this second MC: their late-

eighteenth-century normative schema is asking "What is this? It doesn't belong" while their deformationally normative schema is saying "This is completely normal."

Phenomenologically, the trimodular block represents the ultimate example of two formal schemas colliding with one another. Not only does this movement simply *contain* Type 3 norms and deformational norms, but in this instance the same formal feature—a single clearly articulated MC—is perceived and assimilated as a Type 3 norm in one context (i.e., the first iteration in m. 60) and a deformational norm in another (i.e., the second iteration in m. 97). Temporally, this example illustrates a schematic shift between a listener's Type 3 normative (the first MC) and deformationally normative (the second MC) schemas. This rapid shift from one formal schema to the other produces maximal cognitive dissonance and creates the experience of incoherence. That is, while the formal events themselves are coherent and able to be assimilated into schemas, the shift *between* these two schemas engenders the sensation of incoherence for a listener. Here lies yet another example of why taking a listener's cognitive perception—in addition to musical structure—is so critical for analysis and interpretation. Without knowledge of the first MC's existence, the analyst would have no hesitation in designating the second MC as a Type 3 norm. As such, analyzing works with regard to their *temporal unfolding* is essential for an interpretation that is informed by cognition, not just theory.

In summary, the above examples demonstrate the distinctions between norms and deformational norms. At the heart of this distinction is the historical context of the work and thus the set of expectations a stylistically competent listener has for the hearing at hand. In other words, what were unexpected deformations for Haydn and Mozart became expected deformational norms for Schubert and Brahms. More importantly, however, there are significant differences between deformations and deformational norms in terms of the *cognitive*

consequences each one causes for a listener. While deformations produce cognitive dissonance

for a listener as they cannot be assimilated into any type of schema, deformational norms *are*

assimilated into schemas and therefore reduce cognitive dissonance. However, they can only be

partially assimilated due to that fact that, phenomenologically, a listener still processes these

formal events as both norms *and* deformations, the latter of which cannot be assimilated.

Accordingly, while no literal cognitive dissonance arises for deformational norms, listeners do

experience a state of phenomenological ambivalence as they attempt to grapple with the

dichotomous nature of these formal events. Additionally, the final Schubert example illustrated

how the rapid shift between a listener's Type 3 normative and deformationally normative

schemas engenders maximal cognitive dissonance for a listener. Phenomenologically, this

schematic oscillation creates the experience of incoherence for a listener, as while the formal

events themselves are coherent the *shift* between two contradictory schemas is perceived as

incoherent. This oscillation will be described in much more detail in Chapter Three.

Finally, although not emphasized in this project, Schubert, Brahms, and other nineteenth-

century composers also begin to establish *new* norms altogether that did not originate as

deformations from a listener's earlier formed schema. However, due to the limitations of scope

for the purposes of this project, I have limited my discussion to strictly deformational norms.

While most of the examples offered in this section provided specific *isolated* examples of norms

and deformational norms from different pieces, formal interference is essentially a *temporal*

phenomenon that can only fully be elucidated when analyzing an entire movement from start to

finish. As such, the next chapter seeks to provide a clearer picture of this large-scale cognitive

phenomenon through an extended analysis of the first movement of Schubert's D.664 Piano

Sonata in A Major.

CHAPTER THREE: AN ANALYTICAL CASE STUDY OF THE FIRST MOVEMENT OF SCHUBERT'S PIANO SONATA D.664 IN A MAJOR

I.   Introduction to Gestalt Theory

The final Schubert D.810 example in the previous chapter raises a vital point about the role of context when analyzing formal interference. Although deformational norms deal with a simultaneous experience of two contradicting forces—norms and deformations—and thus are best accounted for by schema theory, formal interference is more concerned with the temporal oscillation a listener experiences *between* their normative and deformationally normative schemas, which schema theory alone cannot account for. As such, when examining the *interaction* of Type 3 normative and deformationally normative action spaces, we can discern what lies at the heart of formal interference: Gestalt theory, which emphasizes that the whole of anything is greater than the sum of its constituent parts. In other words, characteristics of the whole are not discernable from analysis of the parts in isolation, but rather only when they are working in tandem. Conversely, a complete picture of the whole itself is necessary for discerning what constitutes the identity of the parts. [53] In this sense, there is a sort of mutual symbiotic relationship between the individual parts and the whole in which each respective entity *relies* on the other for its perceptibility.

Below in Figures 3.1 and 3.2 are two images of the classic figure-ground example developed by Gestalt psychologists.[54] In Figure 3.1, if we focus on the black space, one can perceive two faces staring at one another, but if we focus on the white space, one can see what

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[53] For a survey of the literature on gestalt theory in the cognitive sciences, see Aveling (1939), Chang et al. (2007), Debmayla and Elhiali (2019), Denham and Winkler (2014), Dumitru and Joergensen (2016), Fischer (2012), Guberman (2017), Koffka (1922), Leman (1997), Lim et al. (2011), Rock and Palmer (1990), Sabar (2013), Silverstein and Uhlhaas (2004), Wagner-Moore (2004), and Wong (2010).
[54] Ibid.

appears to be some sort of chalice or vase. In Figure 3.2, if we focus more on the left side of the image, we see what appears to be a duck, but if we focus more on the right side of the image, we see what appears to be a rabbit. However, one finds that we can never fully attend to *both* the black space and white space or both the left and right side of the duck-rabbit image concurrently, as the limitations of our human perception and cognition force us to organize stimuli into figure-ground relations.

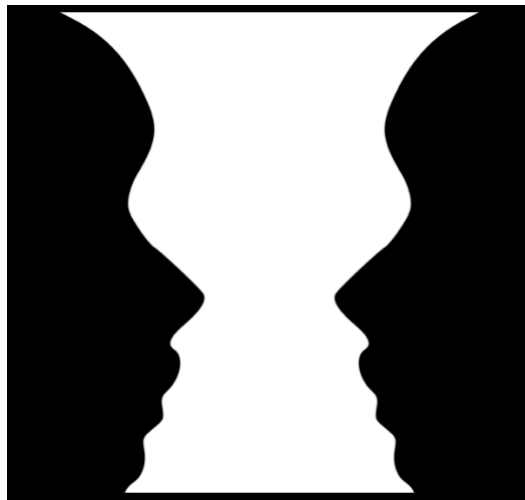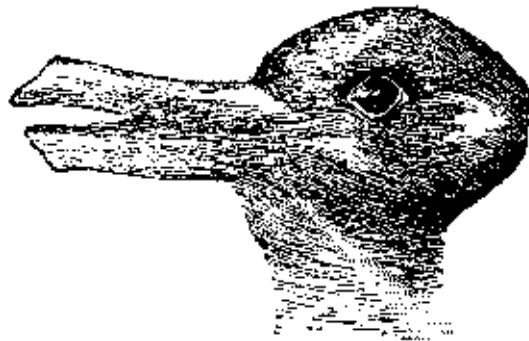**Figure 3.1.** "Face-vase" figure-ground image illustrating the Gestalt analogy.

Figure 3.2. "Duck-rabbit" figure-ground image illustrating the Gestalt analogy.

Similar to schema theory, prior music-theoretical work on Gestalt perception has often

focused on micro-level musical elements such as rhythm and meter.[55] Yet, just as in schema theory, it is *crucial* to our understanding of large-scale formal relationships as well. This figure-ground metaphor becomes especially critical when listening to an entire Type 3 sonata movement from start to finish, as a listener's perceptual focus *oscillates* assimilations between their Type 3 normative and deformationally normative schemas. Thus, in my account, a schema is analogous to a gestalt image.   As such, *within* each gestalt image, the perception of simple deformations can result in the break-down of the figure-ground relation (resulting in minimal cognitive dissonance as noted earlier), but the perception of *interference* only arises between two different gestalt images themselves.

