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Submission Instructions

Cover design by graphic artist Eryn Cruft.
EDITOR’S NOTE

I’m particularly honored to announce our seventh volume of the *Indiana Undergraduate Journal of Cognitive Science* this spring. This is my last year as executive editor, and I continue to be amazed at the quality of writing and research of the undergraduate scholars who submit writing to this journal.

Since its inception, IUJCS has been a free online publication. This decision began an issue of practicality, but has evolved into a statement. After all, the mission of IUJCS is first and foremost a mission of accessibility. This word, to us, has a double meaning. On one hand, we want undergraduate students to have access to the knowledge and scholarship of their peers, colleagues, and mentors. From traveling to conferences to purchasing journal subscriptions, scholarly engagement can be quite expensive. At a time when student debt is at an all-time high, many students simply cannot bear the cost. For these reasons, this journal is freely available to any student in the world.

On the other hand, we want undergraduate scholars to have access to the resources and guidance necessary to effectively conduct and publish independent research and writing. This is a challenge in any discipline, especially in an economic climate where academic funding is in threat. IUJCS is one way of bridging that gap, empowering and recognizing bright undergraduates working on innovative research around the world, often as principal investigators. Our journal has no limit to the number, length, or scope of submissions it accepts. Our only qualifications are that submissions are of sufficient quality, accuracy, originality, and scientific soundness. The fact that IUJCS is an online publication helps facilitate these principles. I trust you will find them embodied in the articles included in this volume.

Kristine Bundschuh of Wellesley College in Wellesley, Massachusetts, discusses the phenomenon of d-deletion in the Andalusian dialect of Spanish, found primarily in southern Spain. Basing her research in a linguistic analysis of language samples collected during her own time in Spain, Bundschuh identifies cases of d-deletion and situates it in relation to other deletion processes in Andalusian Spanish.

Lucia Chen of the University of California in San Diego, California, reviews research on the empathic capacity of individuals diagnosed with a disorder on the autism spectrum (ASD). Chen separates empathy into two components – affective and cognitive – to locate the source of empathy impairment associated with ASDs. Chen argues that this impairment is not in affective empathy, but in cognitive empathy.

Laura Dulude, also of Wellesley College, engages in a cross-linguistic comparative analysis of dyslexia. She analyzes the dynamics of dyslexia in bilingual and monolingual individuals, as well as comparing languages with transparent and opaque writing systems. The result is a keen exposition of cross-linguistic disparities that may shed light not only on the causes of dyslexia, but on second language learning.

Amy Fairgrieve of Illinois Wesleyan University in Bloomington, Illinois, employs cognitive schema theory to investigate interpretation of English poetry. Fairgrieve draws on empirical research where English students were asked to respond to questions about a piece of poetry. Based on this study, Fairgrieve constructs an elaboration of cognitive schema theory in the context of literary interpretation.

McCarthy, Boettcher, Lieberman, Mosbacher, and Russell of Brown University in Providence, Rhode Island, examined the effect of attachment style on relationship anxiety among Brown undergraduates. McCarthy and colleagues found that moderate-anxiety situations were crucial to revealing the difference in anxiety responses patterns of people who were either secure or insecure in their relationships.

Ronak Shah
Executive Editor of the *Indiana Undergraduate Journal of Cognitive Science*
D-deletion in Andalusian Spanish: A Morpho-Phonemic Phenomenon with Frequency-Induced Spreading

Kristine Bundschuh

Cognitive & Linguistic Sciences
Wellesley College

In Andalusian Spanish, consonant deletion in verb suffixes is a common phonological process. I propose to account for d-deletion, which occurs in the past participle suffix, through defining the specific environment in which the final consonants of verb suffixes are deleted and analyzing this deletion using Optimality Theory. By ranking a constraint on which final consonants in verb suffixes are deleted with other constraints, d-deletion can be explained in relation to other deletion processes. Additional cases of d-deletion are analyzed as spreading due to a frequency effect.

1. INTRODUCTION

1.1 Andalusian Spanish.

Andalusian Spanish is a variety of Standard Peninsular Spanish spoken in the autonomous community of Andalusia in southern Spain. The dialect’s distinguishing phonological, morphological, and syntactic features have been extensively studied by linguists. The dialect itself can be subdivided into Eastern Andalusian Spanish and Western Andalusian Spanish; the language spoken in the western provinces in Andalusia has a greater contrast with Standard Peninsular Spanish (Ariza 2007). Western Andalusian Spanish is also more likely to be found in the rural regions of provinces where Eastern Andalusian Spanish is spoken. Some question whether Andalusian Spanish has enough variation from Standard Peninsular Spanish to be termed a dialect. However, there are many linguistic processes which are unique to Andalusian Spanish, which clearly distinguishes it from other forms of spoken Spanish.

1.2 D-deletion in Andalusian Spanish.

This paper focuses on d-deletion in Andalusian Spanish. The dialect has a propensity for consonant deletion in various morphological domains. However, only the final d in a word can be deleted, and this most commonly occurs in the past participial verb suffix. While d-deletion is observable as a widely-occurring speech pattern in the region, this deletion process is subject to sociolinguistic factors and does not always occur. For example, Andalusian speakers often shift from their dialect to Standard Peninsular Spanish unconsciously depending on the situation. When speaking to Spanish speakers not from Andalusia, when in a formal setting, or when reading aloud, Andalusians commonly do not delete the d. It is unclear if this retention of the d is always because the speakers have switched to Standard Peninsular Spanish, as on occasion a speaker will retain the d but delete an s through a different phonological
process. Consonant deletion also varies depending on the speaker’s educational background; University graduates are less likely to delete certain consonants compared to the general population (Villena-Ponsoda, 2008). It is important to note that while the phenomenon of d-deletion does not occur invariably, it is quite common in casual Andalusian Spanish.

1.3 Optimality Theory.

The analysis of d-deletion is framed in Optimality Theory (OT), a constraint-based theory of Universal Grammar. An underlying assumption of OT is that all constraints are universal, that is, they exist in all languages (Prince & Smolensky, 1993/2004; McCarthy, 2002). Differences in the ranking of the universal set of constraints produce different languages. The convention for an OT analysis is to rank a set of at least two constraints against candidates for the output of a word in a table form, conventionally referred to as a tableau, as seen in (1) below.

If a candidate violates a constraint an asterisk is placed in the box. A candidate which violates the more highly ranked constraints, namely that which has the left-most asterisk, is ruled out. The candidate whose highest-ranked violation is lower than the other candidate’s violations is the optimal output (Kager, 1999). This means the selected candidate is the actual output or spoken word. The simplest form of ranking is pairwise ranking, which evaluates two candidates and two constraints. If Candidate A is the actual output, then it must be selected above Candidate B through the correct ranking of two constraints, meaning the constraint which Candidate B violates must dominate the constraint with Candidate A violates. Pairwise ranking is used to determine the specific ranking of constraints within a particular language.

1.4 Configuration of Analysis.

This paper is organized as follows: Section 1.5 demonstrates facts of general consonant deletion and d-deletion; Section 1.6 introduces a constraint by which final consonants in verb suffixes are deleted; Section 2 discusses the previous research on wide-spread consonant deletion and deletion specifically in verb suffixes as well as explains the use of morphological domains; Section 3 clarifies the problem of d-deletion; Section 4 analyzes consonant deletion in verb suffixes; Section 5 addresses why d-deletion in verb suffixes is selected above other potential outputs; Section 6 discusses d-deletion outside of the past participial verb suffix in the context of spreading due to frequency; and Section 7 summarizes the analysis.

The representation of the underlying form of words, or more specifically the written representation of the word, in this paper will be represented in italics, while the spoken form or the potential spoken form
will be in quotes. English translations will be in quotes in parentheses. For example, when discussing the d-deletion in Andalusian Spanish, *acabado* is spoken as ‘acabao’ (‘finished’).

1.5 Consonant Deletion.

While living for four months in Córdoba, a city in Andalusia, I came to notice the commonality of consonant deletion. To investigate this phenomenon more closely I recorded an Andalusian college student from la Universidad de Córdoba, who at the time of recording was studying at Wellesley College for the year. She is a native Spanish speaker who, having grown up in Córdoba, speaks in the Andalusian dialect while at home. The informant also can speak Standard Peninsular Spanish and is competent in English.

My informant showed Andalusian Spanish’s propensity to delete not only consonants but even whole syllables, when speaking casually. The deletion process is apparent in the following commonly used words, which in Andalusian Spanish are shortened to one syllable.

\[
\begin{align*}
\text{para} & \quad \text{‘pa’} & \quad \text{‘for’} \\
\text{todo} & \quad \text{‘to’} & \quad \text{‘all’}
\end{align*}
\]

From the spectrograph below it is clear that in *todo* (‘all’), not just the consonant *d* is deleted, but rather the whole final syllable *do* is removed.

As seen above, the shortening of frequently used words can occur in Andalusian Spanish. However, the most common deletion processes explain the removal of one specific sound. The regularity of consonant deletion can be seen in the data below:\(^1\):

\[
\begin{align*}
\text{isla} & \quad \text{‘ila’} & \quad \text{‘island’} \\
\text{calores} & \quad \text{‘calore’} & \quad \text{‘colors’} \\
\text{toses} & \quad \text{‘tose’} & \quad \text{‘coughs’} \\
\text{perla} & \quad \text{‘pela’} & \quad \text{‘pearl’} \\
\text{carne} & \quad \text{‘cane’} & \quad \text{‘meat’}
\end{align*}
\]

\(^1\) In some of these examples the deleted consonants make the preceding vowels aspirated or cause another phonological process to occur. However, for the purpose of this paper, they will be included with other consonant-deletions in Andalusian Spanish.
1.5.1 D-Deletion Data.

While the deletion of \( d \) in \textit{todo} is part of a propensity to shorten some words, \( d \)-deletion usually occurs only under certain circumstances, specifically, in \(--\text{ado} \) and \(--\text{ido} \) verb suffixes, as seen in (3) and (4). Otherwise, the \( d \) is retained, as in examples (5), (6), and (7).

(3) \textit{--ado} word endings

\begin{itemize}
  \item \textit{callado} ‘callao’ (‘silent’)
  \item \textit{acabado} ‘acabao’ (‘finished’)
  \item \textit{ocupado} ‘ocupao’ (‘occupied, busy’)
\end{itemize}

(4) \textit{--ido} word endings

\begin{itemize}
  \item \textit{dormido} ‘dormio’ (‘slept’)
  \item \textit{recibido} ‘recibio’ (‘received’)
\end{itemize}

(5) \textit{--edo} word endings

\begin{itemize}
  \item \textit{torpedo} ‘torpedo’ (‘torpedo’)
  \item \textit{acomodo} ‘acomodo’ (‘arrangement’)
  \item \textit{periodo} ‘periodo’ (‘period’)
\end{itemize}

(6) \textit{--odo} word endings

\begin{itemize}
  \item \textit{agudo} ‘agudo’ (‘acute’)
  \item \textit{dudo} ‘dudo’ (‘doubt’)
\end{itemize}

The above data from my subject show that \( d \) is deleted in word-final \(--\text{ado} \) and \(--\text{ido} \). However, the context of this deletion cannot be generalized to all words ending in \(--\text{Vdo} \), meaning \(--\text{do} \) preceded by any vowel, as seen in the retention of \( d \) in (5), (6), and (7). While \( d \)-deletion occurs in \textit{ado} and \textit{ido} configurations, the paradigm in which \( d \) is deleted must be specifically word-final, as seen in the following spectrograph, which is of my informant’s representation of \textit{adorado} ‘adorao’ (‘adored’). Note that the \( d \) is deleted in the final \(--\text{ado} \) but is retained in the initial \textit{ado}.

The following spectrograph shows an example of the retention of a word-final \( d \), in \textit{torpedo} ‘torpedo’ (‘torpedo’). There is a distinct contrast between the ending of this word, \textit{--edo}, and the ending of the spectrograph above, \textit{adorado} (‘adored’), ‘-ao.’
The data from this section show that words which end in –ado/ido delete the d. D-deletion can occur in past participle, adjectives, and other individual lexical words. I will discuss these in Section 6. As d-deletion most regularly occurs in past participle conjugations, the bulk of this paper will focus on that phenomenon.

–ado and –ido are the past participle endings in Spanish. The past participle is formed in Spanish by conjugating the verb haber (‘to have’) and changing the main noun to root + -ado for verbs ending in –ar and root + -ido for verbs ending in –er or –ir. For example, ‘I have eaten’ is he comido, where he is haber in first person singular and present tense, com is the root of comer (‘to eat’) and –ido is the past participial ending. As seen in apellido ‘apellio’ (‘last name’), d-deletion can occur outside the domain of past participial verb suffixes. These non-participial cases of deletion can be explained by spreading, to be discussed in Section 6.

1.6 Constraint for Consonant Deletion.

I propose to introduce a constraint, *VC(V)SUFFIX, which, properly ranked against some select established traditional constraints, allows for the deletion of d in the past-participle verb suffixes -ado and -ido to be the selected spoken outcome. VC(V) refers to situations in which a vowel is followed by a consonant and another optional vowel.

*VC(V)SUFFIX: No verb suffix can have a final consonant if the consonant is preceded by a vowel.

The above constraint means that a consonant must be deleted if it is the final consonant in a verb suffix and if it is not preceded by a consonant. The final consonant can be word-final or can be followed by a vowel in the verb suffix.

2. BACKGROUND

In order to account for d-deletion in Andalusian Spanish, the process must be considered in the broader context of all consonant deletion. Using OT, the ranking of constraints which selects for d-deletion in word-final verb suffixes must allow for the dialect’s other deletion processes to occur. D-deletion is not a distinct phonological process in Andalusian Spanish, but rather must be represented in relation to the
dialect’s general propensity to delete consonants.

2.1 Consonant Deletion Overview.

The consonants most commonly deleted in Andalusian Spanish are r, s, and d. R-deletion occurs most frequently when an r precedes an n or an l, or when an r is in word-final position. This deletion process is more commonly used by young female speakers or speakers with informal educational backgrounds (Díaz-Campos, 2008). Because it is word-final, r-deletion is very clear when Andalusian Spanish speakers use the infinitive form of a verb, which must end in –ar, -er, or –ir. The final n in a word is usually velarized, but is deleted by some speakers in words like hablan ‘habla’ (‘they speak’), where the n is in the present tense third person plural verb suffix2 (Mondéjar Cumpián & Carrasco, 2001). S-deletion also is present in verb suffixes, like cantas ‘canta’ (‘sings’). However, s-deletion creates a process called s-aspiration, where the deletion of an s causes the preceding vowel to be aspirated, and sometimes is followed by breathy voice (Mondéjar Cumpián & Carrasco, 2001; Gerfen, 2001; Bishop, 2007; Corbin, 2006). This process explains how Andalusians can drop a word-final s, which often marks plurality, while still retaining the morphological contrast against the singular form. By aspirating the a in casas ‘casa’ (‘houses’) after deleting the s, this plural form of houses can be distinguished from the singular form, casa (‘house’). D-deletion is seen less commonly in Andalusian Spanish, as the d is almost exclusively deleted when present in the intervocalic verb suffixes–ado and –ido, which become ‘ao’ and ‘io’ (Villena-Ponsoda, 2008). There are, however, a few exceptions where a d is deleted when not in this specific past participle verb suffix position.