The rationale behind my usage of two gestalt images rather than one is that each individual formal event in a work implicates its larger zone as a whole. For example, the presence of an MC (the "part") enables a listener to determine that the larger zone it partakes in is TR (the "whole"); conversely, we only hear an individual event as an MC based on our understanding that it takes place as *part* of a larger TR. Furthermore, I argue interference takes place at the precise moment of transition from the end of one zone to the start of the next. Due to this abrupt transition, two gestalt images are necessary to account for the jarring mental shift a listener experiences from one set of norms to another. In contrast, in a single gestalt image, the shift from one perception to another is not quite as rigid, as they both collectively make up a singular "whole," whereas two gestalt images make up two different wholes.

Importantly, my use of two gestalt images is not at all meant to imply that Type 3 norms and deformational norms are necessarily "opposites" of each other, but rather that they are distinct enough that we cannot assimilate a zone as being *both* Type 3 normative and

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[55] For example, see Lerdahl and Jackendoff's *A Generative Theory of Tonal Music* (1983), in which they use the Gestalt metaphor to theorize grouping relationships for rhythmic patterns.

deformationally normative, but instead can only assimilate it as being one or the other. As such,

in Figure 3.3, the classic face-vase gestalt image represents a listener's Type 3 normative schema

and is *juxtaposed* next to the duck-rabbit gestalt that represents a listener's deformationally

normative schema. As one can observe visually, we can never fully attend to both gestalt images

at once, but instead have to choose one to organize our perceptual experience. Accordingly,

these two gestalt images visually illustrate how a stylistically competent listener processes each

respective formal feature of a given sonata, they will *either* assimilate the zone as Type 3

normative *or* deformationally normative, but never both at the same time. In other words, while

their perceptual focus is constantly shifting back and forth between these two schemas as

different sets of norms alternate with one another, they are never fully activated *simultaneously*

due to the inherently distinct nature of these two different sets of norms. Of course, it is clearly

possible that a hypothetical listener with *a different* stylistic competency might have a *singular*

all-encompassing schema (for example, just a Type 3 normative schema if they've never heard

encountered Schubert sonatas) in which there is only one gestalt image dictating their

experience. However, for the purposes of this thesis, I am simply arguing for the possibility that

a listener with competency in *both* Type 3 norms and Schubert's deformational norms can

experience formal interference, and that the use of multiple gestalt images represent this idea.

The goal of this chapter is to demonstrate how the temporal phenomenon of

formal interference manifests itself across the span of an entire movement. To help elucidate this

large-scale process, Section 3.2 takes the general discussion of gestalt theory above and provides

further explication of the gestalt-based nature of formal interference. In Section 3.3, I present

musical examples of Schubert's most common deformational norms to set the stage for Section

3.4, which features an extended analysis of the first movement Schubert's Piano D.664 in A

Major to illustrate how formal interference unfolds across an entire movement.   Although this work might first appear to be one of Schubert's least striking sonata-form movements, it nonetheless illustrates maximum interference precisely because unlike his other works, it goes to great lengths to invoke the stylistic norms of a Type 3 sonata of a "bygone era" (i.e., the late-eighteenth century) for Schubert's generation, which consequently give this movement's P-zone theme a feeling of "innocence." Throughout this analysis, I argue that the use of interference in the first movement of D. 664 represents a battle between the "innocent" norms of the Type 3 sonata (signifying a "bygone era") and Schubert's own deformational norms. Although technically only two adjacent action spaces are needed for interference to arise, this analysis seeks to demonstrate how the in-time layout of multiple action spaces can significantly vary the *accumulative* effects of cognitive dissonance a listener experiences. More specifically, these accumulative effects refer to consecutive zones of the same type (Type 3 normative or deformationally normative) that create increase the expectation that an action space of the same type will follow. Due to this expectation, however, once a listener encounters a zone of the other type, their expectation is denied and they therefore experience even greater cognitive dissonance than occurs in a shift from one singular zone type to another. Using the first movement of Schubert's Piano Sonata D.664 as a case study, I seek to illustrate how these accumulative effects manifest musically.

II.   The Gestalt-Based Nature of Formal Interference

In the previous section, I argued that formal interference is engendered by the oscillation from one type of formal gestalt (Type 3 normative or deformationally normative) to another. Critically, from a phenomenological perspective, the oscillation between two gestalts creates the

experience of incoherence, but that the gestalts themselves are not inherently incoherent. In other words, when focusing on each gestalt in isolation, a listener perceives each one as intelligible, but when oscillating their focus back and forth from one to the other, they perceive this experience as disjointed. Cognitively, experiencing this incoherence between two oscillating gestalts results in cognitive dissonance—a state of psychological discomfort that is engendered by the processing of two opposing cognitions[56]—as there is no one single gestalt (i.e., schema) a listener can rely on to guide their perceptual focus. As a means of attempting to resolve this cognitive dissonance, a listener will constantly search for the predominance of one schema over the other to guide their set of expectations, but in a work with incessant schematic oscillations, this resolution can never fully come to fruition.
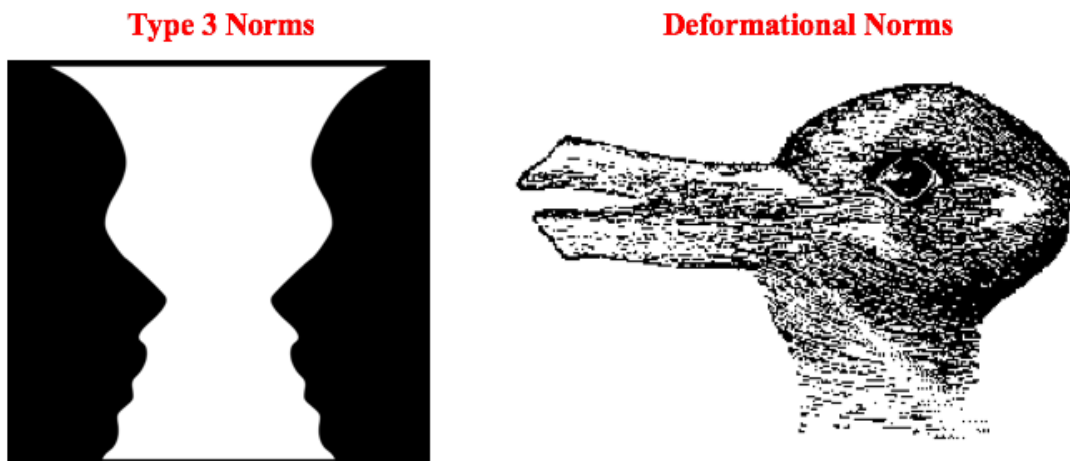

Figure 3.3. Juxtaposition of figure-ground gestalts that illustrates the cognitive relationship between Type 3 norms, deformational norms, and deformations.

An analogy to this gestalt conflict can be seen in the work of educational psychologists

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[56] For a survey of the literature on cognitive dissonance, see Acharya et al. (2018), Aronson (1962), Buckley (2015), Cancino-Montecinos et al. (2020), Cooper (2019), Egan et al. (2007), Festinger and Carlsmith (1959), Fischer et al. (2008), Harmon-Jones and Mills (2019), Telci et al. (2011), Vaidis and Bran (2014), and Yahya and Sukmayadi (2020).

Paul Gorsky and Menahem Finegold, who have found that when being taught the concept of force in a science classroom, students shift between two different gestalts: 1) a pre-scientific explanatory framework based on intuition and emotion, and 2) a scientific explanatory framework based on prior and new knowledge. By measuring students' levels of cognitive dissonance repeatedly throughout each trial, they found that the teaching of force using scientific terms resulted in significantly heightened levels of cognitive dissonance, especially when these scientific explanations contradicted their pre-scientific (emotional) understanding. Thus, they concluded that it is ultimately the *shift* from pre-scientific to scientific gestalts that engenders this cognitive dissonance.[57] Relating this analogy to formal interference, I hypothesize that it is the shift from one *formal* gestalt to another—in this case, the end of a Type 3 normative zone to the start of a deformationally normative zone (or vice versa)—that gives rise to cognitive dissonance for a listener. As in the aforementioned analogy, I argue that *maximal* interference takes place between the oscillation of Type 3 norms and deformational norms (as opposed to two different sets of norms) due to the inherently contradictory nature of these opposing norms.

In this section, I have drawn upon theories of Gestalt perception to illustrate how the limits of human perception and cognition force us to assimilate each action space as only embodying one type of schema or the other. As one might imagine, the invocation of this Gestalt-based metaphor between multiple zones has its most significant cognitive implications on a larger scale when applied to a full-length movement, as the in-time layout of zones results in varying *accumulative* effects based on their ordering. For example, take the accumulation of three normative zones followed by a deformationally normative zone (i.e., N-N-N-D) compared to the shift from a singular normative zone to a deformationally normative zone (i.e., N-D). The

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[57] Gorsky and Finegold (1994).

first instance of interference will produce far greater cognitive dissonance than the second, as a listener starts to build increasingly stronger expectation of normative zones which is completely denied by the fourth zone, whereas a weaker expectation of normative zones is built in the second instance, thereby producing less cognitive dissonance. Accordingly, in the following section, I provide a detailed discussion of Schubert's most commonly used deformational norms in preparation for Section 3.4, where I seek to demonstrate how these large-scale accumulative effects of interference unfold over the course of Schubert's Piano Sonata D. 664 in A Major.

III.   Schubert's Most Commonly Used Deformational Norms

In the previous section, I emphasized the crucial role of the Gestalt metaphor in works that are perceived to embody formal interference, specifically in its relation to a listener's shifting perceptual focus from a Type 3 norm to a deformational norm. In other words, a listener can jump back and forth between their Type 3 normative and deformationally normative schema, but they *cannot* activate them *both* at the same time—that is, one cannot perceive a formal feature as *both* a Type 3 norm and deformational norm simultaneously. For example, one cannot process a given exposition as being both a 2-key (normative) and 3-key (deformationally normative) exposition simultaneously. While there is certainly a great deal of retrospective reinterpretation[58] involved before a listener fully assimilates the exposition as a trimodular block, once the exposition type is determined, it is assimilated into *either* their Type 3 normative or deformationally normative schema, not both. As such, through examining specific musical examples of Schubert's most commonly used deformational norms, the overall goal of this section is to elucidate how the analyst is to go about distinguishing them from Type 3 norms and

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[58] I am adopting the concept of retrospective reinterpretation as it is discussed in Schmalfeldt (2011).

simple deformations, in preparation for my extended analysis of the first movement of

Schubert's Piano Sonata in A Major D. 664 in Section 3.4.

Between consulting Gordon Sly's "Schubert's Innovations in Sonata Form:

Compositional Logic and Structural Interpretation"[59] and my own analysis of the first

movements of Schubert's 20 piano sonatas and 15 string quartets, I have identified ten primary

deformational norms with regards to Schubert's sonata-form works. While this is certainly not

an exhaustive list, it is representative of the most prevalent features in Schubert's sonatas: 1)

three-key exposition, 2) excessive chromaticism that destabilizes the establishment of tonic in

the P zone, 3) "de-energizing" TR zone, 4) an implicit MC that is not clearly articulated, 5)

blurry division between the end of TR and beginning of S, 6) resistance of the dominant in the

TR, S, and C zones[60], 7) the absence of rotational form in the development, 8) episodic

interpolation in the development (this was an inconsistent deformation in the eighteenth-century

and became a nineteenth-century deformational norm for Schubert), 9) fuzzy division between

the end of the development and beginning of the recapitulation, and 10) an off-tonic beginning to

the recapitulation. By analyzing examples of these deformational norms, we can gain

preliminary knowledge of how to detect them in Schubert's works so that we can eventually

study how they interact with Type 3 norms to produce formal interference in Section 3.4.

The first main deformational norm employed by Schubert is his use of the three-key

exposition (or what Hepokoski and Darcy refer to as a "trimodular block"). A clear example of a

classic Schubertian three-key exposition can be found in the first movement of Schubert's String

Quartet D.810 in D minor ("Death and the Maiden"), the same piece that Examples 2.7 and 2.8

explored earlier with regards to its MC candidates. The general formal structure of the

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[59] Sly (2001, 119).
[60] Webster (1968, 18-19).

exposition is illustrated in the chart below, creating a 5:4 interference ratio between Type 3 norms and nineteenth-century deformational norms. As Figure 3.3 indicates, when dealing with a trimodular block, the mere presence of zones involved in the formation of the block (TM1, TM2, TM3, and MC2) creates what are inherently deformational norms, despite how normatively they might be articulated. For instance, in the case of D.810, and as alluded to in Section 2.3, MC2 is every bit as clearly articulated as MC1, yet its presence is deformational by default for the Type 3 sonata in light of Hepokoski and Darcy's theory. Furthermore, trimodular block zones are themselves inherently deformational as, from a *cognitive* standpoint, a listener has no way to pinpoint *which* of the three blocks is the "extra" deformational one, and thus a listener views them all as part of a deformed two-part exposition.

Measure	Zone/ Element	Key Area	Type 3 Norm/Deformation or Deformational Norm
1	P	I	Type 3 norm/deformation
41	TR		Type 3 norm/deformation
60	MC1	III:HC	Type 3 norm/deformation
61	TM^1	III	Deformational norm: Trimodular block zones are inherently deformational norms
83	TM^2/TR^2		Deformational norm: Trimodular block zones are inherently deformational norms
97	MC2	V:HC	Deformational norm: The presence of this second MC is inherently a deformational norm (despite its clear articulation)
102	TM^3	V	Deformational norm: Trimodular block zones are inherently deformational norms
133	EEC	v:PAC	Type 3 norm/deformation
133	C		Type 3 norm/deformation

Figure 3.3. Chart illustrating the expositional layout of Schubert's String Quartet D.810

Now that we have established the three-key exposition as the primary large-scale

deformational norm for Schubert, let us zoom in to individual action spaces to acquire a more specific sense of how Schubert's deformational norms function in each zone. Schubert's second deformational norm is to start in the tonic but immediately destabilize the tonic shortly thereafter via extensive chromaticism *within* one or more formal functions. A clear example of this Schubertian deformational norm can be found in the first movement of his Piano Sonata D.575 in B Major. In this movement, Schubert begins P with a sentence phrase structure that clearly establishes the tonic of B Major in the presentation, but immediately destabilizes the tonic in the continuation with a V^7/ii on the upbeat to m. 3, which is followed by extensive chromaticism through m. 5. Of course, he eventually arrives back to the tonic via a I:PAC on beats two and three of m. 5, but this in no way undermines the aural impact that this tonic destabilization has for a listener this early on in the P zone. As such, the analyst should designate any similar instance of tonic destabilization found *early* within a formal function of the P zone as deformationally normative.

Example 3.1. Schubert, Piano Sonata D.575 in B Major, first movement, mm. 1-6

Schubert's third deformational norm occurs in the TR zone, where he creates a sort of rhetorical "de-energization" that is antithetical to the "energizing" rhetorical function of TR in a prototypical late-eighteenth-century Type 3 sonata. A clear example of this "de-energizing" TR

was found earlier in Example 2.2, but another quintessential example can be found in the first movement of Schubert's Piano Sonata D. 617 in B♭ Major. In this work, the TR begins in m. 20 with a strong *forte* dynamic marking followed by a *piano* marking in m. 22, and this same forte-piano pattern recurs in mm. 24-26. Following the second iteration, however, Schubert softens the dynamic even further to *pianissimo* in m. 27 and *pianississimo* in m. 29. Additionally, he limits the right hand to octave-alternating triplets of the same pitch as a means of "de-densifying" the texture. If that was not already enough, Schubert goes on to lower the dynamic even more with a *diminuendo* in m. 31 and drops the left hand out entirely after the downbeat of the same measure. In other words, within the span of a single zone, Schubert has taken us all the way from *forte* to *pianissimo* followed by a *diminuendo*—the exact rhetorical opposite of the "energizing" TR one is likely to find in a Type 3 sonata by Mozart, Haydn, or early Beethoven.