2.2 Deletion in Verb Suffixes.

Many of the above deletions occur in verb suffixes. For example, deletion of r, n, s, and d can be seen in hablar ‘habla’ (‘to speak’), hablan ‘habla’ (‘they speak’), hablas ‘habla’ (‘you speak’), and hablado ‘hablao’ (‘spoken’). Note that while all of these examples delete the final consonant, they do undergo different processes, like s-aspiration, in order to maintain their morphological contrasts. However, for the purpose of this paper, the subsequent changes which occur after deletion will not be considered. Rather, these examples are used to show a pattern of deletion in word-final consonants in Andalusian Spanish. More specifically, all of the examples above are in verb suffixes.

2.3 Defining Domain.

Since Andalusian Spanish appears to have a propensity to delete consonants in verb suffixes, the following analysis will separate words by root and affixes rather than by syllable boundaries. In the case of consonant deletion, and more specifically d-deletion in the past participle verb suffix, the only affixes being considered are verb suffixes. It has been argued that phonological changes can be tied to morpheme classes, as seen in base reduplication in Yoruba, where the reduplicant domain is only the base, or root, of the word (McCarthy & Prince, 1999). Henceforth words which aim to emphasize the distinction between root and suffix will be represented as root.suffix or ‘root.suffix’. Some of the constraints used in the OT analysis are domain-specific in order to

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2 While the n is usually velarized and not deleted, for the purposes of this analysis it is still being considered a deleted consonant in a verb suffix. Any variation between deleting and velarizing the n is being accounted for by the fact that it is a nasal, which commonly acts differently from other consonants.
account for effects in the root of the word versus effects in the suffix of the verb.

3. **THE PROBLEM: D-DELETION IN THE CONTEXT OF CONSONANT-DELETION**

The deletion of the d in the past participle verb suffix is evident in Andalusian Spanish. Since the phenomenon of deletion of the final consonant in the verb suffix is manifested with various other consonants, it appears that an analysis of d-deletion should consider these similar deletion processes in the dialect.

I will first analyze the specific circumstances in which consonant deletion in verb suffixes occur. A final consonant in a verb suffix is deleted in all cases with the following exceptions:

- The consonant is preceded by a consonant
- The deletion of this consonant will create a long vowel
- The final syllable of the word is stressed.

After creating a ranking of constraints which accounts for the context in which a final consonant is deleted in a verb suffix, I will narrow my analysis to d-deletion. Using the previously ranked constraints as well as some principled traditional constraints, I will analyze why d-deletion is the output for the suffixes –ado and –ido compared to other potential outputs for a conjugated verb in the past participle. Finally, I will explain other d-deletion occurrences in Andalusian Spanish through frequency and spreading.

4. **RANKING OF CONSONANT-DELETION IN VERB SUFFIXES**

Before determining why the d is deleted in the past participle verb suffixes –ado/-ido, consonant deletion in verb suffixes must be contextualized. As noted in the background, in Andalusian Spanish consonants like r, s, n, and d are deleted in certain places.

(8) cantar ‘canta’ (‘to sing’)
bailas ‘baila’ (‘he dances’)
hablan ‘habla’ (‘they speak’)
acabado ‘acabao’ (‘finished’)

These examples show a clear propensity for Andalusian Spanish to delete the final consonant in verb suffixes. While other consonants are deleted in Andalusian Spanish, inside the domain of verb suffixes only final consonants have the potential to be deleted. All other consonants are retained. For example, in the verb suffix for the first person plural in the present tense, -amos/-emos/-imos, the s is deleted, but the m is retained.

There are three significant characteristics for all of the consonants deleted in verb suffixes in the examples above. These show that only in a specific context can the final consonant of a verb suffix be deleted. First, the deleted final consonant is preceded by a vowel. Verb suffixes where the last consonant is preceded by a consonant, like the perfect simple preterit second person single endings –aste/-iste and the gerunds –ando/-iendo do not delete the final consonant. This means that for deletion to occur, the final consonant of a suffix must be preceded by a vowel. The reason may be that consonant clusters act differently from single consonants, as they have more complexity. Second, the verb suffixes which

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3 Although some languages can stack suffixes, in the case of Andalusian Spanish verb suffixes, only one suffix can attach to the root verb. Therefore deleting the final consonant in a suffix is effectively the same as deleting the final consonant in the word.
delete the final consonant are not stress-final. Suffixes where the final consonant is in the stressed syllable, like the future first person singular viviré (‘I will live’), do not delete the final consonant. Third, when the final consonant of a verb suffix is between two of the same vowels, like in saltaba (‘he/she/it jumped’), the consonant is not deleted. Thus, in cases where the final consonant precedes a vowel, like in acabado (‘finished’), the deletion of the consonant does not cause a long vowel to occur.

The above situations can be accounted for with three constraints being properly ranked for Andalusian Spanish. These are *VC(V)\]SUFFIX, *LONGVOWEL, and IDENTSS.

*VC(V)\]SUFFIX: No verb suffix can have a final consonant if the consonant is preceded by a vowel.

* LONGVOWEL: No vowel can follow the same vowel (Zoll, 1998; Baković, 2006; Rosenthall, 1994).

IDENTSTRESSEDSYLLABLE (IDENTSS): All features in input of the stressed syllable are present in the output of the stressed syllable.4

While *VC(V)\]SUFFIX justifies the deletion of final consonants in the verb suffixes of Andalusian Spanish, the language’s aversion to long vowels ranks above its propensity to delete, which explains why, while the d in acabado is deleted, the b in cantaba is retained. Below *LONGVOWEL is show in a pairwise ranking dominating *VC(V)\]SUFFIX. Henceforth all situations where Constraint X dominates Constraint Y will be represented as X >> Y, as in *LONGVOWEL >> *VC(V)\]SUFFIX.

(2) *LONGVOWEL >> *VC(V)\]SUFFIX

<table>
<thead>
<tr>
<th>cant.aba (‘he was singing’)</th>
<th>* LONGVOWEL</th>
<th>*VC(V)]SUFFIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>cant.aa</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>cant.aba</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

‘cant.aa’ violates *LONGVOWEL because the deletion of the b creates the long vowel ‘aa’. ‘cant.aba’ violates *VC(V)\]SUFFIX, as the b is the final consonant in a verb suffix and is preceded by a vowel, and yet it is not deleted.

Also ranked above *VC(V)\]SUFFIX is IDENTSS, meaning that maintaining the original features of the stressed syllable outranks deletions. In the below example, the final syllable of cantaré (‘I will sing’) is stressed, and as noted above, features in stressed syllables are not deleted.

(3) IDENTSS >> *VC(V)\]SUFFIX

<table>
<thead>
<tr>
<th>cant.aré (‘I will sing’)</th>
<th>IDENTSS</th>
<th>*VC(V)]SUFFIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>cant.aé</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>cant.aré</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

‘cant.aé’ violates IDENTSS, as the deleted r is from the stressed syllable ré. ‘cant.aré’ violates *VC(V)\]SUFFIX because the r is a final consonant, preceded by a vowel, and in a verb suffix, and yet it is not deleted.

By ranking *LONGVOWEL and IDENTSS above *VC(V)\]SUFFIX, the analysis shows the specific circumstances where deleting the final consonant in the verb suffix is outranked, and therefore does not occur.

---

4 I acknowledge that this constraint likely covers a family of stress constraints which, when properly ranked for Andalusian Spanish, will cause stressed syllables to retain all features. For brevity’s sake, and as this paper does not delve into the stress system for syllables in Andalusian Spanish, I will simply use IDENTSS.
5. SELECTING FOR D-DELETION

In the specific case of d-deletion, additional constraints are required to show why deleting the d in –ado/-ido outranks other potential outputs of a conjugated verb in the past participle. The ranked constraints above signal when deletion will occur, but other constraints play a role in Andalusian Spanish as well. This section will use the verb acab.ado (‘finished’) as an example to show why deleting the d, which forms ‘acab.ao’, is selected above other possible spoken forms.

Potential outputs of acab.ado:
- ‘acab.ado’
- ‘acab.ao’ → actual output
- ‘aca.ado’
- ‘aca.ao’
- ‘acaob.ado’
- ‘acab.adao’
- ‘acaob.adao’

If in fact Andalusian Spanish does not want to have a VCV verb suffix ending, one possibility is to insert a vowel. Some languages, like Japanese, insert in order to create the desired output (Itō & Mester, 1986). To my knowledge Andalusian Spanish has no forms of insertion, and therefore insertion does not seem to be the preferred way of dealing with phonotactic preferences in general. Thus, the potential forms of acabado that use insertion—‘acaob.ado’, ‘acab.adao’, and ‘acaob.adao’—would be ruled out. From this I can assume that the family of dependence constraints is very highly ranked so that it is never—or at least rarely—violated. Dependence constraints, henceforth referred to as DEP, are constraints which require that every element in the output has a correspondent in the input, meaning nothing is inserted. Because of this assumption, the last three listed potential spoken forms of acab.ado, ‘acaob.ado’, ‘acab.adao’ and ‘acaob.adao’, would never be selected, as they would always violate a highly-ranked DEP constraint.

Other potential outputs for acab.ado are ‘aca.ado’ and ‘aca.ao’, as consonants are commonly deleted in Andalusian Spanish. While deleting any consonant seems like a potential possibility, in fact the consonants which are deleted outside of the verb suffix are all sonorants, like s and r. Thus, there is no evidence of obstruents being deleted in the root. This observation suggests that Max-ObsRoot, is highly ranked. Max-ObsRoot, defined below, is a maximality (MAX) constraint. A general MAX constraint requires that every element in the input has a correspondent in the output, or more simply, requires that no deletion occurs (Kager, 1999).

To determine why ‘acab.ao’ is preferred above acab.ado, the constraint *VC(V)SUFFIX must out-rank any faithfulness constraints which affect verb suffixes.

The following constraints will be used to show why ‘acab.ao’ is selected over other potential spoken forms of acab.ado:

Max-ObsRoot: Every obstruent of the root of the input has a correspondent in root of the output
**MAXSUFFIX**: Every segment of the suffix of the input has a correspondent in the suffix of the output.

**IDENT**: All features in the input are in the output, and all features in the output are in the input.

The tableau below shows that Andalusian Spanish allows for the deletion of the d in ‘acab.ao’ and prohibits the deletion of the b in ‘aca.ado’ through the constraint ranking MAX-OBSROOT >> MAXSUFFIX.

(5) **MAX-OBSROOT >> MAXSUFFIX**

<table>
<thead>
<tr>
<th>Input</th>
<th>MAX-OBSROOT</th>
<th>MAXSUFFIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>acab.ado</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aca.ado</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>acab.ao</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

‘aca.ado’ violates MAX-OBSROOT because the obstruent b is deleted in the root acab. MAXSUFFIX is violated by ‘acab.ao’ because a segment, in this case the d, is in the input of the suffix but not the output.

Since MAXSUFFIX is outranked by MAX-OBSROOT and any DEP constraints, ‘acab.ao’ is selected over any potential output which uses epenthesis or which deletes obstruents in the root. In order to justify why ‘acab.ao’ should be selected over the input, acab.ado, *VC(V)SUFFIX must be shown outranking a principled faithfulness constraint, IDENT.

(6) **VC(V)SUFFIX >> IDENT**

<table>
<thead>
<tr>
<th>Input</th>
<th>*VC(V)SUFFIX</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>acab.ado</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>acab.ao</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

‘acab.ado’ violates *VC(V)SUFFIX because the consonant d is the final consonant in the verb suffix and also is preceded by a vowel, yet it remains in the output. ‘acab.ao’ violates IDENT because the d-feature is not in both the input and the output.

All of the constraints used above can be combined into one large ranking which explains why ‘acab.ao’ is the spoken form of acab.ado in Andalusian Spanish and how it outranks all the other options of how to say the past participle form of this verb. The following ranking is not only for acab.ado, but also an analysis of the deletion of the final d in all past participle verb suffixes in Andalusian Spanish.

(7) **LONGVOWEL, IDENTSS >> VC(V)SUFFIX, MAX-OBSROOT >> MAXSUFFIX, IDENT**

<table>
<thead>
<tr>
<th>Input</th>
<th>*LONGVOWEL</th>
<th>IDENTSS</th>
<th>*VC(V)SUFFIX</th>
<th>MAX-OBSROOT</th>
<th>MAXSUFFIX</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>acab.ado</td>
<td>*</td>
<td></td>
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<tr>
<td>acab.ao</td>
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<td>aca.ao</td>
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The ranking of these constraints can also be expressed in this manner:

\[
\begin{align*}
*\text{LONGVOWEL}, \text{IDENT}_{SS} \\
*\text{VC}(V)]_{\text{SUFFIX}}, \text{MAX-OBS}_\text{ROOT} \\
\text{MAX}_{\text{SUFFIX}}, \text{IDENT}
\end{align*}
\]

6. SPREADING OF D-DELETION

The ranking of constraints above accounts for the deletion of \(d\) in the \(-ado\) and \(-ido\) paradigm. While the past participle verb suffix is the only situation in which the \(d\) is deleted almost always by speakers of Andalusian Spanish, some speakers will d-delete for certain other words. The following data is from my personal observations while in Córdoba of words which end in \(-ado\) and \(-ido\), where these endings are not verb suffixes. In these cases, the ranking of constraints would not account for the d-deletion, as *VC(V)]_{SUFFIX} would not apply. Note that while not every speaker of Andalusian Spanish will delete the \(d\) in the output, the following words have the potential to delete the final \(d\).

(9) apellido ‘apellio’ (‘last name’)  
pescado ‘pescao’ (‘fish’)

The above cases delete the \(d\) despite the lack of morphological break between root and suffix. While the \(d\) is deleted in these cases, a rule cannot be posited that every \(d\) which follows an \(a\) or an \(i\) and precedes an \(o\) should be deleted. For example, the adjective definido (‘definite’) does not often delete the \(d\). The d-deletion which occurs when words end in \(-ado\) or \(-ido\) without these endings being verb suffixes can be explained through spreading. The past participle is a relatively common verb tense to use in Spanish, and deletion of sounds in past participles occurs in other dialects of the language (Bybee, 2002). Because of the frequency with which speakers use the past participle, d-deletion occurs the paradigm of \(-ado\) and \(-ido\) frequently. Since d-deletion transpires readily in Andalusian Spanish, the speakers are accustomed to the lack of the \(d\) when words end in \(-ado\) and \(-ido\). Thus, when this situation occurs outside of a verb suffix, speakers spread the use of d-deletion to the final \(d\) in these frequently used words.

D-deletion is also observable in a few other cases which are similar to the \(-ado\) and \(-ido\) paradigm. The examples below show that d-deletion has also spread to words where the final \(d\) is preceded by a \(u\) and followed by an \(o\):

(10) peludo ‘peluo’ (‘hairy’)  
a menudo ‘a menuo’ (‘often’)

The above data show the spreading effect of d-deletion because of the frequency of use of the past participle. However, the same informant who said ‘peluo’ for peludo (‘hairy’) also said ‘agudo’ for agudo (‘acute’). The spreading of d-deletion to other words should not be considered a formal rule, but rather a possible occurrence.

7. CONCLUSION

The proclivity of consonant deletion in Andalusian Spanish is apparent in the verb suffixes, where the final \(s\), \(r\), \(n\), and \(d\) are regularly deleted. Most speakers delete the final \(d\) in the past participial verb suffix, which can be accounted for in the larger
paradigm of deletion in verb suffixes through the introduction of the constraint *VC(V)\textsubscript{SUFFIX}. When correctly ranked against select traditional constraints, *VC(V)\textsubscript{SUFFIX} represents the presence of final-consonant-deletion in verb suffixes. Deletion occasionally happens outside of verb suffixes, which can be justified through the frequent use of the domain in which d-deletion occurs and its subsequent spreading to similar positions in words. The deletion of d in Andalusian Spanish occurs because the morphology of the verb suffix triggers a phonological process of deletion, which subsequently has spread to comparable locations without morphological breaks.

8. REFERENCES


9. APPENDIX

Words referenced from informant recordings:

- acabado ‘acabao’ (‘finished’)
- acomodo ‘acomodo’ (‘arrangement’)
- agudo ‘agudo’ (‘acute’)
- apellido ‘apellio’ (‘last name’)
- callado ‘callao’ (‘silent’)
- dormido ‘dormio’ (‘slept’)
- dudo ‘dudo’ (‘doubt’)
- ocupado ‘ocupao’ (‘occupied, busy’)
- para ‘pa’ (‘for’)
- peludo ‘peluo’ (‘hairy’)
- periodo ‘periodo’ (‘period’)
- pescado ‘pescao’ (‘fish’)
- recibido ‘recibio’ (‘received’)
- todo ‘to’ (‘all’)
- torpedo ‘torpedo’ (‘torpedo’)

All other examples which are not specifically cited in this paper are from personal observations.
EMPATHY AND ITS IMPLICATIONS IN HIGH-FUNCTIONING INDIVIDUALS WITH AUTISM SPECTRUM DISORDER (ASD)

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ABSTRACT

Individuals with Autism Spectrum Disorder (ASD) are characterized, among other criteria, by their impairment in the ability to empathize with others. This may serve as a major underlying cause behind other deficiencies in greater areas of social cognition such as casual social interaction and relationship-building skills. This review will examine exactly where initial empathetic impairment lies—in particular, it separates empathy into its affective and cognitive components and tests for each area independently. It will first introduce empirical studies supporting the view that although individuals with ASD are lacking in cognitive empathy, there is no significant difference in affective empathy between individuals with ASD and typically developing controls. Furthermore, this review will examine the implications of ASD individuals’ deficiency in cognitive empathy for their larger-scale social functioning capacities. Empirical research, as well as firsthand, anecdotal accounts from ASD research participants, sheds light on the challenging nature of the social interactions experienced by those with ASD. Taken as a whole, this body of research will ultimately be seen to show (a) that a curvilinear relationship exists between empathic skills and social anxiety; and (b) that a lack of empathic skills may result in a resounding sense of social exclusion and psychological isolation.

The phenomenon of empathy can be described as the ability to mentally align oneself to the cognitive and emotional perspective of another, or in more colloquial terms, “put oneself in another’s shoes.” It allows one to tune into how someone else is feeling or what he or she might be thinking, enabling sophisticated and meaningful interaction between humans. Social psychologists have long argued that empathy can facilitate understanding and act as a glue for social relationships; thus, it follows that impairments in this capability will produce negative consequences in social interactive ability.

According to Davis’ original taxonomy (1983), empathy consists of two components: the affective and the cognitive. Affective empathy occurs when an observer experiences an appropriate emotional response to the affective or emotional state of another individual—for example, feeling fright upon seeing a frightened person, or feeling pity at the sadness of another. It should be noted that the elicited emotion does not need to match the observed emotion. For example, one may feel relief at the death of a friend due to the fact that their friend’s suffering has ended—this is also affective empathy, as it is an appropriate emotional response to an observed affective state. Cognitive empathy, on the other hand, is described as using a ‘theory of mind’ to essentially read the minds of others. It involves setting aside one’s own current perspective, attributing a mental state or attitude to another person, and subsequently inferring the likely content of that mental state. For example, a student can infer through cognitive empathy that his or her classmate will not know about an upcoming midterm because the classmate was absent on the day it was announced in class (Davis, 1983). Furthermore, the distinction between empathy and the related notion of sympathy should be clarified. Sympathy, as defined by Bennett (1998), occurs when the observer references only how he or she would feel in similar circumstances as the individual in question. Consider a scenario in
which an observer encounters a homeless person: the observer might sympathize by imagining how he himself would feel if he were homeless. To empathize with the homeless person, in its most accurate form, requires acknowledging the true thoughts and feelings of the homeless individual—thoughts and feelings that may not coincide with the observer’s own (Bennett, 1998).

A core deficit in individuals with Autism Spectrum Disorder (ASD) lies in their deficiency in empathetic ability (Baren-Cohen & Wheelwright, 2004). For reliability purposes, this review will focus specifically on individuals with high-functioning autism (HFA) and Asperger Syndrome (AS), as it may be more difficult for lower-functioning autistic individuals to participate correctly in elaborate experiments or report evidence in a coherent manner. Furthermore, it should be acknowledged that AS is differentiated from HFA by the absence of any significant delay in language or cognitive development. HFA is defined as autism in the presence of normal intelligence, as measured by IQ (American Psychiatric Association [DSM-IV-TR], 2000).

Regarding the aforementioned deficit in empathy, impairment in HFA and AS patients appears to lie particularly in the domain of cognitive empathy, leaving affective empathy rather unaffected. This theory has been gleaned by a number of studies demonstrating that, compared with typically developing controls, those with HFA and AS tend to score substantially lower on cognitive empathy-related measures of assessment but reveal no significant differences in measures of affective empathy. Rogers et al. (2007) studied the dual-dimensional nature of empathy in AS through the use of multiple questionnaires that targeted each aspect of empathy distinctly. These questionnaires included the Interpersonal Reactivity Index (IRI), tailored to measure affective and cognitive empathy as separate entities, and a modified version of the Strange Stories task (Happé, 1994), designed to measure theory of mind. To date, the IRI is the only published measure that tests for empathy on a multi-dimensional level. It is comprised of two cognitive scales—perspective-taking (PT) and fantasy (F)—and two affective scales—empathic concern (EC) and personal distress (PD). Regarding the cognitive aspect, the PT scale assesses the tendency to spontaneously adopt the psychological viewpoint of others, while the F scale measures the participant’s tendency to identify with fictional characters such as those from books, movies and plays. As for the affective aspect, the EC scale taps the participant’s feelings of warmth, compassion and concern for others while the PD scale assesses self-oriented feelings of anxiety and discomfort resulting from tense interpersonal settings. For the modified Strange Stories test, participants read short stories and subsequently answer questions about the text that require them to infer a character’s thoughts, feelings, or intentions.

After statistical analysis and comparison, it was found that AS groups scored significantly lower than controls on the cognitive scales of the IRI (PT and F). This indicates a very obvious deficit in the capacity of AS patients for cognitive empathy—that is, AS patients seem to have trouble taking the perspective of and identifying with other people, both real and fictional. However, results were quite different for the affective scales. There was no significant difference between the AS group and control group on the EC scale; in addition, the AS group actually scored higher than controls on the PD scale. These findings confirm the dissociation between cognitive and affective empathy, as well as suggest that socially directed emotional capacity remains preserved in AS individuals. In other words, people with AS are able to elicit just as much care, concern and compassion for others as typically developing individuals do. They also seem to experience a higher sense of socially induced anxiety and discomfort; however, it should be kept in mind that this may simply reflect a generally increased baseline level of stress and anxiety in AS individuals. On the Strange Stories test, the AS group again scored significantly lower than their typically developing counterparts, as expected. These scores correlate with their lower performance on cognitive measures, as the ‘theory of mind’ tested by the Strange Stories task is closely reminiscent of cognitive empathic ability.

It follows logically that deficits in areas of social cognition (such as cognitive empathy) will manifest themselves through internal and external struggles in one’s social realm. A study by Bellini (2004) addressed the relationship between empathic skills and various social anxiety
measures in AS and HFA adolescents. This relationship was examined by administering the Social Skills Rating System (SSRS), the Multidimensional Anxiety Scale for Children (MASC), and the Social Anxiety Skills for Adolescents (SAS-A) to a group of AS or HFA adolescents, and the SSRS and Behavioral Assessment System for Children (BASC) to the parents of the adolescents. The SSRS is a questionnaire designed to gather information on the social behavior of children 3-18 years old, measuring whether the child uses various social skills during social interactions. The MASC consists of four basic anxiety scales that assess the major dimensions of anxiety—physical symptoms, social anxiety, harm avoidance, and separation/panic. The SAS-A is a self-report measure of social anxiety on three factors: (1) fear of negative evaluation, (2) social avoidance and distress in new situations, and (3) social avoidance and distress in general. The BASC, administered to parents, measures the multidimensional nature of children’s behavior through items assessing anxiety, social skill problems, and other behaviors.

Results found that adolescents with ASD reported levels of anxiety that were significantly higher than the mean of the normative sample, as determined by the MASC. On the parent version of the BASC, significant differences were found in the subscales of anxiety and internalizing problems. On the SAS-A, 49% of participants scored at a level indicating high social anxiety while 12% scored for low social anxiety. After correlational analysis, a curvilinear (inverted U-shaped) relationship was found between the SSRS empathy subscale and all of the SAS-A scales as well as between the SSRS empathy subscale and the MASC subscales of social anxiety and performance fears. These data suggest that low empathy scores correlate with low social anxiety, and as empathy scores increase, so does social anxiety. However, when empathy scores rise further—usually just past the mean—social anxiety scores begin to drop. This is perhaps because adolescents with low empathy may be unaware of or unconcerned with what people think of them socially, and as a result exhibit little social anxiety. As empathic skills increase, so does the awareness that other people may perceive their behavior as odd or deviant, thus increasing social anxiety. Lastly, better empathic skills are most likely associated with more adept social functioning and more effective emotional coping skills, again resulting in lower social anxiety. Although it was not specified which component of empathy was tested for, these findings define an initial relationship between general empathy and social cognitive aspects, namely social anxiety.

A related study by Williams (2006) examined ten autobiographical accounts, written for empirical purposes, of adults diagnosed with either HFA or AS in search of common challenges they experienced in day-to-day living—namely regarding the gap they felt between themselves and their society and the strong sense of alienation it created. Through careful analysis of these autobiographical accounts, Williams was able to identify four common themes concerned specifically with the writers’ difficulties in trying to relate to other people and the coping strategies they devised to try to address these difficulties.

The first of these themes addressed the psychological distance they experienced between themselves and other people. Some participants described themselves as detached scientists, recording observational data. One participant writes, “When other students swooned over the Beatles, I called this an ISP—an interesting social phenomenon. I was a scientist trying to figure out the ways of the natives. I wanted to participate, but I didn’t know how” (Williams, 2006, pg. 709). Others described themselves as aliens from outer space, in an effort to fully capture the extent of the gulf they felt between themselves and others. However, not all of these accounts were written negatively—interestingly, some accounts conveyed a sense of fascination rather than discomfort, illustrating that the writers did not necessarily regard their condition in the same light as the general population would assume.

The second theme was that social and emotional cues were ‘hidden’ or inaccessible to these participants. Most accounts revealed difficulties in picking up both verbal and non-verbal social and affective information such as particular gestures, physical changes, facial expressions and tone of voice. Most participants discussed one of the following: the enigmatic nature of social interaction, difficulty in picking up ‘hidden’ social and emotional cues, difficulty picking up social and emotional cues due to
sensory problems, and development of the ability to “read” emotional cues.

The third theme regarded coping strategies. Most writers stated that they had to consciously form explicit strategies to help facilitate their social interactions in the absence of the social intuition that most people are endowed with. These strategies included studying other people’s behavior, imposing a system of rules to help them manage social situations, and using a ‘visual library’—a record of past social situations that they could access at a later date to search for solutions to new situations.

The last theme, unfortunately, was the limited success of their coping strategies. Writers commonly wrote about the inadequacy of their devised cognitive strategies in helping them deal successfully with the variety of complex social situations they encountered every day. One account questioned:

Do I really have to talk on the phone to anyone if I think the conversation is boring or a waste of my time? If there is a lapse in the conversation, am I supposed to hang up or tell a joke or just sit there? What if I like the person well enough, but I decide I can’t stand one of their behaviors or habits?…The questions are endless, and the concerns mountain high. This is why human relationships usually take me beyond my limits (Williams, 2006, pg. 716).

These insightful accounts paint a clear picture of the tremendous amount of energy that individuals with AS or HFA must expend in order just to navigate the same social situations that come as secondhand nature for the typically developing population. According to Baron-Cohen (2000), the capacity to reflect on the content of one’s own and others’ minds enables him to interact successfully with those around him. Therefore, it can be safely presumed that what causes, or at least contributes to, the social struggles encountered by people with AS or HFA is their deficiency in cognitive empathy. Because they are not as proficient in being able to take the perspective of another, their social interactions subsequently suffer, as portrayed by the accounts discussed above. Gallup Jr. (2002) makes the empirically founded claim for cognitive empathy as a byproduct of self-awareness; Asendorpf and Baudonnière (1993) also propose the theory that self- and other-awareness are closely linked. Logically speaking, the dual equipping of an awareness of both oneself and others should manifest in relative social competence or at least facilitate the learning of normative social conduct, reinforcing a correlational and suggesting a causal relationship.

This review integrates two tendencies associated with ASD—impairments in empathy and impairments in social functioning—and attempts to establish a relationship between them. When discussing empathy, one should be careful to separate the distinct elements of cognitive versus affective empathy. These two components refer to the ability to take the perspective of another and the capacity to respond emotionally towards another person’s affective state, respectively. Studies have indicated that in individuals with AS and HFA, only the cognitive aspect of empathy suffers damage while the affective realm is preserved.

Previous investigation conducted on typically developing children confirms the existence of a positive relationship between theory of mind and social interaction skills (Watson et al., 1999; Astington & Jenkins, 1995), particularly through correlational analyses of performance on false-belief tasks and naturalistic observations of behavior. Reports on the social manifestations specifically of affective empathy are scarcer, but there has been evidence suggesting an inverse correlation between measures of affective empathy and levels of aggression, independent of cognitive empathic measures (Shechtman, 2003; Lovett & Sheffield, 2007). Under these premises, the pattern of results summarized above should reflect no significant deviations in aggression for HFA and AS populations, but this is an assumption that must be formally tested.

Through an analysis of relevant literature, it can be proposed that a deficit in the distinct area of cognitive empathy not only correlates with but also holds responsibility, at least in part, for the significant detriments in aspects of social functioning seen in those who suffer from ASD, as suggested by both empirical research and firsthand anecdotes from AS and HFA participants themselves.
REFERENCES


WRITING SYSTEMS, PHONEMIC AWARENESS, AND BILINGUALISM: CROSS-LINGUISTIC ISSUES IN DYSLEXIA

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ABSTRACT

Research suggests that more cases of dyslexia are diagnosed in populations that speak languages with highly opaque writing systems, such as the United States, the United Kingdom, or France, and fewer cases of dyslexia are diagnosed in populations that speak language with transparent writing systems, such as Italy, Spain, or Mexico. This disparity can be explained by the differences in how dyslexic people and non-dyslexic people read and by the many irregular combinations of letters in opaque orthographies that require memorization. Discussing these topics paves the way to considering issues of bilingualism and second language learning as they are related to dyslexia.

Introduction

Dyslexia is a learning disability that is often misunderstood. The popular perception of what dyslexia is or feels like is not in line with the reality of dyslexia. Dyslexia becomes an even more complex issue when multiple languages – and with them, multiple writing systems – are brought into play. My goal in this paper is to explore what dyslexia is, why dyslexia is different in various languages, how issues of multiple orthographies change dyslexia, the challenges faced by dyslexics who want to learn a second language, and the unique issues surrounding bilingualism in dyslexia. Throughout this exploration, it is inevitable to discover again and again that the unique characteristics of different writing systems are extremely influential in how dyslexia is manifested and even defined.

What is Dyslexia?