Example 3.2. Schubert, Piano Sonata D.617 for Four Hands, first movement, mm. 24-35.

In addition to this "de-energization", the fourth deformational norm Schubert employs profusely in his TR zones is an ambiguous MC that is not clearly articulated. It is critical to note that this description is left intentionally broad as there is no single most common way in which Schubert ambiguates his MCs. Instead this deformational norm appears in a variety of ways, including multiple MC candidates in which only one ultimately materializes as the true MC, one MC candidate that is weakly articulated, or no perceptible MC candidate at all (while still creating a two-part exposition indicative of the Type 3 sonata). An example of the third option can be found in the first movement of Schubert's Piano Sonata D. 566 in E minor, in which there is no clearly articulated MC providing the necessary tonal or rhetorical break from the preceding material. Instead, he uses an extended cadential 6/4 in m. 16 to establish III (G major) as the key of S starting on the downbeat of m. 17, but no rhetorical pause on the half cadence—a crucial MC component—ever arrives. While one could argue that this is a MC with caesura fill, the quite perceptually salient chordal seventh on the third beat of m. 16 helps to further bring the ambiguity to the foreground as it strongly rules against hearing m. 16 as a half cadence. Furthermore, while the cadential 6/4 suggests the imminent arrival of the MC, there are no *rhetorical* elements, such as energy gains, dominant locks, and so forth, preceding m. 16 that signal an MC is imminent. Consequently, no rhetorical pause—a crucial MC component—ever arrives. As such, whenever an analyst comes across such an instance or one of the other two commonly used options mentioned earlier, any kind of MC that is not clearly articulated justifies a designation of the TR zone as deformationally normative.

Additionally, since the final chord of the aforementioned "cadence" is also the first chord in the opening phrase of S, this isn't really a cadence in a strict sense, as the G major chord on the downbeat of m. 17 is harmonically functioning more prominently as the start

of S than it is a conclusion of TR. This harmonic function is only bolstered by the slur beginning

on the downbeat of m. 17, indicating that the opening phrase of S starts precisely on the

downbeat.   In other words, Schubert's elision of a clear-cut MC blurs the line between the end

of TR and the start of S, which brings us to the fifth most common deformational norm used in

Schubertian sonatas. While a listener certainly does not expect this blurry division between TR

and S in a late-eighteenth-century Type 3 sonata, they most likely expect to hear it as a

deformational norm in the context of a sonata by Schubert. Accordingly, for any similar instance

where the division between TR and S is blurred, the analyst should designate *both* zones as

deformationally normative, as both zones are involved and required for the perception of this

deformational norm and thus must be accounted for analytically.

Crucially, however, the presence of one of these deformational norms in no

Way guarantees the presence of the other, and thus the analyst must account for each on an

individual basis.   For example, in the first movement of Schubert's Symphony No. 2 in B♭

Major, D. 125 there is one potential ii:HC MC candidate in mm. 47-48 that is followed not by a

confirmative S zone but rather an MC decline and continuation of TR. In this continuation, a

listener expects for the real MC to be articulated but no potential MC candidate ever presents

itself. Instead, Schubert uses mm. 49-79 to wander aimlessly into a surprisingly clear onset of S

in m. 80, creating a clear division between TR and S. Thus, this example illustrates how the two

deformational norms at hand—an ambiguous MC and a blurry division between TR and S—can

very much be independent of one another.

Example 3.3. Schubert Piano Sonata D.566 in E minor, first movement, mm. 10-19

Next, let us move to the S and C zones, where Schubert arguably deploys his sixth and perhaps most common deformational norm—an aversion to the dominant.[61] Although many examples of this deformational norm have been seen earlier (though not necessarily explicitly noted), an especially clear example of this aversion can be found in the secondo part of the first movement of Schubert's Piano Sonata D.617 in B♭ Major for Four Hands. With a clearly articulated EEC in mm. 52-53, one has a strong aural expectation for the confirmation of V (F major) to follow in the closing zone (C). However, while Schubert begins C in V, he quickly diverts away from this key by the third beat of m. 54, where he uses a D7 chord to begin a tonicization of ii (G minor) that carries through m. 59 before finally returning to V on the

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[61] Ibid.

downbeat of m. 61. In other words, Schubert's deformational norm in the S and C zones is to tonicize "off-dominant" keys in order to depolarize the tonic-dominant relationship that is very much a norm prototypical of the late-eighteenth-century Type 3 sonata.

Example 3.4. Schubert's Piano Sonata D.617 for Four Hands, first movement, mm. 52-67.

Moving to the development, Schubert's seventh and eighth most common deformational norms include the lack of any resemblance of rotational form as well as at least one episodic interpolation—that is, new thematic material that was not heard previously in the exposition. As for the former, although the rotational principle has been one of Hepokoski and Darcy's most contentious ideas, [62] between the first movements of Schubert's 20 piano sonatas and 15 string quartets, 15/35 (42.9%) feature some type or subtype of rotational form, while the remaining 20/35 (57.1%) completely avoid or even contradict the rotational principle.[63] Both of these deformational norms can be found in the development of the first movement of Schubert's Piano Sonata D. 575 in B Major. While Schubert begins this development with fragments of P stated in B *minor* in mm. 61-63, he immediately interpolates episodic material beginning in m. 59 (see Example 3.5) using a flurry of modulations through the last bar of the development in m. 89 (see Example 3.6). In other words, Schubert teases listeners with an expectation that there will be rotational form due to the return of P material in the first few bars of the development only to follow this anticipated rotation with nothing but new episodic material that is foreign to listeners.

As such, while this example demonstrates Schubert's two most common deformational norms for his developments, crucially, this does not necessarily guarantee that the presence of one entails the presence of the other. In other words, Schubert can use a lack of rotation without

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[62] Hepokoski (2020, 26-28). Although the rotational principle has widely been disputed over since the publication of *Elements* in 2006, in Hepokoski's *A Sonata Theory Handbook* (2020), he addresses these criticisms (among others) extensively. Namely, he clarifies the broad nature of the rotational principle, noting that there need not be all expositional zones present in the development to constitute rotational form. Furthermore, he offers examples of the many rotational type possibilities (P-TR, TR-S, S-C, etc.). As such, in my analyses of Schubert's 20 piano sonata and 15 string quartet first movements, I designated *any* type of rotational form designated by Hepokoski and Darcy as being a norm, and anything that avoided or contradicted rotational form (as is the case in D.664) as being a deformational norm.

[63] See Appendix B for a raw data table used to generate these statistical values.

inserting any episodic interpolations in the same way that he can use episodic interpolations while following a rotational form. Nevertheless, I would designate this preparation zone as normative due to its return of P material and the developmental core as deformationally normative due to its episodic interpolation.