First, it would be valuable to give some background on what dyslexia is and what causes it. Most of the research done on dyslexia has been written in and about English speakers, partly because a large breadth of scholarly work is done in English and partly because English speakers, as a group, have a high prevalence of dyslexia as compared to speakers of other languages. As a result of this ample amount of work done on dyslexia in English speakers and because this paper is in English, I will talk about dyslexia in English speakers in this section. Dyslexia is defined as “unexpectedly low reading ability in people who have adequate intelligence, typical schooling, and sufficient sociocultural opportunities,” (Siok, Zhendong, Jin, Perfetti, and Tan, 2008, pg. 5561). Basically, dyslexia is only diagnosed after exhausting all other possible reasons for low reading levels.

Although the definition of dyslexia essentially labels it as a catch-all for poor readers, dyslexia is a specific impairment in reading and writing with its own unique characteristics. Most dyslexics struggle with issues of phonemic/phonological awareness. Far from the popular image of letters swirling around a page, impossible to catch and thus impossible to decipher, dyslexics actually have difficulty aurally distinguishing the phoneme [b] from [p] or [m] from [n] and so forth with other sounds that share multiple features. They also have issues in recognizing what a phoneme is. Dehaene (2009) gives the example of asking a child how many sounds they hear in the word “rich” and then asking how many they hear in the word “pitch.” For “rich,” most children will say three (r-i-ch), but for “pitch,” they will say...
four (p-i-t-ch) despite the fact that “rich” and “pitch” are minimal pairs and sound the same except for the first phoneme. This confusion results from having learned that [tʃ] can be notated as “ch,” but not yet realizing that it can also be written “tch,” so the children trick themselves into believing that they also hear a [t] in “pitch” as a result of a lack of understanding of grapheme to phoneme conversion. An adult with no language impairment would likely tell you that she hears three sounds for both “rich” and “pitch” because she has higher phonemic awareness than a child just learning to read. Dyslexics have trouble with these kinds of phonemic awareness tasks, generally answering in agreement with the child, and that difficulty is a defining characteristic of their condition.

Neurologically, Dehaene tells us, when dyslexics read, the left middle temporal gyrus is activated less than it would be in the brain of a non-dyslexic reader. To compensate for the low-performing left middle temporal gyrus, dyslexics overuse the left inferior frontal cortex (which contains Broca’s area). However, it does not seem to help them decode writing. Upon further examination, researchers have determined that dyslexics have more gray matter in the left middle temporal gyrus than have non-dyslexics. Unfortunately, this larger mass of gray matter seems to actually decrease productivity in the region because it is very unorganized and contains ectopias (misplaced neurons). The quantity of misplaced gray matter correlates positively with the severity of the reading impairment, which seems to go along with the idea that more gray matter in the left middle temporal gyrus decreases reading skill or productivity (2009).

These ectopias in the left middle temporal gyrus led researchers to the genetic causes of dyslexia, which include abnormal neuronal migration. During pregnancy, neurons migrate from the ventricles to where they are supposed to end up in the cortex. Ectopias are formed when the neurons go too far and “crash” land. Essentially, the excess unorganized gray matter around the left middle temporal gyrus in the brains of dyslexics is formed by neurons that were not told how to migrate correctly. Neuronal migration is dictated by some sections of DNA. Of the four genes that have been isolated and connected with dyslexia, three of them are involved in neuronal migration. If any of those three genes do not give the correct information and the neurons do not migrate how and where they are supposed to migrate, excess gray matter is formed around the left middle temporal gyrus while the child is still in the womb, later causing dyslexia (Dehaene, 2009).

There is more than one type of reading impairment, so it is important for anyone who is studying dyslexia to understand what other types of impairment there are, especially in terms of understanding when dyslexia is involved and when the impairment is something else. When I mention dyslexia in this paper, I am talking about developmental dyslexia, which is genetically transferred in the way that I have described above and present from birth. However, there are also many types of acquired dyslexia that usually result from brain lesions, either in the posterior region of the dominant hemisphere for language (usually the left) or in the dominant perisylvian region, meaning the area around the sylvian fissure (Coslett, 2000):

![Figure 1](http://psychology.uwo.ca/fmri4newbies/Images/sylvian_fissure.jpg)

The Sylvian fissure touches on many of the areas used in processing of reading, so the fact that a lesion in this area would cause reading difficulty is unsurprising.

There are two main types of acquired dyslexia: peripheral dyslexia, which is primarily an issue of matching writing to stored meaning, and central dyslexia, which is a deeper issue with processing text. Within the category of peripheral dyslexia, there are three types: pure
alexia (alexia without agraphia), neglect dyslexia, and attention dyslexia. All three types of peripheral dyslexia are caused by lesions, usually in the posterior region of the dominant hemisphere (as a lesion in the occipital lobe would disrupt the travel of some visual stimuli to other areas of the brain). Pure alexia is characterized by reading very slowly, letter by letter (Dehaene, 2009). Neglect dyslexia is characterized by missing the beginning of a string of letters. This form of dyslexia is sometimes affected by what the string is, so someone with neglect dyslexia could not be able to read a non-word like “tiggle” but be able to read a real word like “giggle” if she was sensitive to the letter “g” (Coslett, 2000). Someone with attention dyslexia, the third type of peripheral dyslexia, could read a word on its own, but not when it is surrounded by words. Similarly, she could identify letters individually, but not in the context of a word (Coslett, 2000). Not much is known yet about the exact workings of the brains of people with these acquired dyslexias, but they are certainly related to visual difficulties, which developmental dyslexia usually is not.

In the category of central dyslexias, we find three specific types: deep dyslexia, phonological dyslexia, and surface dyslexia. All three of these dyslexias are also acquired, but phonological dyslexia and surface dyslexia are quite similar to developmental dyslexia. Deep dyslexia is characterized by semantic errors (giving “knight” as an answer when asked to read “castle”), visual errors (reading words as visually similar words, e.g. reading “scale” as “skate”), morphological errors (reading “scolded” as “scolds” or “governor” as “government”), reading words that describe tangible objects (“hat,” “car”) more easily than words that describe intangible ones (“wish,” “thought”), reading nouns more easily than adverbs/adjectives, which in turn are read more easily than verbs (though this difference in difficulty may be as a result of the tangible/intangible issues), having a hard time reading function words (which again, could have to do with the tangibility issue), and having great difficulty reading pseudo-words. This is a very wide range of symptoms, so there are several proposed explanations for what processes exactly are disrupted in deep dyslexia, but the most likely answer seems to be that the process of converting from graphemes to phonemes is disrupted, some semantic impairment is involved, and visual processing issues also persist. Deep dyslexia is usually caused by lesions in the dominant perisylvian region (Coslett, 2000, pg. 238-9).

As we can see based on the symptoms, deep dyslexia and the peripheral dyslexias are not very similar to developmental dyslexia. Phonological and surface dyslexia, however, are slightly more similar. Phonological dyslexia is characterized by not being able to read non-words. Although people with phonological dyslexia can read 85-95% of words correctly, they sometimes perform as poorly at 10% correctness on pseudo-words (Coslett, 2000, pg. 239). Usually this difficulty stems from confusing a non-word with a real word that looks similar to it or from converting graphemes to phonemes incorrectly (e.g. pronouncing the non-word “stime” as [stɪm] to rhyme with “him” rather than [stʌɪm] to rhyme with “lɪm”). Phonological dyslexia is also usually caused by lesions in the dominant perisylvian region, but most phonologic dyslexics also have lesions in the angular and supramarginal gyri as well as the superior temporal lobe (Coslett, 2000, pg. 239-40).

The last type of dyslexia, and the most similar to the majority of cases of developmental dyslexia, is surface dyslexia. It is characterized by relative ease reading phonologically regular words and non-words, but difficulty reading irregular words. Some people with surface dyslexia are only able to grasp the meaning of a written word after they have found its phonological form by saying it aloud or thinking it (Coslett, 2000, pg. 240-1). These issues with phonological forms seem to stem from difficulty accessing the lexical route, which is one of the two ways that readers process written language. To read a word, we either go through the lexical route or the phonological route in the brain. The phonological route is the way that non-dyslexic elementary schoolers read: sounding the words out to get their meaning. The lexical route is more like how non-dyslexic adults read: seeing a word on the page leads directly to its meaning without the phonological middle man. Most
non-dyslexic adults do not read only with the lexical route, but some words do become more automatic and can take the lexical route, which some longer and less frequent words still need to be sounded out to be understood (Dehaene, 2009). The issue of phonological route vs. lexical route is an important one in the discussion of dyslexia because so many dyslexics have difficulty accessing the lexical route.

In summary, dyslexia in English speakers is an issue of difficulty in converting graphemes to phonemes. It is caused by excess unorganized gray matter in the left middle temporal gyrus, which does not activate as much as it would in a non-dyslexic while reading. The excess gray matter is a result of poor neuronal migration, which, in turn, is a result of poorly laid plans by some strands of DNA. There are six types of acquired dyslexia, two of which (phonological and surface dyslexia) are similar to developmental dyslexia, which is the reading impairment that this paper discusses. Dyslexia seems to exist on some sort of spectrum, so there can be more severe and less severe cases (which we judge in English by the amount of excess gray matter surrounding the left middle temporal gyrus).

Differences in Dyslexia Across Languages

As I mentioned earlier, English speakers have higher rates of dyslexia than do speakers of other languages. This fact seems odd at first, but there is a simple explanation. A language whose writing system has graphemes mapping almost one-to-one onto phonemes is called a transparent writing system (e.g. Spanish, Italian), while a writing system where graphemes have many phonetic interpretations or phonemes have many graphemic interpretations is called an opaque writing system (e.g. French, English). As stated before, dyslexia is primarily an issue of phonemic awareness and converting graphemes to phonemes, so languages with transparent writing systems are the ones whose speakers have relatively low rates of dyslexia because it is easier to convert graphemes to phonemes when there is an almost one-to-one correspondence. As an example, Italian has 33 ways to spell its 25 sounds while English has approximately 1,120 ways to spell its 40 sounds (Helmuth, 2001, pg. 2064). This disparity in number of irregular combinations of letters helps to explain why there are fewer cases of dyslexia in Italy than in the United Kingdom or the United States.

Of course, having low rates of diagnosis of dyslexia does not mean that there are no dyslexics in Italy. Dyslexia still exists in the same form in Italy; the brains of Italian dyslexics (whether diagnosed or not diagnosed) have the same characteristics as the brains of English dyslexics with excess gray matter and ectopias in the left middle temporal gyrus. However, dyslexia, as stated before, exists on a spectrum. Paulesu, a knowledgeable scholar in the field of Italian vs. English dyslexia, suggests that mild dyslexia may be “aggravated” by opaque orthographies like English or French (2001, pg. 2167) so that mild dyslexia may not be obvious in some Italian readers while it would be in an English or French reader. This difference in display but similarity in condition can be seen from testing dyslexic speakers of different languages on reading comprehension and on phonemic awareness. In one study, Italian, English, and French dyslexics performed equally poorly on phonological tasks, but the Italian dyslexics performed better on reading comprehension tasks than did the speakers of languages with opaque writing systems, showing that while the condition of dyslexia is the same in these three languages, it is more clearly manifested in languages with opaque orthographies (Johansson, 2006, pg. 33). In fact, even in non-dyslexic, fully grown readers, there is a reading speed difference between languages with transparent orthographies and languages with opaque orthographies (Frost, Katz, and Bentin, 1987), so the issue may be less about dyslexia and more about transparent writing systems being easier to process than opaque ones. Regardless, there are less diagnosed cases of dyslexia in countries where a language with a transparent writing system is spoken than countries were a language with an opaque writing system is spoken.

Although writing about how languages with transparent orthographies tend to have less dyslexic readers than languages with opaque writing systems do is very interesting, we do have to remember that cause and effect are not always so clear. In one study of predictors of
reading skill across several languages, an author cautioned his readers with one possible explanation of why literacy skills may be higher in countries with languages that have transparent writing systems:

[One] explanation may be that an interaction between literacy levels and phonological skills leads to variation in the ability of measures to assess these skills across languages. Hence, a highly transparent orthography leads to high-level literacy as well as good phonological skills in certain areas but not in others requiring more complex literacy and variable phonological measures to assess these varying skill levels (Smythe, Everatt, Al-Menaye, Xianyou, Capellini, Gyarmathy, and Siegel, 2008, pg. 184)

Though it is certainly possible that the only reason why there are less cases of dyslexia in languages with transparent orthographies may be that these languages are easier for dyslexics to read, it may also be possible that having a highly transparent orthography may allow for more opportunities for learning of literacy and phonological skills than a dyslexic reading a language with a relatively opaque writing system would have.

Most of this discussion of dyslexia so far has been focused on languages with alphabetic writing systems, but there are many languages in the world with logographic systems or systems somewhere in between alphabetic and logographic. Mandarin Chinese is an interesting example because it is a widely spoken language with a mostly logographic writing system. Since readers of Chinese do not perform a lot of conversion from graphemes to phonemes because their writing system is non-alphabetic, dyslexia in Chinese is somewhat related to phonological problems, but is more an issue of low levels of activation in the left middle frontal gyrus, where visuospatial and verbal working memory is coordinated (Siok, Zhendong, Jin, Perfetti, and Tan, 2008, pg. 5564). This area may be recruited to deal with Chinese characters because they require memorization. Unlike dyslexia in English, there is also component of impaired reading in the right hemisphere. Non-dyslexic readers of Chinese react strongly to writing in the right midinferior frontal gyrus, while dyslexics react more strongly in the right inferior occipital cortex (Siok, Zhendong, Jin, Perfetti, and Tan, 2008, pg. 5564). It seems that the right midinferior frontal areas of the brain are involved in fluent reading of Chinese, while the right inferior occipital areas are involved in the visual processing of the characters, suggesting that dyslexic Chinese readers have issues processing the characters before even dealing with the phonological processing (if they need to use the phonological route at all). Dyslexia in Chinese may also be related to handwriting skill because to learn and memorize characters, Chinese children copy the characters out many times over in school (Siok, Zhendong, Jin, Perfetti, and Tan, 2008, pg. 5564). These huge differences in cause of reading impairment across writing systems raise a fascinating question: is dyslexia a different condition in readers of Chinese versus readers of English? Not enough research has been done yet to give a confident answer to this interesting idea, but it is important to keep this question in mind when discussing cross-linguistic issues of dyslexia.

When Scripts Intersect

The differences between writing systems and how we read differently depending on what kind of script we are reading is fascinating, but what happens when our brain deals with more than one orthography? Japanese is a language that has three scripts: kanji, hiragana, and katakana. Kanji is a logographic script borrowed from Chinese. Hiragana and katakana can be encompassed under one name: kana. Kana is a syllabic script that is completely regular and transparent: one character is one syllable and the character always means the same sound. No more than one character relates to one sound. There is a perfect one-to-one correspondence of grapheme to sound. Readers of Japanese probably process kanji in the same way that readers of Chinese process their writing, while Japanese readers likely process kana similarly to a highly transparent alphabetic script. Because of these two scripts that are processed in very different ways, Japanese has a very unique writing system.

The Japanese kana system may give dyslexics a chance to re-interpret phonemes and give them a tool for understanding writing, thus
causing less dyslexia in Japan than in other countries (Johansson, 2006, pg. 35). Because Japanese has two writing systems that do not generally cause people with phonemic awareness issues to be diagnosed with dyslexia (since the kana system is transparent and the kanji system is logographic, which does not require phonological skill), the numbers of diagnosed dyslexics in Japan are lower than in English-speaking countries (Wydell and Kondo, 2003, pg. 38). Wydell and Kondo found a college student who is natively bilingual in Japanese and English and has severe reading problems in English, but no issues in Japanese (2003). This lack of reading problems in Japanese is likely caused by their subject (1) not having the memory issues or handwriting issues that would cause problems for a reader of Chinese or other logographic writing systems and (2) the extreme regularity and transparency of the kana system.

It is fairly uncommon for scripts to intersect except when looking at bilingualism, so I will only discuss one other example of a language that can be written with more than one script that illustrates a very different point from the example of Japanese. Currently, Serbian is written with Cyrillic characters and Croatian is written with Roman characters, but in the 1980’s when Feldman and Turvey performed a study on this issue, Serbian and Croatian were one language, Serbo-Croatian, that could be written either with the Cyrillic alphabet or with the Roman alphabet. Because of this variance in ways to write the language, children learned how to write their language with both alphabets in school, so they were all essentially “bigraphic.” Serbo-Croatian is highly transparent, so it is very easy to agree on how non-words should be read and non-words should be read fairly quickly. In the way of writing at the time, there were some characters that were the same in the two writing systems and signified the same sound: A, E, O, J, K, M, and T. There were also some characters that looked the same in the two systems, but meant a different sound: H, P, C, and B. This means that there were eleven letters in total with overlap between the Cyrillic alphabet and the Roman alphabet. The scholars performing the study had “bigraphic” readers of Serbo-Croatian read several words that they had selected that only used letters from the eleven overlapping characters. Some words would convey real meaning if they were read as written in the Cyrillic alphabet but would be non-words in the Roman alphabet. Other words were real words in the Roman alphabet but non-words in the Cyrillic. The “bigraphic” readers took twice as long to read any of these overlapping words as they took to read words that contained clear indicators of Cyrillic (e.g. Љ, Д) or Roman (e.g. S, D). This study suggests that the phonological route is very important in Serbo-Croatian as a shallow language because the participants did not recognize the words via the lexical route, which would have saved them time (Feldman and Turvey, 1983).

Second Language Learning

Although the popular conception is that to learn multiple languages, you must be somehow intelligent, intelligence is not necessarily related to skill for language learning, which means that there may be some other inherent skill for language learning. It seems that the number one predictor of overall skill in a second language (L2) is read and written native language (L1) proficiency, but speed of native language learning is also a significant predictor of L2 skill (Sparks, Patton, Ganschow, Humbach, and Javorsky, 2006). This piece of information obviously has important implications for dyslexics who want to learn a second language, since their reading and writing skills are less developed than those of non-dyslexics. However, there are ways to combat this language-learning disadvantage, since knowledge of vocabulary in the native language and familiarity with the L2 writing system also play a role in predicting second language proficiency (Kahn-Horwitz, Shimron, and Sparks, 2006, pg. 177-8). Dyslexics could focus on learning a lot of vocabulary in their first language before attempting to learn a second language and try to choose a language with familiar writing system. Of course, most children who learn a second language transfer their reading difficulties and phonological processing issues over from L1 (Chung and Ho, 2010, pg. 195). In fact, Chinese dyslexics seem to be at high risk for a reading deficit in L2 despite the fact that the writing systems are so different. It also seems that the
level of difficulty involved in reading in L1 seems to be reflected in L2 (Chung and Ho, 2010, pg. 206). So regardless of coping strategy, these issues do present significant difficulties to dyslexics who seek to learn a second or third language.

**Bilingualism**

Bilingualism and dyslexia is the combination of everything that has been discussed in this paper: dyslexia, differences in dyslexia between languages, intersections of writing systems, and learning a second language. Combining the knowledge that we now have about all of those topics will allow us to understand the unique issues surrounding bilingual (and multilingual) dyslexics.

Bilingualism in itself is an interesting area of study with as many popular misconceptions attached to it as there are misconceptions about dyslexia. The main false belief about bilingualism is that raising a child to be bilingual will hurt the child’s development because learning more than one language at once will be too overwhelming. This is a concern that is often raised when discussing bilingual dyslexics. Some might say that if children cannot learn to read in one language, how can they learn to read in two or more languages? Cline (2000) provides a response:

We might hypothesize that the additional challenges will overload children with dyslexia and increase the likelihood of failure. But an alternative hypothesis is possible—that such children will benefit from varied reading experiences and will be more likely to engage successfully with print, generalizing from one form to another (pg. 8-9).

Dyslexics could be overwhelmed by multiple languages and “self-destruct” when it comes to reading or they could learn from multiple language experiences and use their knowledge to cope with their disability. So, to find the answer to this issue, the questions that we should be considering about bilingualism and dyslexia seem to be: (1) Do dyslexic bilinguals transfer their dyslexia across languages? and (2) Do dyslexic bilinguals perform worse, better, or the same on reading tasks as dyslexic monolinguals?

In terms of the question of whether dyslexia is transferred across languages, we have already seen that dyslexia is transferred across languages with the information on the Chinese-English bilingual dyslexics who tended to have similar reading difficulties in L1 and L2 (Chung and Ho, 2010, pg. 195). Another study with dyslexic and hyperlexic Kannada-English bilinguals showed that these bilinguals showed similar reading impairments in both languages that they spoke (Joshi, Padakannaya, and Nishanimath, 2010). However, Wydell and Kondo’s subject who was a Japanese-English bilingual was dyslexic in English but not in Japanese (2003). I suspect, however, that this lack of obvious dyslexia in Japanese was not actually a mystical absence of dyslexia in Japanese, but rather, a lack of obvious dyslexia in Japanese. Much like Italian dyslexics who do not manifest easily seen difficulties in reading because of the high level of transparency of their writing system, Wydell and Kondo’s subject likely did have some level of dyslexia in Japanese but it did not show because of the extreme transparency of the syllabic kana system and the lack of reliance on phonological representations inherent in the logographic kanji system.

As stated before, many people would expect dyslexic bilinguals to perform worse on language tests than dyslexic monolinguals because the bilinguals could be confused by speaking two languages. However, there is evidence that in at least one study, dyslexic bilinguals performed better on English tests than their dyslexic monolingual counterparts. A group of Arabic-English dyslexic bilinguals were compared to a group of dyslexic English monolinguals. The bilinguals learned to read English in school (as did the monolinguals) and Arabic at a three hours/week Arabic Heritage Language school. The researchers tested a group of non-dyslexic Arabic-English bilinguals against a group of non-dyslexic English monolinguals using word and pseudo-word reading tests and general language proficiency. These two groups performed at a similar level. However, when comparing the dyslexics, the Arabic-English bilingual dyslexics performed better than the English monolingual dyslexics on the same tests (although both groups performed worse than the non-dyslexics). The researchers
suggest that the highly regular orthography of Arabic may have helped the bilinguals to develop better literacy skills (Abu-Rabia and Siegel, 2002). So in some cases, bilingual dyslexics do perform better than monolinguals. Unfortunately, this area of study is still small, so I was unable to find any other studies specifically comparing reading skills of dyslexic bilinguals and monolinguals.

Another interesting case of bilingualism is the case of Hebrew and English. In a study of non-dyslexic Hebrew-English and English-Hebrew bilinguals, both the bilinguals whose first language was English and the bilinguals whose first language was Hebrew read English faster than Hebrew, even though bilinguals usually suffer some sort of speed and accuracy deficit in their second language (Shimron and Sivan, 1994). Shimron and Sivan theorize that reading Hebrew takes more time because of its ambiguity when unwoveled (Hebrew, like the other Semitic languages, is traditionally written without vowels and the vowels must be inferred), its complex affixes that require extra mental “unpacking,” and its right-to-left orientation (words seen in the right visual field are processed more quickly because they go straight to the left hemisphere of the brain where language is centered) (1994). Regardless of why this difference in reading speed occurs, it runs counter to the typical situation where L2 is slower to read than L1, so Hebrew gives us an interesting forum in which to compare bilingual dyslexics and bilingual non-dyslexics.

In one study by Oren and Breznitz, Hebrew(L1)-English(L2) dyslexic bilinguals were compared to Hebrew-English non-dyslexic bilinguals. The dyslexics performed poorly on speed, phonological processing, and orthographic ability both in Hebrew and in English. While dyslexics were slower in reading Hebrew than the non-dyslexics, their accuracy was the same as non-dyslexics. In English, both reading rates and accuracy were lower for dyslexics than non-dyslexics. The dyslexics’ reading rates in English were also slower than their reading rates in Hebrew, a contrast from the non-dyslexics who read faster in English (2005). In an analysis of their data, Oren and Breznitz explained that in skilled readers, reading proficiency in English does not have to follow the typical L2 profile and readers can, in fact, be more proficient in English than in Hebrew (L1). However, in impaired readers, the demands for phonemic awareness in English and decreased automaticity that comes with a second language cause more reading problems than Hebrew does. They bring this conclusion into the practical sphere by saying that we cannot ignore the unique constraints and characteristics of each human language since reading difficulties vary widely by orthography, as we have seen over and over again in this paper (2005).

Conclusion
Orthography is key in understanding dyslexia. Since dyslexia is a learning disability that can vary widely from language to language, orthography and the specific writing-related features of the languages must be kept in mind during study, diagnosis, and treatment of dyslexia. Second language learning and bilingualism in dyslexia are of special interest to teachers of dyslexic bilinguals and students seeking to learn a second, third, or fourth language, but are also enlightening topics for all of those people who study dyslexia because of the cross-linguistic issues that they bring up. From the few cases of dyslexia in Italy to the different challenges required in reading Chinese and the neurological effects of intersecting scripts, we have seen in this paper that dyslexia exists not only on a spectrum of mild to severe, but on a plane of many different symptoms. Dyslexia is a truly variable disability, and this fact must be kept in mind when studying it.

References


SCHEMA TRIGGERING, SCHEMA APPLICATION:
ON AGREEMENT AND DISAGREEMENT IN READING

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In this paper I explain how we come to agree or disagree about interpretations of literary texts. The foundation for my argument is schema theory, a cognitive theory of memory structure, which I use to demonstrate how each of us develops an overall interpretation of a given story or poem. I consider several patterns of schema triggering and application that occur as we read, each of which helps lead us to a unique interpretation of a given text. In order to support this argument, I draw from my own empirical research, consisting of undergraduate English students reading a poem and then responding to preset questions about that poem. I also draw from figures in cognitive theory such as Rumelhart, Turner, and Hogan.

Introduction

The introduction of cognitive science into the field of literary studies has the potential to provide English scholars with new ways of thinking about reader response. Specifically, cognitive science can help with a particularly difficult issue in literary studies, one that has been controversial throughout the history of the field: why do we agree and disagree about interpretations? In the past scholars have gone so far as to argue that an objectively correct interpretation of a text was possible, meaning that disagreement could be explained by the fact that most people were just wrong, while agreements could be explained by pointing to the objectivity of the text at hand. Most scholars do not currently hold this view, but to my knowledge, no satisfying account has been produced to explain why disagreement and agreement are possible when we read. If there is a text in front of us, how can we disagree about what is right there? But if we are all different people with different attitudes and beliefs, how can we agree at all? Cognitive science, and schema theory in particular, is well suited to this task. There have been numerous studies into how schemas affect reading comprehension and interpretation, and that schemas play a central role in reading as well as everyday life is undeniable.

However, the kinds of schemas that we use when we read, and the ways in which those schemas influence our reading, have not been explored in terms of agreement and disagreement.

In order to answer the question of why readers both agree and disagree, I conducted research with seven students from an upper-division English course at Illinois Wesleyan University; these students were asked to read a Sylvia Plath poem, “Stopped Dead,” and then respond to several questions about the poem. The questionnaire, along with a copy of the poem, is attached in the appendix at the end of this paper. The participants had one week to complete and return the questionnaire, and were instructed to refrain from accessing any outside sources that might help them interpret the poem, including scholarly articles, other poems by the poet, biographical information about the poet, each other, etc. This research allowed me to examine reader response from a schema theoretic perspective and to develop a theory of reading that can explain the ways in which we agree or disagree about texts as well as how that happens. Specifically, it gave insight into the ways in which schemas are triggered and applied while we read.\(^1\)

\(^1\) It’s important to note here that, though seven students responded to my questionnaire, not all of the students
Schema Theory

A schema “is a data structure for representing the generic concepts stored in memory. There are schemata representing our knowledge about all concepts” (Rumelhart, 1980, p. 34). Far from having dictionary definitions of words stored in our brains, we actually store much of our knowledge in schema form, as a “network of interrelations that is believed to normally hold among the constituents of the concept in question” (p. 34). For instance, the constituents, or “slots,” of our schema for dog might include “four legs,” “furry,” “has a tail,” and “has sharp teeth.” In addition to physical aspects of the dog, a dog’s role as a pet rather than as a wild animal might make up part of the schema, and culturally relevant traits, such as loyalty, might be added in as well. The network of interrelations between these constituents tells us how these elements fit together to form the concept of a dog (p. 34). The slots (has four legs, is furry) listed above are what are called “defaults,” at least as far as my own schema for dog is concerned (Hogan, 2003, 44). Default values for slots allow us to predict and more easily understand what a thing will be like. Slots, however, are flexible, and when we come into contact with something that does not match up with our defaults for the corresponding schema, we still easily recognize the thing in question; though one of my default values for dogs is that they are furry, I can adjust that understanding when I come into contact with a hairless dog. This flexibility exists because “default hierarchies usually include specified alternatives to the default” (p. 44). So, to use Patrick Colm Hogan’s example, if one of the defaults in our “man” schema is that he has two arms, upon learning that a particular man does not have two arms, we will switch to one of two alternatives: the man was “born without an arm/both arms” or he “lost an arm/both arms” (p. 44).

Schemas play crucial roles in comprehension in terms of both everyday life and reading. Some research on schemas focuses specifically on comprehension, on “how memory schemata are activated and used to guide the organization of incoming information” (Thorndyke and Yekovich, 1980, p. 26). David E. Rumelhart expresses the general attitude of theorists with this focus when he says that “perhaps the central function of schemata is in the construction of an interpretation of an event, object, or situation – that is, in the process of comprehension” (p. 37). Many others have applied this principle to the reading process, suggesting that we understand the text through our own schemas, constructing our reading through collaboration between the text and our own minds. Dieter Freundlieb sums this up well: “the large part of what we understand when we read even very simple texts is the result of complex inference-making rather than a mere cognition of what is explicitly stated or somehow inherent in the text” (26).

Cycling Schemas

As we read, we not only use the schemas that we have already formed before reading, but develop additional schemas tailored specifically to the individual text. Two types of schemas that we typically develop as we read are thematic and character schemas. With schemas like these, we often work from a generic thematic or character schema, which we trigger in response to certain attributes of the text in general or of a specific character or speaker, then develop it into something particularly suited to the text at hand (Hogan 129-30). Our schemas for character or theme in a given text are developed from schemas that we already have in place, especially generic schemas for character and theme as well as everyday schemas. Soon, rather than having other schemas completely control developing schemas, developing schemas begin to cycle, controlling

have been included in this paper. I have organized the paper not by respondent, but by schematic process. As a result, some readers’ responses appear several times throughout the paper, while others are left out: for each process, I chose the clearest and most concise example I could.
how we use everyday schemas. That is, schemas developed as we read, like character schemas, schemas for theme, etc., are triggered, start to develop, and then are applied to other parts of the poem with the expectation that those parts will fit easily with the developing schema. We start by finding the schema using the poem; then, when the schema begins to develop, we start finding the poem using the schema.