Example 3.5. Schubert's Piano Sonata D.575 in B Major, first movement, mm. 61-70

Finally, Schubert's ninth and tenth most common deformational norms occur at the end of the development and the start of the recapitulation. Namely, Schubert's two main deformational norms here are to 1) blur the line between the end of the developmental retransition and beginning of the recapitulatory P, and 2) to start the recapitulatory P in an off-tonic key. As for the second one, although this is not Schubert's absolute most common deformational norm, between the first movements of his 20 piano sonatas and 15 string quartets, 12/35 (34.3%) feature off-tonic beginnings to the recapitulation.[64]

Both deformational norms are found in the first movement of Schubert's Piano Sonata D. 575 in B Major. Schubert begins his retransition in m. 81 by modulating back to the tonic of B

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[64] See Appendix B for a raw data table used to generate these statistical values.

major. Although the thematic content is still novel, episodic material that is a continuation of the preceding episodic material can be heard in the developmental core. In this RT, Schubert very clearly establishes B major as the new key, reaching a clearly articulated I:PAC in mm. 87-88. Seemingly out of nowhere, however, he begins the start of the recapitulatory P on the pickup to m. 89 in the subdominant key of E major—an off-tonic key that clearly represents Schubert's deformational norm. Furthermore, this return of P is preceded by no literal or rhetorical break as one would find in most late-eighteenth-century Type 3 sonatas. As such, due to the lack of any literal or rhetorical pause break prior to this return of P as well as the off-tonic key in which it is articulated, it becomes ambiguous to a listener whether this is truly the start of the recapitulation or merely a "false" start to the recapitulation, especially in light of the tease of P listeners heard earlier in the preparation zone.

As such, any sonata with a similarly ambiguous division between the end of the development and beginning of the recapitulation results in a designation of both the retransition and recapitulatory P as deformationally normative given that both zones must be involved to result in the perception of this deformational norm. Additionally, any similar instance of an off-tonic beginning of the recapitulation qualifies for a designation of the recapitulatory P as being deformationally normative as well. However, just as in the previous pairing of deformational norms in Example 3.5, the presence of one of these deformational norms does not in any way guarantee the presence of the other. In other words, there can be an ambiguous division between the end of the development and start of the recapitulation while the recapitulatory P starts in the tonic. Conversely, there can be a clearly articulated division between the end of the development and beginning of the recapitulation with a recapitulatory P that starts in an off-tonic key.

Nonetheless, both types of deformational norms can coexist within the same given sonata, as seen below in Example 3.6.

Example 3.6. Schubert's Piano Sonata D.575 in B Major, first movement, mm. 80-90

Beyond the recapitulatory P, Schubert's deformational norms in the expositional action spaces can also be found in their recapitulatory iterations, with one exception: Schubert's "aversion" to the dominant is not found in the recapitulatory S or C zone for the simple fact that the recapitulation's tonal function is to reestablish the tonic key. Additionally, there is no three-key framework found in any of Schubert's recapitulations, but rather a generally strong prolongation of the tonic. In this regard, Schubert's recapitulations are generally quite similar to Type 3 recapitulations of the late-eighteenth-century. Nevertheless, Schubert's other expositional deformational norms—destabilization of the tonic in P via chromaticism, "de-energizing" TR, and blurry division between TR and S—can all be found in his recapitulations as

frequently as in his expositions. As a general rule of thumb, if one of the aforementioned deformational norms is found in a given Schubertian exposition, the same deformational norm is likely to be found in the recapitulation as well.

In this section, I have described ten of Schubert's most common deformational norms for his Type 3 sonatas. In addition, I provided examples as a means of demonstrating how an analyst might go about determining whether a given formal feature constitutes a deformational norm for Schubert or not. Now that this section has established the most common Schubertian deformational norms, the next section will use an extended analysis of the first movement of Schubert's Piano Sonata D.664 to give more attention to the precise means by which interference is produced between sections in real time. The overall goal of this section is to illustrate the *large-scale* oscillations and varying accumulative effects of cognitive dissonance produced between two gestalts that occur across a full-length movement, as the full extent of the gestalt analogy described earlier cannot be realized without analyzing a single piece from start to finish.

IV.   Analytical Case Study: The First Movement ("Allegro Moderato") of Schubert's Piano Sonata D.664 in A Major

As alluded to in the previous section, I will be using Schubert's "Allegro Moderato" from Piano Sonata D.664 in A Major as a case study because it exemplifies an instance of what a stylistically competent listener perceives as maximal interference. In doing so, I will also draw reference to the interference ratio, but it must be stated from the onset that the overarching goal of this analysis is *not* to emphasize this ratio but rather to show how a ratio can both align with and contradict the actual cognitive experience of a listener. In other words, I aim to illustrate not only *how* the analyst is to go about designating zones as normative versus deformationally normative but also how these different types of zones *interact* to produce the cognitive

phenomenon of formal interference. In doing so, it will hopefully become apparent that it is not only the mere *presence* of deformationally normative zones but also their respective *placement* in relation to other zones (both normative and deformationally normative) that shape a listener's cognitive experience.

By my calculations, between Type 3 norms/deformations and Schubert's deformational norms, this work contains an approximate 6:6 (i.e., 1:1) formal-interferential ratio, as illustrated by the chart in Figure 3.1. To reiterate, though, the ratio generated by formal interference should be used exclusively for statistically-based corpus studies, and thus we should not at all assume that a listener—even the most stylistically competent one—will be able to gauge such a ratio on based on an in-time listening alone. Instead, the ratio represents an attempt to objectify the subjective nature of a listener's schematic organization between norms and deformational norms in an atemporal manner. Accordingly, in terms of the interference ratio, a zone can only be designated as Type 3 normative or deformationally normative. As such, cognitive theories such as schema theory, cognitive dissonance theory, and Gestalt theory should be incorporated in our analysis of the interference ratios to give us insights into how a listener might actually perceive a work as it unfolds in real time.

Action-Space	'Normative' or 'Deformationally Normative'
Exposition: P (mm. 1-20)	Normative
Exposition: TR (mm. 20-24)	Deformationally Normative: Ambiguous end to zone; lack of energy gain; ambiguous MC
Exposition: S (mm. 21-39)	Deformationally Normative: Ambiguous start to zone; ambiguous MC
Exposition: C (mm. 40-47)	Normative
Development: Preparation Zone (mm. 48-57)	Normative
Development: Developmental Core (mm. 57-65)	Deformationally Normative: episodic interpolation
Development: Retransition (mm. 65-79)	Deformationally Normative: lack of rotation

Recapitulation: P (mm. 80-99)	Normative
Recapitulation: TR (mm. 99-103)	Deformationally Normative: Ambiguous ending to zone; lack of energy gain; ambiguous MC
Recapitulation: S (mm. 100-112)	Deformationally Normative: Ambiguous start to zone; ambiguous MC
Recapitulation: C (mm. 112-126)	Normative
Coda (mm. 127-130)	Normative

Figure 3.3. A chart designating each zone as 'normative' or 'deformationally normative' in Schubert's "Allegro Moderato" from Piano Sonata D.664 in A Major.

Before continuing, there are two caveats to make regarding the following analysis. The first point concerns the subjective nature of schemas that listeners construct for Type 3 norms and deformational norms (or any set of norms, for that matter). While my own personal experience with the first movement of Schubert's Piano Sonata D.664 in A Major (as an analyst, listener, and performer) has been one full of jarring surprises, another listener's schemas might perceive this work as sounding quite normative. In addition, it also must be restated that while this thesis is *primarily* interested in the modern-day listener, there are certainly historical precedents to the theory of formal interference. Accordingly, while this work contains, for example, no jarring "purple patches"[65] or deformational norms that one encounters in Schubert's more well-known sonatas, I argue there are *enough* deformational norms present in this work to constitute a prime example of formal interference from *at least* a historical perspective (and for at least some modern-day listeners as well). Accordingly, while some modern-day listeners might perceive this work as a mere "Classical-sounding" sonata by Schubert (as opposed to a

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[65] See Ludwig (2013, 31), who defines a "purple patch" as a "modulation to an unexpected area—a practice that became especially commonplace in the early Romantic period."

more "Romantic-sounding" one), a historical listener who has constructed schemas for Type 3 norms and deformational norms would surely find this movement to be out of the ordinary in relation to their knowledge of Schubert's other output.

In order to examine how this interference unfolds, let us begin with the expositional P. As mentioned in the previous section, the primary deformational norm Schubert uses in this action-space is to destabilize the tonic a few bars into the zone, often starting in the tonic but immediately modulating to a distant key within the first few measures of the zone (this always occurs *within* one or more formal functions in the zone). However, that is far from the case for this P: there is a generally clear sense of diatonic stability from start to finish of its small ternary structure, resulting in a sense of simplicity and "innocence." That is not to say that this action space is entirely vacant of chromaticism—indeed, there are several non-diatonic notes and chords present. In fact, the B section of this small ternary form goes as far as to tonicize the relative minor, suggesting that Schubert's deformational norms are already beginning to interject—and thus interfere—with this "innocent" diatonic stability. However, this chromatic destabilization occurs *between*—not *within*—formal functions. Additionally, following this brief destabilization, the music quickly returns to and reaffirms the stabilization of the tonic in the A' section, clearly resisting the urge to fully destabilize the tonic. As a result of this chromatic resistance and overall diatonic stability, I have designated this zone as Type 3 'normative' as seen in Figure 3.1. As such, a stylistically competent listener will likely perceive and assimilate this zone into their Type 3 normative schema due to the lack of any legitimate deformational norms. In terms of Gestalt perception, while a listener has now initially oriented their perceptual focus to their Type 3 schema, this focus will change a multitude of times by the end of the work.

Example 3.7. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 1-20

   Regarding TR itself, however, it is somewhat formally ambiguous as to where the MC occurs. The only plausible candidate appears in m. 24, which is preceded by no form of energy gain, but this deenergizing TR is very much in keeping with Schubert's deformational norm. While there is rhythmically no literal pause that seems to suggest an MC in m. 24 (with the exception of the eighth-rest on the fourth beat of the measure), this candidate harmonically features a I:HC, which is a common option for relatively smaller-scale Type 3 sonatas in the eighteenth century in which Schubert seems to be in dialogue. Structurally, the ordering of this

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MC in relation to the TR also makes sense. According to Hepokoski and Darcy, the TR must precede and therefore *lead to* an MC,[66] which this MC candidate allows for if one is to retrospectively reinterpret mm. 20-24 as the TR.   However, I:HC MCs (as opposed to V:HCs) are often used to "signal" lighter, less complicated works. Thus, the fact that what seems to be the only MC candidate is based on a I:HC creates a schematic expectation that the subsequent material will be predominantly Type 3 normative, and thus causes a listener to metaphorically anticipate their focus to be on the Type 3 normative "white space" of the Gestalt figure-ground image back in Figures 3.1 or 3.2. As we will see, however, although the P material of this movement is quite simple, the developmental material is quite complex harmonically. Additionally, this lack of a V:HC also clearly illustrates an aversion to the dominant, yet another one of Schubert's deformational norms.[67]

As such, between the ambiguous MC candidate and Schubert's aversion to the dominant (due to the lack of a V:HC MC), these are all preliminary signs that Schubert's deformational norms are starting to clash with late-eighteenth-century Type 3 norms. Accordingly, I have designated TR is the first 'deformationally normative' action-space in the work as seen in Figure 3.1. Structurally, this zone is significant in creating a 1:1 ratio, creating the first interaction between normative and deformationally normative zones, and thereby indicating the first signs of formal interference. Cognitively, a listener has now fully activated both their Type 3 normative and deformationally normative schemas, preventing them from being able to predict/expect what is to come in the subsequent zones. Phenomenologically, Schubert's invocation of his deformational norms in the TR make it clear that a battle has begun between the "innocent"

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[66] Ibid.

[67] Webster (1968, 18-19). Webster describes Schubert's resistance to the dominant as one of his most frequently recurring strategies in his sonata-form works.

eighteenth-century Type 3 norms of a "bygone era" and his own deformational norms which, as we will see, only heighten throughout the work. Innocence, in this context, refers to Schubert's clear reliance on historically simple precedents, such as his usage of a small ternary phrase structure in the P zone, I:HC MC candidate in the TR zone, and so forth.

Example 3.8. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 16-24

The ambiguity created by the MC candidate in m. 24 has significant implications for how we interpret the end of TR and the beginning of S. Although unorthodox, one could argue that mm. 21-24 serve a dual role as both TR and S zones while mm. 25-33 constitute the *exclusive* S zone. In other words, due to the clear I:PAC ending of P followed by a pause in m. 19-20, a listener may initially perceive mm. 21-24 as S, but when mm. 23-24 cancel out the "S-ness" of this phrase by repeating the rhetorical question posed in mm. 21-22 instead of answering it, a listener *retrospectively reinterprets* mm. 21-24 as TR. This retrospective reinterpretation is only strengthened following the I:HC MC in m. 24, which is a much more common default for an MC in type 3 sonatas. As stated earlier, however, one of the hallmarks of the eighteenth-century sonata is the clear delineation of distinct zones. Thus, this retrospective reinterpretation that

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occurs between TR and S is one of the most profound ways in which this work deviates from the distinct zones proposed by Hepokoski and Darcy's theory, and is perhaps one of the most striking ways in which it is clear Schubert's own deformational norms are interfering with an attempt at modeling this sonata in the style of the eighteenth century.

Up to this point, a listener has already had to jump back and forth between their Type 3 normative and deformationally schemas, and thus cognitive dissonance has already ensued within the first few zones. Furthermore, the particular magnitude of this interaction is especially jarring, given that one of the deformational norms in question—an ambiguous MC candidate— impacts not one but *two* adjacent zones, impairing one's ability to distinguish between the end of TR and the start of S. Accordingly, it can reasonably be assumed that a listener will experience twice as much cognitive dissonance for these two back-to-back deformationally normative zones, as this ordering calls for a double activation of their deformationally normative schemas. As such, a listener realizes that what they initially perceived as an innocent character in the P zone is now starting to transform into a more devious one as their schematic oscillation persists.

Zone	P	TR/S*	S**	C
Exposition Measures	1-20	21-24	25-33	33-47
Recapitulation Measures	79-99	100-103	104-112	112-126

*dual TR/S zone; **exclusive S zone

Figure 3.4. A chart illustrating the formal layout of the exposition and recapitulation.

In stark contrast to the ambiguous overlapping of TR and S, C returns to the 'normative' formal procedures first established in P. Although a listener is sure to find the modal mixture in mm. 34-36 striking to say the least, this use of mixture is not out of the

ordinary for a Type 3 sonata and is not consistent enough to constitute a deformational norm for Schubert. In mm. 38-39, Schubert cleverly sets up a bassline descent, leading to cadential six-four motion that underlies a clearly articulated EEC in m. 40. From here, as one would expect, there is a strong post-cadential tonic pedal in the key of the dominant, which lasts until the end of the exposition. This usage of a dominant lock clearly departs from Schubert's deformational norm of resisting the dominant in C, thus making this zone highly idiomatic of the eighteenth-century Type 3 sonata.   As a result, I have designated this zone as "normative."

Thus, as seen by the interjection of Schubert's deformational norms in both TR and S juxtaposed alongside the 'normative' P and C, it is clear that Type 3 norms have fought back, thereby creating maximal formal interference at the level of the exposition itself. Cognitively, not only have both a listener's Type 3 normative and deformationally normative schemas been fully activated, but they've already shifted back and forth from the activation of their normative schema in P to the deformationally normative schema in TR and S back to their normative schema in C. At this point, the Gestalt analogy has become especially clear to a listener—while most pieces have minimal formal interference and require little to no shifting of one's perceptual focus from one action space schema to another, this sonata has already required listeners to undergo a sort of oscillation between their Type 3 and deformationally normative expositional schemas multiple times. Beyond the oscillations themselves, however, the respective *magnitudes* of these interactions are not equal: while the normative P and C zones function as individual units, they are interacting with the back-to-back deformationally normative TR and S zones, which inherently has 'double' the magnitude due to their adjacency and the accumulative effect of consecutive deformationally normative action spaces preceding C. Furthermore, arguably the most perceptually salient deformational norm present—the lack of a clear

distinction between the end of TR and beginning of S—involves the presence of not one but *two* zones. As such, while the first interaction between P and TR produces only mild interference, the TR and S zones collectively build up schematic momentum as they both remain deformationally normative, causing the shift from S to C to cause far more cognitive dissonance than the one between P and TR.