R2’s response to question three, which asks: “What is (for you) the central idea of the poem and why do you think so?” provides a perfect example of cycling schemas, specifically a cycling thematic schema. R2 probably began developing a thematic schema for stasis and entrapment early in reading the poem, or perhaps developed it after having read the poem once. R2 cites multiple pieces of evidence for reading the poem in this way: “phrases like ‘squeal of brakes,’ ‘hung out,’ ‘dead drop,’ ‘out cold,’ ‘sunk in,’ ‘still as a ham’; consistent references to the uncle’s obesity and immobility” and the seeming definition of the soul as something “hidden away, stopped, unmoving and unchanging” (R2Q3). These pieces of evidence are scattered throughout the poem, and it’s not clear at what point a schema for this kind of theme would have been triggered. It could have been triggered early in the reading by two or three schema headers (signals to our brain to trigger a given schema) like “dead drop,” the third of the cited phrases, which occurs in only the third line of the poem; although such phrases as “dead drop” might not be exact matches to the content of the schema, they would fit well enough with that content to act as headers (Stockwell, 2003, p. 256). Perhaps, however, the schema was not triggered on the first read-through or even during the reading process at all. Even if that is the case, there is value in understanding the schema as working cyclically.

I’d first like to consider what would have happened if R2 had triggered the schema very early, say during the first stanza of the poem during the first read-through. In that case, the schema would be further developed over the course of the poem. That is, as R2 encountered the other cited pieces of evidence, schema accretion, which involves the addition of small pieces of information to an existing schema, would have taken place. As each piece of evidence was encountered, it would be added to the thematic entrapment/stasis schema, and the schema would be reinforced by it. As the schema acquired more support, it would continue to undergo accretion. It would also begin to affect interpretation of other elements of the poem. Especially in the case of a thematic schema, a schema that has already been activated and deemed appropriate for the poem at hand, application of that schema to elements of the poem that would not have been interpreted in the same way in the absence of the cycling schema. In terms of R2’s reading, some of the “pieces of evidence” that R2 cites might not have been interpreted as indicative of “stasis” without the thematic schema having begun to develop beforehand. The developing thematic schema controls the interpretation of later elements.

A schema triggered during an after-the-fact interpretation could also be applied cyclically, though the process might not be as strictly “cyclical” as in the first case. Rather, it would be a process of reapplication in which a reader confronted a number of pieces of information in need of being fitted together. A fairly pervasive schema like a thematic schema, represented by so many different elements of the poem, would propel interpretation; in order to make pieces fit, the reader would read each piece through the lens of that theme, whether or not they obviously reflected it, allowing for an overarching interpretation of the poem. So the schema acts like a ball of snow rolling downhill, gathering momentum and material as it goes, flattening anything small that gets in its way, being broken apart by anything large enough to truly interfere; if the schema triggered for the theme ended up being

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2 Throughout this paper I will refer to the readers as “R#.” So reader number two is R2, etc.
in significant conflict with anything encountered in the text, a more dramatic learning process than accretion would have to occur, and a different approach would necessary.

The accretion and then reapplication of a schema can also apply to other schemas that maintain their influence across the stretch of a story or poem, like character schemas. With character schemas, this idea is specifically supported by the fact that we are hard-wired to maintain knowledge of the identity of a person or object across time and space. Patrick Colm Hogan claims that we construct “identity schemas” for both objects and persons, which consist of “material continuity or persistence through time in the case of objects and mental continuity or persistence through time in the case of persons” (p. 118). Hogan discusses this through the example of the movie *Titanic*, saying that “we subsume Jack getting on the boat and Jack clinging to the raft under the schema for identity as there is both material continuity (of his body) and mental continuity (p. 118). The identity schema Hogan describes means that while we are engaged with a narrative like *Titanic*, we understand the characters and objects by assuming that these are unified and have continuity of identify and self unless inconsistency is itself an established trait.

The readers of “Stopped Dead” demonstrate the use of identity schemas by interpreting the characters, and specifically the speaker, as having mental continuity and a unified self. A good example of the coherent development of an identity schema for the speaker comes from R5, who consistently characterizes the speaker as an American citizen, with the speaker’s suicidal desire to leave the car analogous to a citizen’s desire to regain control over his or her own life. In R5’s interpretation, the speaker is determined, sure of his/her actions, as in R5’s response to question three: “the narrator leaves the country, risking (or even enduring) death as a price for achieving true independence.”

Later in the poem, R5 takes this understanding of the narrator as brave and independent and reapplies it to the extreme, letting it affect not just his or her reading of the poem, but also, retroactively, of *Hamlet*. In response to question five, R5 begins, “Hamlet seems like an appropriate allusion to make in the reference of Uncle, since Hamlet’s mission was to set out and kill his Uncle.” In most cultural understandings Hamlet is indecisive, not on a “mission” but struggling to decide whether or how to carry out an undeveloped plan. While it’s possible that R5’s schema for Hamlet is idiosyncratic enough to completely reject this view of Hamlet, this interpretation of Hamlet is rare enough that it’s more feasible to think that R5 is recycling his or her schema for the speaker and applying it to the Hamlet allusion. By applying it to the allusion, R5 manages to render the allusion appropriate to the character schema she has already developed for the speaker: someone on a mission. A certain amount of manipulation of the Hamlet schema by way of the speaker character schema is necessary to continue to understand the speaker in the same way. To better realize how important the reapplication is, imagine if the reader had instead understood Hamlet as indecisive. This characterization of Hamlet does not match the characterization of the speaker already created by R5, and since Hamlet’s traits must be projected onto the speaker, if the characterization of Hamlet does not match the previous characterization of the speaker, the speaker’s character schema must be reevaluated. By using that character schema to manipulate Hamlet’s traits, R5 (probably unconsciously) ensures that the schema will continue to apply and that the allusion will reinforce and not diminish his or her already forming interpretation.

Cycling schemas have the potential to take small scale agreements or disagreements and render them into major ones because cycling schemas contribute heavily to the development and strengthening of an overall poem schema.
Take, for instance, R2’s development of a thematic schema for stasis. Because schemas work cyclically, and can be reapplied in this way, the schema for stasis can become a thematic schema, one that holds a central position in the poem at hand. This is reinforced by the identity schema created for the speaker, in which he or she continues to feel trapped during all of the time that the poem takes place. If the schema were not reapplied in that way, it would be a minor part of the interpretation of the poem, relevant to the individual elements that could easily be interpreted as fitting into it, but not going beyond those elements; it would be relatively local. But, because it does become central, the triggering of one schema ends up committing R2 to a certain overall interpretation. So schemas that are cyclically reapplied contribute heavily to the reader’s overall schema for the work. Because schemas that are triggered on a relatively local level have the potential to become so globally important, differences in these schemas can create important disagreements between readers. Any reader who does not trigger the stasis/entrapment schema cannot integrate it into an overall interpretation, so because schemas cycle in this way, these readers will disagree with R2 not just over a small aspect of the poem, but about a major feature of their individual text schemas. Our ability to manipulate certain information in order to have it fit with our existing schemas means that we will often continue to reinforce schemas that are different than those of others. But the opposite can happen if a reader triggers a similar schema to someone else. If two readers trigger similar schemas on a local level, then develop those same schemas into global-level schemas, those readers will go from agreeing about a small portion of the poem to agreeing about a major point in their overall interpretation, just as R2 and the differing reader ended up disagreeing about the overall interpretation. Developing similar local schemas into similar global schemas might be relatively common, because we often have similar generic schemas for character and theme developed from having read a lot of other texts. This makes it likely that in many cases, the schemas that we will trigger will be at least relatively similar from the start, making it easier for us to develop those schemas into similar individual text schemas.

Influencing Future Schemas

Another way in which schemas are applied and triggered during reading is through temporal influence. Schemas that work in this way are similar to cyclical schemas insofar as schemas triggered earlier in a given reading can affect the schemas triggered later in the reading. However, these schemas do not influence later schemas in the same way as cyclical schemas do. Whereas cyclical schemas limit future schemas through reapplication, other schemas merely influence what schemas are triggered later without being reapplied. One schema influences the schema to be triggered directly after it by making a given set of schemas the most probable to be triggered.

There are several ways in which schemas can limit the other schemas they help trigger. One factor is probably priming, which occurs as a result of the way lexical entries (including schemas) are structured in relation to each other. According to Patrick Colm Hogan, far from being organized in a dictionary-like fashion, lexical entries are more web-like, with entries for different things being accessible from other closely linked entries. Links between entries are important because lexical entries (again, including schemas), can be either fully accessed (as in they enter working memory) or merely primed, meaning they are partially activated but have not yet entered working memory. Priming occurs along the lines of the links between entries. For instance, when respondents are asked to respond to the word “river,” it takes them longer to identify it as a word when it follows “dog” than when it follows “boat” (p. 48). That is because “boat” and “river” are linked in the mental lexicon, so when
we encounter “boat,” “river” gets primed and is more quickly accessible to working memory.

The fact that we prime lexical entries that are linked to already accessed entries implies that when we trigger certain schemas as we read, we are more likely to trigger related schemas than unrelated ones later. Of course we will still be able to trigger unrelated schemas when necessary; schemas triggered directly after an already triggered schema need not be linked. But, in cases where triggering a linked schema is possible, priming makes it more likely that we will do so.

Priming appears to come into play in R5’s interpretation, in question six, of “bloody baby,” in which he or she combines “bloody” and “baby” to trigger a schema for “birth.” When R5 read the word “baby,” birth was probably quickly primed, being a closely related subject and one specifically mentioned at the beginning of the poem. This priming meant that birth, especially since it works in conjunction with “bloody,” already had a greater likelihood of being fully activated than many other concepts related to babies. This is a case in which that priming was strong enough for the schema to finally become fully activated. Birth was not mentioned in any other respondents’ answers about the “bloody baby,” so it’s clear that while priming occurs constantly as we read, it’s not necessarily consistent between individuals, and even when it is, a primed schema will not always be activated. For this reader, having birth primed brought the birth schema close enough to the surface to break through, but for other readers the priming, if it happened at all, was evidently not enough to have the same effect, and some other schema took hold instead.

There are other ways, in addition to priming, that future schemas can be influenced by previously triggered schemas. One of these ways is through association between schemas; this kind of association is looser than those between the linked lexical entries causing priming. Additionally, associative triggering seems wrapped up in consciousness; rather than simply triggering a primed schema, a reader making associations might be consciously casting about for a schema to fit neatly with previously triggered schemas. A good example of this comes from R5’s response to question seven, in which he or she triggers a series of schemas that eventually link babies to political change:

Baby associations contradict the associations made with “sunset,” as sunsets denote conclusion and babies are new beginnings. The fact that it is described as bloody could be seen as newly born (as is alluded to in the first stanza, second line) or as a newborn dying, the stifling of potential change and new ideas. I prefer the imagery of the first, however, the concept of change coming into the world, new things emerging from the mess that is left behind as old ideologies die out. And birth is painful. So is change.

R5 constructs a conceptual blend that combines “bloody” and “baby” to reach “birth.” “Birth” then connects back to “baby.” After returning to the “baby” schema, R5 associates this schema with “new beginnings,” which leads to schemas for “new ideas” and “political change” almost simultaneously.

The associations R5 makes might ordinarily be connected somewhat loosely, not the kinds of connections that are normally associated with priming. The connections between schemas here is very contextual; a schema for new ideas might not prime a schema for political change, because though they’re connected, the connection isn’t general enough for a priming effect to occur. In the context of the poem, however, and certainly in the context of the cyclical thematic schema of a disillusioned citizen within a problematic country that R5 has begun to develop, these schemas fit closely together. This series of schemas gets compressed into one overall interpretation, giving R5 a unique reading of the poem based on his or her own associations between various schemas within the context of this poem.
In addition to priming and associative triggering, causal relationships place heavy influence on movement from one schema to the next. In response to question three, R7 demonstrates this, using causal reasoning to move between several schemas:

This poem seems to be about the speaker’s strained relationship with the Uncle—a relationship of misunderstanding that probably cannot be reconciled. This relationship seems to place the speaker in a bizarre state of mind; she (I assume) finds herself at the edge, staring into what she does not know. The only solution is to get out of the car and live in the air of Gibraltar.

First, the idea of a strained relationship comes into play. This relationship schema then gets reapplied to the speaker and uncle, and a schema for their relationship in particular gets constructed. The schema for the relationship between the speaker and the uncle then moves toward a more specific focus on the schema for the speaker, as, even though R7 claims that the most important aspect of the poem is the relationship between the speaker and the uncle, he or she uses the relationship as a jumping off point, and ends by discussing the speaker’s state of mind and the speaker’s proposed solution to the problem of the relationship. The speaker schema comes from the schema for the relationship, as the “bizarre state of mind” R7 attributes to the speaker comes directly from it.

Each movement from one schema to the next requires not just association but a creative exercise in step-by-step causal reasoning. The schema for the speaker and uncle’s relationship is applied to the speaker schema causally, which results in a guess that the speaker means to somehow solve the problem created by the relationship; this probably requires a schema for problem-solving to come into play. In the R5 example in which R5 links babies to political change, R5 triggered pre-formed schemas (such as his or her schemas for babies and birth) but did not develop schemas within this example; here, R7 is not only triggering schemas, but developing his or her schemas for the speaker-uncle relationship and for the speaker as he or she goes. By using the schema for the speaker and uncle’s relationship to trigger the schema for just the speaker, R7 allows the relationship schema to influence the kind of schema that can be used for the speaker; the speaker schema that gets developed then influences future possibilities for interpretation, letting R7 guess that the speaker posits a solution, and, later, guess what that solution will be.

If schemas work by influencing future schemas without cycling, the consequences for two people’s interpretations will be important. To get a feel for the possibilities for disagreement that could be created through the content of the schemas alone, imagine that a reader triggers a series of schemas, each a schema that the reader has brought to the text and influencing the schema after it. Given the fact that every reader might not trigger exactly the same schemas at first, the result of the schemas’ influence might be significantly different between two readers after a series of schemas linked together in one or more of these ways. This is evident in the example of R5 linking babies to political change. R5 triggers a schema for birth, then links birth back to babies. If R5 had not triggered a birth schema, he or she would have had to account for “bloody” in some other way. Whether bloody was interpreted as a swear word or an expletive, it’s hard to imagine that it would be possible to trigger the same series of schemas, and therefore arrive at the same interpretation, without having first triggered a schema for birth, which makes the word “bloody” much less threatening than either of the other two interpretations do. In other circumstances, of course, people might wind up agreeing. They might agree because, since the poem forces them to trigger certain schemas and it’s likely that people would make similar moves in linking schemas together, the similar schemas that they
trigger in the first place will lead them to trigger a whole series of similar schemas. Though none of the other readers triggered a birth schema like R5 did, if someone had, it would be much more possible for that person to connect the baby to new ideas coming into the world, and therefore much easier for him or her to agree with R2’s interpretation. Finally, in addition to agreeing or disagreeing as a result of triggering similar or different schemas, it’s possible that, even triggering somewhat different schemas throughout, the overall interpretation of those schemas, or the last schemas of the series, could still be similar and so cause agreement.

Adding in the possibility that some of the schemas like this will have been created during reading, and that the creation of those schemas will be dependent upon the schemas that have come before, the consequences for agreement and disagreement will be important. This will depend upon the factors discussed above with cyclical schemas, as the schemas we develop as we read are frequently culturally influenced (generic schemas for character and theme or schemas with similar development for author or genre) and so might create agreement. But, as with cyclical schemas, triggering different schemas to begin with might affect the way we develop future schemas because those schemas could end up being dependent upon the previous schemas. If we trigger different schemas to begin with and these schemas affect future schemas, then disagreement becomes likely. For instance, in R7’s case, he or she triggers a schema for a speaker who is out of place, “staring into what she does not know,” and forced into making a choice (“the only choice she has”) at the end of the poem. R7’s speaker is recognizably passive, but if someone else had triggered a generic character schema that was more active and decisive from the get-go, perhaps as a result of reading the tone of the poem as aggressive, that person might develop a very different schema from R7’s. On the other hand, someone else might easily trigger a culturally relevant passive character schema and develop it in much the same way R7 does, thus creating agreement.