Example 3.9. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 29-47

As illustrated in Example 3.4 and in the context of E major, the preparation zone of the development begins with fragments of the second phrase of the A section from the expositional P that quickly lead to the B section by the upbeat to m. 52. In fact, although now transposed to C-sharp minor, this recall of the B section from P is quite similar (but not identical) in terms of

notes, articulations, dynamics, and rhythm, making this preparation zone overall highly idiomatic of the eighteenth-century sonata, which normatively begins with material from P. Additionally, this repetition of P-material strongly suggests Hepokoski and Darcy's concept of rotational form,[68] in strong contrast to Schubert's deformational norm of a *lack* of rotations. Needless to say, I have designated this action-space as 'normative.' Schematically, we now have the inverse scenario of what we had between the back-to-back deformationally normative TR and S zones in the exposition: a collective buildup of two adjacent *normative* zones between C and the preparation zone. Just as in the exposition, a listener's assimilations will now accumulate to their normative schema over the entirety of not one but *two* adjacent action space schemas, which will lead to an even more jarring instance of interference causing double the amount of cognitive dissonance when their deformationally normative schema is activated again.

Example 3.10. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 48-57

Following the preparation zone, we are presented with an episodic interpolation—that is, a section of new thematic material that has previously not yet been heard—spanning

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[68] Hepokoski and Darcy (2006, 202-204).

from mm. 57-65. Although an episodic interpolation usually functions as an inconsistent deformation for late-eighteenth-century composers, it became one of Schubert's most prominent deformational norms, as evidenced by the fact that nearly every single one of his piano sonatas incorporates at least one episodic interpolation in its development. Given the already highly unpredictable nature of developments, determining whether a developmental zone is 'normative' or 'deformationally normative' forces the analyst into fairly subjective territory. Nonetheless, although a developmental episode might be considered as a simple deformation for a late-eighteenth-century composer, it is a deformational norm for Schubert. As such, I have deemed this zone as 'deformationally normative,' thereby creating a 3:3 ratio and representing the climax of the battle between Type 3 norms and Schubert's deformational norms.

A stylistically competent listener is likely to process this formal interference cognitively as well, as they have now continued to jump back and forth between their Type 3 normative and deformationally normative schemas several times, preventing them from predicting what will come next. In terms of the Gestalt analogy, a listener has not been able to rely on one single formal schema to organize their perception into figure-ground relations between and within action spaces but instead has had to oscillate back and forth between both schemas, resulting in maximal cognitive dissonance. However, the adjacent placement of two zones of the same type (i.e., normative or deformationally normative) do schematically tease a listener, as all it takes is a single repetition of a given zone type to create an expectation that the third zone will be of the same type. We have encountered three adjacent pairings so far: the expositional TR and S, the expositional C and developmental preparization zone, and the developmental core and retransition zone. Accordingly, what started out as mild interference (producing minimal levels of cognitive dissonance) between the expositional P and TR has now

grown into maximal interference/dissonance with three consecutive pairings of the same

schematic type.

Example 3.11. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 53-66

Despite the developmental core's somewhat ambiguous classification as 'normative' or

'deformationally normative,' the subsequent retransition zone is clearly normative. By

reordering fragments of the expositional zones following a structure of {C, TR/S, P, C, TR/S, P},

Schubert completely declines any initial suggestion of rotational form he first seemed to hint at

through the return of P at the beginning of the development. In fact, the ordering of the return of

these zones is the exact opposite of what Hepokoski and Darcy consider to be a "rotation," which

would be P, TR/S, C (i.e., the original expositional ordering of these zones). Example 3.6 and

Figure 3.3 further illustrate this "anti-rotational" formal layout Schubert seems to be following

and exemplifies yet another way in which Schubert's deformational norms are interfering with

the norms of the eighteenth-century style. By the end of the development, we now collectively

have a 3:4 ratio between Type 3 sonata norms and Schubert's deformational norms. Between the

1:1 ratio of normative:deformationally normative zones in the exposition and the 1:2 ratio in the

development, it is clear that this extreme formal interferential battle has still not yet been

resolved, thus necessitating the need for a recapitulation to achieve formal and hermeneutic

closure.

Up to this point, a listener's contradicting Type 3 normative and deformationally

normative schemas have both been fully activated and gone back and forth assimilating roughly

the same number of zones into each respective schema. Furthermore, the in-time layout of the

schemas has produced particularly extreme levels of cognitive dissonance when two normative

or deformationally normative zones are placed right next to one another. As such, they have

experienced varying levels of cognitive dissonance all throughout the piece and looking for one

schema or the other to start dominating the rest of the zones they encounter as a means of

resolving this dissonance. Phenomenologically, this ongoing formal interference has created an

experience of disjointedness—even though the individual zones in isolation are clearly

assimilated into one schema or the other, the constant vacillation of assimilations between these

two contradicting schemas likely creates a mental perception of incoherence. Importantly, it

must be clarified that it is not the music *itself* that is incoherent, but only a listener's perception.

Example 3.12. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 62-83

As mentioned earlier, the recapitulation is almost identical to the exposition with one critical exception: in mm. 102-103, Schubert recomposes the second half of the "dual" TR/S in order to keep the music in the tonic. However, as Hepokoski and Darcy note, recomposing the TR in the recapitulation is a hallmark of the Type 3 sonata. This recomposition of TR, however, has important implications in "answering" the rhetorical question first posed in mm. 21-22 and repeated in the minor-mode in mm. 23-24, and a listener is sure to find this to be a moment of resolution, perhaps suggesting that the Type 3 norms have indeed triumphed over Schubert's deformational norms in this ongoing battle. Formally, however, what makes both TR and S 'deformationally normative' is the fact that the same ambiguous medial caesura from the exposition is present and thus there is no clear end to the TR or beginning to the S. However, one of Schubert's most frequently used deformational norms is beginning the recapitulation in an off-tonic key, a norm which he clearly refrains from invoking in P. Additionally, the C in the

recapitulation is identical to the normative C heard in the exposition. As a result, I have marked the recapitulatory P and C as 'normative' and the TR and S as 'deformationally normative' in keeping with their expositional designations.

By the end of the recapitulation, we now collectively have a 5:6 ratio between Type 3 sonata norms and Schubert's deformational norms. It is clear then, even before we are presented with the coda and despite the purported 'victory' of Type 3 norms, that this work has featured maximal formal interference from start to finish. Consequently, I argue that a stylistically competent listener has likely experienced extreme cognitive dissonance from start to finish, as the constant assimilating oscillation between their Type 3 normative and deformationally normative schemas has never abated. As a result, a listener's quest to find an overarching Gestalt-based schema that guides their perception of the sonata as a whole is unfulfilled.

Example 3.13. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 21-24

Example 3.14. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 100-103

Finally, as alluded to above, the coda is where a listener finally receives affirmation that the movement as a whole is just about as formally interferential as it gets. With an exceptionally soft *pianissimo* marking, this section clearly restates fragments of the "innocent" theme material heard in the A section of the expositional P (among other places), which is one of the most normative options for codas of the late-eighteenth-century sonatas. That being said, the striking vii°7/ii that launches the P theme as well as the deceptive motion ending on vi (F♯ minor) still show signs that the devious character of the work is at play, but ultimately the richer PAC in m. 133 affirms that this is a 'normative' action space, therefore ending the piece on a 6:6 (or 1:1) ratio between Type 3 sonata norms and Schubert's deformations.