Conceptual Blending

Another important schematic process that contributes to individual text schema is conceptual blending. Conceptual blending is a concept that has frequently been studied in an attempt to explain how metaphor functions, and a traditional understanding of metaphor is the best place to start in describing how conceptual blending functions. In traditional descriptions of metaphor, a source is mapped onto a target. In “Juliet is the sun,” for example, the sun is the source and Juliet is the target (Stockwell 107). We take known attributes of the source and map them onto the target. Attributing traits from source to target, in this understanding, is a one directional process, and the transfer of traits is fairly straightforward. No truly new or creative understanding of the source or the target arises; we merely transfer an existing understanding of one thing to another.

Conceptual blending turns this understanding of metaphor on its head. In a conceptual blend, things get much more complicated than the mere transfer of traits from one object or concept to another. Patrick Colm Hogan describes Mark Turner’s theory of conceptual blending as follows:

metaphor—and, indeed, all thought—involves two or more inputs or input spaces, as he calls them. These input spaces project some properties to a blended space—thus the projection does not go directly from source to target. The resulting blend may then project back to a particular input [. . .] Moreover, the blend is not confined to the mere combination of the projected (or, equivalently, transferred) properties. There is, in addition, an emergent structure that results from the combination itself. Finally, Turner emphasizes that blending is recursive and thus a blend may itself operate as an input to another blend. (pp. 107-08)
Blending can happen in a variety of ways, but none of those ways involves a simple one-directional transfer of traits from a source to a target. And this process is not limited to metaphor, but happens regularly, in thought that we would not consider to be “special” in the way that we might consider metaphor to be.

In my own research, conceptual blending turned out to be a vitally important part of the students’ responses. Take, for example, the response that R1 gives to question three: “The speaker is poor and the uncle is rich. The uncle is unkind and squanders money as others suffer. Nice guy.” Upon first reading this, the response is striking. Where does R1 get so much information about the uncle? The uncle is described only infrequently throughout the poem. In the fourth and fifth lines, he is “a pants factory Fatso, millionaire / out cold beside” the speaker.” Later he is “sunk in [his] seven chins, still as a ham” (line 16), taunted by the speaker as to whether or not he thinks of her as being like Hamlet (lines 17-19), and asked if his soul is “a penny, a pearl” (line 21). Nowhere, however, does the speaker explicitly say that the Uncle is unkind, or that he squanders money, or even that anyone (except, apparently, the speaker herself) suffers as he squanders that money. So where does the reader get the idea that the uncle is generally unkind? From a blend between the sources just described. The uncle is described only infrequently throughout the poem. In the fourth and fifth lines, he is “a pants factory Fatso, millionaire / out cold beside” the speaker.” Later he is “sunk in [his] seven chins, still as a ham” (line 16), taunted by the speaker as to whether or not he thinks of her as being like Hamlet (lines 17-19), and asked if his soul is “a penny, a pearl” (line 21). Nowhere, however, does the speaker explicitly say that the Uncle is unkind, or that he squanders money, or even that anyone (except, apparently, the speaker herself) suffers as he squanders that money. So where does the reader get the idea that the uncle is generally unkind? From a blend between the sources just described. If the reader, coming across various descriptions of the uncle, had constructed a blend using select elements of the poem as inputs, the emergent structure from that blend could easily have been that the uncle is unkind and callously wastes money as others suffer.

Especially salient possibilities for R1’s blend inputs come from the description of the uncle as a “pants factory Fatso, millionaire.” If “pants factory” were taken as one input, while “millionaire” was used as a second input, a blend that created an emergent structure of the uncle as unkind would be easily imaginable. One further input that would support the same emergent structure could be that the speaker, who is apparently poor (as she is not, it seems, the “rich pretty girl” she imagines) resents the Uncle. From these inputs, then, the reader comes up with a trait of the uncle’s that is never explicitly mentioned in the poem, but which feels like a justifiable reading of the uncle’s character as it is described. This blend, of course, is dependent upon the reader’s schemas for pants factories, or perhaps for factories in general; for millionaires; and for people that poor people, particularly the speaker, resent. So how does the blend come about, and why does this reader create this particular blend for the uncle that others, including me, do not? Quite possibly from overlaps between the reader’s schemas for the given inputs. The factories input for this speaker might have had a particularly salient slot for sweat shops and the cruelty of those who own and operate them to make a profit. The input for millionaires probably comes from a schema with a salient slot for unkindness, for wealthy people who do not concern themselves with others, especially those whom they take to be beneath them. The fact that the millionaire is apparently the owner of one of these pants factories, and that owning capital and being a millionaire go hand in hand, serves as impetus for the blend. If the fact of the speaker being poor and resentful also worked as an input, then the schema for poor people, and specifically the part of it related to poor peoples’ attitudes toward wealthy people, must contain a slot for the mistreatment of the poor at the hands of wealthy people, in other words, cruelty or unkindness. If all three of the schemas involved in the inputs contained slots for unkindness, then the emergent structure, in which the reader believes the uncle to be unkind, makes sense.

Looking at this example, it becomes quite apparent why different readers’ overall poem schemas could diverge significantly as a result of conceptual blending, even given similar schemas to start with; even with similar schemas, blending could still create different emergent structures for
those readers, leading to different individual text schemas. If this is the case, then the level of divergence between readers who trigger and use very different inputs (including very different schemas for the same thing) has the potential to be great. Given that conceptual blending can yield different emergent structures even through the use of similar inputs, the emergent structures coming out of blends constructed with differing inputs might be even more different from each other. And given the fact that conceptual blending happens quite frequently in reading, these divergences have the potential to be numerous. As the emergent structures coming from these blends will themselves end up being inputs into an overall blend, if two readers created a few different blends near the beginning of a reading, differences could easily become magnified; conceptual blending, like cyclical schemas, has the potential make the gap between different schemas widen, eventually leading the reader to an overall interpretation that might be very different from any other reader’s, even a reader who triggers all of the same schemas in the same places. Despite the potential for disagreement, though, conceptual blending could sometimes help foster agreement. Because many readers have similar schemas going into a reading, they will frequently use similar inputs in blends. While blends with similar inputs can turn out differently, readers will frequently yield similar emergent structures from the blends they create. Since these emergent structures often function as inputs for future blends, conceptual blending has the potential to turn agreement about one part of the poem into overall agreement, as previous blends frequently feed into later blends. The type of agreement that is possible here is not just agreement based on content of schemas; readers do not just agree on the meaning of the words in the poem, but actually end up agreeing about what additional schemas should be triggered in interpreting the poem.

**Guessing At Others’ Schemas**

A final process involving schemas is guessing at others’ schemas as we read. In addition to having a constitutive part, the part of the schema that tells us what a thing is like, schemas also have parts telling us what other people think that thing is like. These parts become more important with complex or abstract concepts; though many people have very similar beliefs about what dogs are like, allowing our subschema for others’ beliefs to be quite limited, a schema for something like a “soul” might have a much richer subschema for others’ beliefs, as those beliefs will vary quite a bit. These parts of our schemas allow for smoother communication; if we did not have them, we would assume that our own understanding of a given thing was the same as other people’s and that would make for a lot of confusion when discussing topics on which people tend to have important variations in belief. Knowing that there will probably be differences makes it easier to ascertain what the relevant differences are more quickly and with less confusion.

In reading, we necessarily interact with “other people” to a certain extent. Even in poetry in which no human actors exist, the fact of language means that someone is speaking the poem, which means that we are engaged in an act of communication, no matter how one-sided. This is especially important in light of another cognitive capacity, that of metarepresentation. Metarepresentation, as described by Lisa Zunshine, “consists of two parts. The first part specifies a source of representation, for example, ‘I thought . . . ,’ or ‘Our teacher informed us . . .’ The second part provides the content of representation, for example, ‘. . . that it was going to rain . . . ’ or ‘. . . that plants photosynthesize’” (p. 47). The “meta” part of metarepresentation, the source tag, “is what prevents the representation from circulating freely within our cognitive system” (p. 50). According to Zunshine, although not all incoming information must be tagged with the appropriate source, we do this regularly in
everyday thought, and it is extremely important insofar as it matters quite a bit what information is allowed to circulate freely. Metarepresentation is important in terms of literature; with characters, we use metarepresentation much as we do in everyday life. Moreover, we use metarepresentation in dealing with a literary work as a whole; when we read literature, Zunshine argues, we store the entire work as a metarepresentation with a source tag pointing to its author, in order not to let the information that we learn from it circulate as truth.

Because we metarepresent a full text to the author, we naturally guess at an author’s schemas throughout a piece; in order to store something with a source tag pointing to the author, we want to figure out what the author meant by it, not just what we think it means. We also guess at the schemas of characters, narrators, speakers, etc. In “Stopped Dead,” we guess at Sylvia Plath’s schemas as well as the speaker’s, whom we may or may not conflate with Plath. The best examples of the readers guessing at others’ schemas involve the speaker, who, as the only voice throughout the poem, gives the best opportunities for guessing at his or her schemas. One example of guessing at others’ schemas comes from R2 in response to question three: “the question ‘Where do you stash your life?’ seems to define the ‘soul’ as something hidden away, stopped, unmoving and unchanging.” Here, rather than applying his or her own understanding of a soul, R2 tries to apply the speaker’s schema for soul. Using evidence from the line before, R2 posits that here a soul means something “hidden away, stopped, unmoving and unchanging.” So even if R2 believes that a soul is something that grows with a person, can be demonstrated outwardly, etc., he or she posits exactly the opposite. Of course, it’s possible that R2 actually does believe that the soul can be described as hidden and static. However, even if that is the case, he or she specifically points to textual evidence for that interpretation of soul, descriptions of the soul given by the speaker. So, whether or not R2 holds these particular beliefs about the soul, he or she guesses at the speaker’s schemas nonetheless.

Whether we guess at the speaker’s schemas or the poet’s, those schemas end up contributing to our individual text schema, and the same could be said if we guessed at a narrator and author’s schemas in a story. And, when a poem or story contains speech from others besides the narrator, speaker, author, or poet, readers might also guess at those characters’ schemas. So, instead of our own interpretations of various parts of a story or poem coming together to form an individual text schema, we must combine our interpretations of some parts with our interpretation of someone else’s meaning for other parts. It’s not clear whether or not guessing at others’ schemas would bring readers’ interpretations closer together or divide them, but these interpretations of others’ interpretations would always be filtered through our own schemas; though two people are guessing at a speaker’s schema for something, they might not agree any more than if they weren’t guessing in that way; in order to guess at a speaker’s schema for something, we must either use available evidence to add information to an existing schema (we learn something new about the concept, then attribute it to the speaker), or we must take parts of an already existing schema and attribute them. In either case, we are unlikely to attribute a schema to the speaker in the same way as another reader would. So, though guessing at others’ schemas might not contribute to disagreement any more than not guessing at them would do, it probably doesn’t contribute much to agreement either.

**Conclusion**

Most of the processes discussed here have the potential to further either agreement or disagreement. Agreements or disagreements can be both local and global, and they will not be uniform; that is, someone can agree with another reader on several local level issues, but disagree on
a global level, or possibly even reach general agreement globally, but not about several local issues. These combinations of agreement and disagreement occur due to the fact that each process or content issue applies to only certain situations, with those certain situations adding up to create an individual text schema. In creating the individual schema, readers apply multiple processes and may be additionally affected by similarities and differences in schema content from reader to reader. Of course, it’s possible that some of the processes or content issues will not be relevant in a certain group for a certain poem. For instance, it might be the case that for a given story or poem there is little character development, minimizing the cycling of a character schema. Certain processes, however, must always occur. It’s hard to imagine a reader reading a story or poem all the way through without constructing a single conceptual blend. Blending is pervasive, it occurs frequently across all forms of language. So while some of these contributors to agreement disagreement may sometimes be absent, it’s likely that at least some will be present in any reading, and since that’s the case, some form of both agreement and disagreement between readers, however minor, will be present in any reading.

References


Appendix

Poem:

Sylvia Plath
“Stopped Dead”

A squeal of brakes.
Or is it a birth cry?
And here we are, hung out over the dead drop
Uncle, pants factory Fatso, millionaire.
And you out cold beside me in your chair.

The wheels, two rubber grubs, bite their sweet
tails.
Is that Spain down there?
Red and yellow, two passionate hot metals
Writhing and sighing, what sort of a scenery is it?
It isn’t England, it isn’t France, it isn’t Ireland.

It’s violent. We’re here on a visit,
With a goddam baby screaming off somewhere.
There’s always a bloody baby in the air.
I’d call it a sunset, but
Whoever heard a sunset yowl like that?

You are sunk in your seven chins, still as a ham.
Who do you think I am,
Uncle, uncle?
Sad Hamlet, with a knife?
Where do you stash your life?

Is it a penny, a pearl —
Your soul, your soul?
I’ll carry it off like a rich pretty girl,
Simply open the door and step out of the car
And live in Gibraltar on air, on air.

Response Questions:

1. Have you read the poem before?

2. What else have you read by Sylvia Plath?

3. What is (for you) the central idea of the poem and why do you think so?

4. What do you think the one or two most important conventional literary devices in the poem are and how do they tie into the central idea that you identified above?

5. What about Hamlet makes it appropriate for the speaker to compare him/herself with him? Why does the speaker make this comparison?

6. Why does the speaker concern him/herself with the sunset? How would the poem be different if this information were left out, or another time of day (like sunrise) were described?

7. Why does the speaker say that there’s always a “bloody baby in the air”?

8. What background information about Sylvia Plath are you aware of?
ATTACHMENT STYLE PREDICTS ANXIETY IN UNDERGRADUATES’ ROMANTIC RELATIONSHIPS

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Originally conceived by psychoanalyst John Bowlby (1969), attachment theory suggests that young children’s interactions with their caregivers influence the way the children relate to other people throughout their lives. Bowlby argued that it is “essential for mental health...that the infant and young child should experience a warm, intimate, and continuous relationship with his mother...in which both find satisfaction and enjoyment” (Bowlby, 1951, p. 11). He would later come to define such a parental bond as “secure attachment” (Bowlby 1969). But not all parent-child relationships are of such a “secure” nature, and various distortions within this relationship, such as deprivation, rejection, and neediness on the part of the parent, can lead to disturbances in the child’s attachment and future social interactions (Bowlby, 1951, p. 12). Expansions of the theory have addressed this, proposing the additional style of “insecure attachment,” characterized by avoidance or anxiety around social relationships (Ainsworth, Blehar, Waters, & Wall, 1978). Previous research (Shi, 2003) has indicated that attachment styles are most likely to be activated in conflict interactions with a romantic partner, as these situations accentuate the need to give and receive psychological support.

Attachment theory is central to much research surrounding romantic relationships; research examining attachment in adult romantic relationships indicates that securely and insecurely attached individuals behave in systematically different ways. According to Hazan and Shaver (1987), securely attached adults do not have difficulty being intimate with others, do not worry about others abandoning them, and find it easy to depend on others and have others depend on them. There are two types of insecurely attached individuals: insecure-avoidantly attached and insecure-anxious/ambivalently attached. Insecure-avoidantly attached adults are uncomfortable with intimacy and have difficulty trusting or depending on people; an avoidant individual may feel as though others want to be closer to her than she wants to be to them. Insecure-anxious/ambivalently attached adults, on the other hand, desire intimate relationships and in fact often want to be closer to others than others want to be to them, but they are afraid of rejection; they may be preoccupied with fears of abandonment, and their neediness may actually increase the chance that they will encounter rejection. Other research has further reported that securely attached individuals tend to have constructive conflict resolution styles, whereas insecurely attached individuals are more likely to engage in avoidant, dominating or obliging behavior in response to relationship conflict (Shi, 2001). The current study uses an undergraduate sample to examine the impact of attachment style on anxious responding to a variety of stressful romantic situations.