Hermeneutically, it seems that Schubert's resistance to fully embracing eighteenth-century norms leads to a highly ambivalent, *formally interferential* sonata. More importantly, however, in terms of cognition, the constant movement back and forth between a listener's attempts to assimilate their experiences to Type 3 normative and deformationally normative schemas causes a listener's cognitive dissonance to never truly resolve, as they never reach a point where one type of normative schema dominates over the other. As such, they are never able to mentally categorize this work as embodying one set of norms over another, but rather phenomenologically experience the work as disjointed from start to finish.

Example 3.15. Schubert, Piano Sonata D.664 in A Major, first movement, mm. 127-133

CONCLUSION

In this thesis, I have developed a theory of formal interference, which I argued

is the degree to which a listener's Type 3 normative schema collides with their deformationally

normative schema as the sonata unfolds in time, producing varying amounts of cognitive

dissonance based on the consecutive accumulation of juxtaposed normative or deformationally

normative zones. As I argued in my extended analysis in Section 3.4, formal interference can be

measured quantitatively by analyzing each individual action space of a given Type 3 sonata,

accounting for any deformational norms present, and determining if the zone collectively

features eighteenth-century 'norms' and deformations or 'deformational norms.' From there,

ratios are used to determine how interferential the work is between its given norms/deformations

and deformational norms. Using Schubert's Piano Sonata D. 664 in A Major as a case study, I

argue that the first movement of this work represents a quintessential case of maximal formal

interference.

While the movement used for this extended analysis does in fact generate a 1:1

interference ratio, it is once again critical to reiterate that the ratio is best used

for the purposes of statistically-based corpus studies, *not* a listener's cognitive perception. We

can only gain insights about a listener's perception through empirical studies (i.e., exploring

actual listeners' perceptions). Nevertheless, cognitive theories that have been tested empirically

can provide valuable insights in and of themselves. Indeed, through the framework of schema

theory, we are able to generate testable hypotheses regarding where the perception of

interference arises on a more specific basis than the quantitative ratio, as we can juxtapose two or

more norms and deformational norms together and examine them in much closer detail than a

simple ratio. When using this schematic framework, I argued that cognitive dissonance arises

between the full activation of two contradicting schemas alternating with one another. This cognitive dissonance can best be explained by gestalt theory to elucidate the back-and-forth oscillation between these two contradicting schemas over the course of listening to an entire movement from start to finish. Needless to say, the cognitive implications of works in sonata form that are perceived to embody formal interference are tremendous. For stylistically competent listeners who have constructed respective schemas for Type 3 norms and deformational norms, such pieces provide the ultimate challenge for listeners to reconcile rapid shifts from one distinct set of norms to another in real time.

Future research on formal interference should involve more formal corpus studies examining and identifying the respective deformational norms for both late-eighteenth- and nineteenth-century composers, as it is impossible to determine whether a deformation is truly a 'deformational norm' without a highly thorough consultation of the sonata-form works of all Western art composers from this time period. In other words, while Hepokoski and Darcy have provided us with a rich and comprehensive approach to theorizing Type 3 *norms* of the late-eighteenth-century sonata, further investigation is needed into the frequency of deformational types employed by composers to determine each composer's respective set of *deformational norms*. Furthermore, due to the assumptive limits of schema theory, gestalt theory, and cognitive dissonance theory, future studies should involve *empirical* experiments to actually discern how the perception of formal interference varies among listeners today.

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APPENDIX A

In order to approximate the interference ratios found in the examples of Figure 1.3, I followed essentially the same process as described for the Schubert case study in Chapter 3, albeit the range of deformational norms was considerably wider given the samples span through the late-nineteenth century. First, I compiled a list of deformational norms for the nineteenth century through an extensive reading of the literature and my own analyses of these works. In this list, I included commonly used deformational norms by most all nineteenth-century composers (trimodular blocks, "de-energizing" TR zones, etc.) as well as idiolects unique to individual composers found within my nineteenth-century sample—Beethoven, Schubert, Brahms, Grieg, Mahler, and Dvořák.

Once this comprehensive list of deformational norms had been completed, I followed the same procedure for each sonata-form movement. First, I simply tallied the total number of action spaces in each sonata. For instance, if a piece had an exposition with four action spaces, a development with three, and a recapitulation with four plus a coda (as in the first movement of Schubert's Piano Sonata D.664 in A Major), I would designate the work as having 11 action spaces total. From here, I went zone by zone, accounting for any Type 3 norms/deformations and deformational norms. If a given zone contained *any* type of deformational norm from my list, I would designate it as 'deformationally normative,' but if no deformational norms were present, I would label it as 'Type 3 normative.'

Once I had completed this same process for every action space, I tallied the total number of Type 3 normative versus deformationally normative zones in order to calculate the interference ratio. Finally, I rounded these ratios up or down to create more generalized

statistical patterns of minimal interference (1:0 or 1:0) and maximal interference (1:1). For

instance, if a sonata had a 6:5 interference ratio, I would round it to 1:1.

Piece	Year Composed	Off-tonic start to recap?	Rotational Form?
String Quartet in G minor, D.18	1810	No	No
String Quartet in D Major, D.94	1811	Yes	No
String Quartet in C Major, D.32	1812	No	No
String Quartet in B-flat major, D.36	1812	No	Yes
String Quartet in E-flat Major, D.87	1813	No	No
String Quartet in C Major, D.46	1813	Yes	Yes
String Quartet in B-flat Major, D.168	1813	No	No
String Quartet in D Major, D.74	1813	Yes	Yes
String Quartet in B-flat Major, D.112	1814	No	No
String Quartet in G minor, D.173	1815	Yes	Yes
Piano Sonata in E Major, D.157	1815	No	Yes
Piano Sonata in C Major, D.279	1815	Yes	Yes
Piano Sonata in E Major, D.459	1816	Yes	Yes
String Quartet in E Major, D.353	1816	No	No
Piano Sonata in A minor, D.537	1817	Yes	No
Piano Sonata in A-flat Major, D.557	1817	No	No
Piano Sonata in E minor, D.566	1817	No	No

Piano Sonata in F-sharp minor, D.571	1817	No	Yes
Piano Sonata in E-flat Major, D.568	1817	No	No
Piano Sonata in B Major, D.575	1817	Yes	No
Piano Sonata in F minor, D.625	1818	Yes	Yes
Piano Sonata in A Major, D.664	1819	No	No
Piano Sonata in C-sharp minor, D.655	1819	Yes	No
String Quartet in C minor, D.703	1820	Yes	Yes
Piano Sonata in A minor, D.784	1823	No	Yes
String Quartet in A minor, D.804	1824	No	Yes
String Quartet in D minor, D.810	1824	No	No
Piano Sonata in A minor, D.845	1825	No	No
Piano Sonata in C Major, D.840	1825	Yes	Yes
Piano Sonata in D Major, D.850	1825	No	Yes
Piano Sonata in G Major, D.894	1826	No	Yes
String Quartet in G Major, D.887	1826	No	No
Piano Sonata in A Major, D.959	1828	No	No
Piano Sonata in C minor, D.958	1828	No	No
Piano Sonata in B-flat Major, D.960	1828	No	No

<u>Statistical Summary of Appendix B Data Table</u>

Recapitulatory Starts:
- 7/20 piano sonatas (35%) feature off-tonic recapitulatory starts
- 5/15 string quartets (33.3%) feature off-tonic recapitulatory starts
- **12/35 total movements (34.3%) feature off-tonic recapitulatory starts**
- **23/25 total movements (65.7%) feature tonic recapitulatory starts**

Rotational Form in the Development:
- 9/20 piano sonatas (40%) feature rotational form in the development
- 6/15 string quartets (33.3%) feature rotational form in the development
- **15/35 total movements (42.9%) feature some type of rotational form in the development**
- **20/35 total movements (57.1%) do not contain any type of rotational form in the development**