We hypothesized that insecurely attached individuals would respond with greater anxiety than securely attached individuals overall. This hypothesis is supported by previous research (Hazan & Shaver, 1987) that suggests securely attached adults are confident and happier in their relationships than insecure-anxious/ambivalently attached adults, who are preoccupied with interpersonal relationships and show greater symptoms of anxiety. We were particularly interested in seeing which types of situations mediated the difference in anxiety between securely and insecurely attached individuals. We examined low-, moderate-, and high-anxiety situations, and we predicted that significant differences in anxiety between the two at-
attachment styles would be revealed almost exclusively by the moderate-anxiety situations (e.g., “Your partner says, ‘We need to talk later’”) because the greater ambiguity would give the participant more room to interpret the gravity of the situation in a way that was consistent with his or her attachment style. This hypothesis is supported by previous work that showed that insecurely attached adolescents focused more on negative emotions and situational cues than securely attached adolescents (Fraley & Shaver, 1997). Additionally, research has found that anxious individuals tend to show a “negative interpretation bias for ambiguous social events” (Amir, Beard, & Bower, 2005, p. 434). We predicted fewer differences in responding to low-anxiety situations (e.g., “Your partner asks you how your day was”) and high-anxiety situations (e.g., “You find out that your partner has been cheating on you”) because the extremity of very banal or very distressing situations would lead to more uniform responding regardless of attachment style.

We also hypothesized that females would show greater overall levels of anxious responding across all situations, in light of our previous work on the NEO-PI-R (Costa & McCrae, 1992), which demonstrated that females showed higher levels of neuroticism, of which anxiety is an important facet (Boettcher, Lieberman, McCarthy, Russell, & Mosbacher, 2010). This hypothesis is also supported by research that indicates that females show significantly higher rates of anxiety symptoms and anxiety disorders than do males (Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998).

Furthermore, we were interested in investigating the mediating roles of relationship longevity and satisfaction because both can be expected to increase anxiety in some cases (e.g., being cheated on) and decrease anxiety in others (e.g., your partner telling you s/he loves you). Specifically, we predicted that people in longer and more satisfying relationships would display lower anxiety in low- and moderate-anxiety situations but higher anxiety in high-anxiety situations because these situations are more directly contradictory to the overall quality of their relationships.

**METHOD**

**Participants.** Participants were Brown University undergraduates in heterosexual relationships of at least three months in duration. One hundred five students responded to the survey; however, 42 were excluded due to incomplete responses, for a total of 63 participants (37 females and 26 males, mean age 20.4 years)

**Materials.** We used an online survey to collect the data. Participants reported their gender, age, sexual orientation, length of current relationship, and level of satisfaction in their relationship on a five-point scale (1 = “very dissatisfied”; 5 = “very satisfied”). To assess attachment style, participants responded to an 18-item attachment style questionnaire developed by Collins and Read (1990), who built on the work of Hazan and Shaver (1987). The questionnaire had six items relevant to each of three attachment styles: secure, anxious, and avoidant. Items included statements such as “I am somewhat uncomfortable being close to others” and were rated on a five-point scale (1 = “not at all characteristic of me”; 5 = “very characteristic of me”). We aggregated responses to anxious and avoidant items into a general scale of insecure attachment (lower scores on this scale represented more secure attachment).

Participants also rated their anxiety levels in 13 hypothetical interactions with their romantic partner (“situational items”) on a seven-point scale (1 = “not at all anxious”; 7 = “unbearably anxious”). There were four high-anxiety items (e.g., “You discover that your partner is cheating on you”), four moderate-anxiety items (e.g., “Your partner says to you, ‘We need to talk later’”), four low-anxiety items (e.g., “Your partner asks you how your day was”), and one “ambiguous” item (“Your partner tells you he or she loves you”).

**Procedure.** The survey was hosted on SurveyMonkey and publicized on the social networking site Facebook; subjects decided without the knowledge of the researchers whether or not to participate. Those who wanted to participate gave their informed consent electronically. There were two versions of the survey, which counterbalanced the order in which the set of attachment items and the set of situational items were administered. Participants were directed to one order or the other based on whether their birthdates were odd or
even. On all surveys, the order of both the attachment items and situational items was randomized.

RESULTS

Preliminary Analyses. Prior to analyzing our data, we computed a new variable that aggregated participants’ responses on the attachment items by reverse-scoring the six “secure” attachment items to create a continuous measure for “insecurity.” We ran exploratory tests to examine the distribution of participants’ ratings on this scale. Responses were normally distributed ($M = 2.36$, $SD = .53$). A boxplot revealed a single high outlier of 3.72 that fell close to the third quartile and that thus likely did not have a large impact on the findings. Next, we performed a median split to divide respondents into secure or insecure attachment. Those scoring below the median of 2.28 were labeled as securely attached, and those scoring above the median were labeled as insecurely attached.

Next, we created a new variable that aggregated participants’ anxiety over all of the interactions with their partner. We then ran exploratory data analyses to examine the distribution of this new variable. There was a single high outlier at 5.46; otherwise the variable was approximately normally distributed ($M = 3.48$, $SD = .90$).

In order to test our hypothesis that differences in anxiety between insecurely and securely attached individuals would be more salient in moderate-anxiety situations than in low- or high-anxiety situations, we created three new variables: the aggregation of responses to the four items in each of the low-, moderate-, and high-anxiety categories. We also isolated responses to the ambiguous item 13 (“Your partner tells you he or she loves you”) as a separate variable to be used for later analyses. The mean of anxious responding was 1.46 in low-anxiety situations ($SD = .68$), 3.98 in moderate-anxiety situations ($SD = 1.19$), and 5.42 in high-anxiety situations ($SD = .96$).

Anxiety and Attachment Analyses. To explore the relationships between these new variables of anxiety in low-, moderate-, and high-anxiety situations and participants’ levels of insecure attachment, we performed a series of Pearson’s $r$ correlations. The correlation between insecurity and overall anxious responding was $r(61) = .40$, $p < .01$. Consistent with our original hypothesis, the correlation between insecurity and anxious responding was greatest in moderate-anxiety situations, $r(61) = .45$, $p < .001$. There was also a significant correlation between insecurity and anxious responding in low-anxiety situations, $r(61) = .33$, $p < .01$. As expected, there was a correlation between insecurity and overall anxious responding, $r(61) = .40$, $p < .01$. In support of our hypothesis, there was no significant correlation between insecurity and anxious responding in high-anxiety situations. There was also no significant correlation between insecurity and anxious responding to one’s partner expressing love (i.e., “ambiguous” item 13).

Next, we performed a 3 (anxiety situation) x 2 (gender) x 2 (security) mixed-model ANOVA, where the repeated measure was low-, moderate-, or high-anxiety situation and the between-subjects factors were security and gender. We found a main effect for situation, $F(2,118) = 413.24$, $p < .001$, indicating that our choices for low-, moderate- and high-anxiety items were appropriately reflective of the anxiety these situations evoked. These results can be seen in Figure 1. As expected, there was also a main effect for security, in which insecure individuals displayed significantly more anxiety than secure individuals across all situations, $F(1,59) = 5.88$, $p < .05$. In support of our original hypothesis, insecurely attached individuals responded with significantly more anxiety in moderate-anxiety situations, $t(61) = 2.60$, $p < .05$, but did not differ significantly from securely attached individuals in low- or high-anxiety situations. Differences in secure and insecure responding across situations can also be seen in Figure 1. There was a main effect for gender that approached significance, $F(1,59) = 3.56$, $p < .07$. We followed this with independent-samples $t$-tests comparing males’ and females’ responding in low-, moderate-, and high-anxiety situations. Anxious responding did not differ significantly between genders in low- and moderate-anxiety situations, but females reported significantly more anxiety than males in high-anxiety situations, $t(61) = 2.21$, $p < .05$. This was in line with our original hypothesis that females would exhibit more anxiety than males. To explore the more precise differences among anxious responding in specific situations, we followed this with three more ANOVAs. First, we
performed a 4 (low-anxiety item) x 2 (gender) x 2 (security) mixed-model ANOVA, where the repeated measure was low-anxiety item and the between-subjects factors were security and gender. The only significant main effect was for situation, $F(3,177) = 4.34, p < .01$, indicating that there were significant differences in the amount of anxiety triggered by each of the four low-anxiety situations. In order to determine the nature of this effect, we ran paired samples $t$-tests for all pairs formed by the four situations. Situation 9 (“Your partner asks you how your day was”) evoked less anxiety than situation 10 (“Your partner asks if you want to have dinner together”), $t(62) = 2.26, p < .05$. Situation 9 also evoked less anxiety than situation 11 (“Your partner asks you to remind him or her to do something later that day”), $t(62) = 2.60, p < .05$. No other results were significant.

Our next analysis was a 4 (moderate-anxiety item) x 2 (gender) x 2 (security) mixed-model ANOVA, where the repeated measure was moderate-anxiety item and the between-subjects factors were security and gender. The purpose was to examine inter-item differences in the moderate-anxiety situation. There was a main effect for security in responses to the moderate-anxiety situations, $F(1,177) = 6.84, p < .05$: consistent with our original hypothesis, insecurely attached individuals exhibited more anxiety over all moderate-anxiety situations than securely attached individuals, $t(61) = 2.60, p < .05$. There was also a significant main effect for moderate-anxiety item, $F(3,177) = 30.17, p < .001$, indicating that the four moderate-anxiety items produced different levels of anxiety. Paired samples $t$-tests revealed that situation 1 (“Your partner says to you, ‘We need to talk later’”) evoked more anxiety than situation 2 (“You see your partner laughing and talking with an attractive member of the opposite sex”), $t(62) = 7.71, p < .001$, and situation 4 (“Your partner continues to express concern that you are upset even though you have assured him or her that nothing is wrong”), $t(62) = 5.63, p < .001$. Situation 3 (“Your partner is acting distant—he or she seems less talkative and responds to your questions only briefly”) also evoked more anxiety than situation 2, $t(62) = 7.80, p < .001$. Situation 3 evoked more anxiety than situation 4, $t(62) = 6.63, p < .001$. To determine the nature of the marginally significant interaction effect for moderate-anxiety item and security, $F(3,177) = 2.01, p < .11$, we performed independent $t$-tests between secure and insecure
Finally, we ran a 4 (high-anxiety item) x 2 (gender) x 2 (security) mixed-model ANOVA, where the repeated measure was high-anxiety item and the between-subjects factors were security and gender. There was a significant main effect for gender, $F(1, 59) = 4.92$, $p < .05$. A subsequent independent samples $t$-test revealed that females responded significantly more anxiously than did males to these high-anxiety items, $t(61) = 2.21$, $p < .05$. As with the two previous ANOVAs, there was also a significant main effect for high-anxiety item, $F(3,177) = 22.07$, $p < .001$. Specifically, situation 5 (“You find out your partner has been cheating on you”) evoked more anxiety than situation 6 (“You’ve just had a heated argument with your partner and he or she has left before it was resolved”), situation 7 (“Your partner insults you in front of friends about something he or she knows you are sensitive about”), and situation 8 (“Your partner says he or she loves you so much that life isn’t worth living without you”). Respectively, these values were $t(62) = 4.66$, $p < .001$; $t(62) = 6.11$, $p < .001$; and $t(62) = 7.18$, $p < .001$. Situation 6 evoked more anxiety than situation 8, $t(62) = 3.81$, $p < .001$. Situation 7 also evoked more anxiety than situation 8, $t(62) = 2.42$, $p < .05$.

For a concluding analysis, we wanted to investigate the effects of relationship duration and attachment style on relationship satisfaction. Respondents were grouped into three categories of relationship longevity based on how long they had been with their partner: 3-6 months, 6-12 months, and longer than one year. We ran a 3 (relationship duration) x 2 (security) between-subjects ANOVA with satisfaction as the dependent variable. The only result that approached significance was a
main effect for security, $F(1, 57) = 3.43, p = .069$. We followed this with an independent samples $t$-test, which indicated that securely attached people were more satisfied than insecurely attached people, $t(61) = 2.02, p < .05$. Finally, we examined respondents’ anxiety in response to “ambiguous” item 13 (“Your partner tells you that he or she loves you”). We ran a 3 (relationship duration) x 2 (security) x 2 (gender) between-subjects ANOVA with anxious responding to item 13 as the dependent variable. We found an effect of relationship duration on anxiety that approached significance, $F(2, 51) = 2.75, p = .073$. We followed this with independent samples $t$-tests examining differences in situational anxiety as a function of relationship duration and found that people who had been with their partner for less than six months responded to this situation with significantly more anxiety than those who had been with their partner for over a year, $t(46) = 3.87, p < .001$. We also found a significant interaction between security and gender on anxious responding in situation 13, $F(1,51) = 5.70, p < .05$. As shown in Figure 3a-b, insecurely attached men were significantly more anxious in situation 13 than securely attached men, but this was not the case for females. We followed this by dividing the participants into securely and insecurely attached individuals based on our previously computed variable measuring insecurity. When we examined only the insecurely attached individuals, males were significantly more anxious than females in situation 13, $t(29) = 2.98, p < .01$. Among securely attached individuals, there was no significant difference between genders.

![Figure 3a-b](image-url)

*Figure 3a-b.* 3a. Mean anxiety responses of male subjects to situation 13 (“Your partner tells you that he/she loves you” as a function of attachment style. Error bars = ± 1 SEM. 3b. Mean anxiety responses of female subjects to situation 13 (“Your partner tells you that he/she loves you” as a function of attachment style. Error bars = ± 1 SEM.
DISCUSSION

The data were largely consistent with our hypotheses and with past research. We found greater anxious responding among insecurely attached individuals than among securely attached individuals, particularly in moderate-anxiety situations. Females also tended to respond more anxiously than did males. Differences in responding across specific situations indicate that further research may be required to illuminate more precise determinants of relationship anxiety.

Our chief hypothesis, that moderate-anxiety situations would reveal the greatest differences in anxious responding between secure and insecure individuals, was supported. One possible explanation for this result can be drawn from past work (Erozkan, 2009; Amir et al., 2005). Erozkan (2009) demonstrated that social anxiety is highly positively correlated with insecure attachment styles. In turn, Amir et al. (2005) showed that social anxiety is characterized by an interpretation bias, whereby socially anxious people are more likely to interpret ambiguous stimuli as negative in social interactions. Because our insecure sample may have been more socially anxious than our secure sample, it is possible that they showed a greater interpretation bias. This would make them particularly susceptible to having negative appraisals of more ambiguous situations (moderate-anxiety situations, in this case), whereas low- and high-anxiety situations would be less affected by the interpretation bias and thus show fewer differences between secure and insecure subjects.

Our hypothesis that females would respond more anxiously than males in interactions with a romantic partner was modestly supported: although the difference in anxious responding was only approaching significance across all situations, women were significantly more anxious in the high-anxiety situations. Given our extremely homogenous sample of participants, claims of evolutionary motivation or causation cannot go far beyond speculation; with that caveat in mind, this difference may indeed be interpreted as linked to behavior that developed evolutionarily. Because in the past women have traditionally relied on males to support them and their children, women who cared about maintaining a relationship with a protector and benefactor were more likely to raise viable offspring (Buss, 1995). Thus, signals of potential abandonment (e.g., “You find out your partner is cheating on you”) would lead to distress. In contrast, males’ evolutionary success was not dependent on remaining with one partner, so the desire to maintain a relationship would not be selected for as strongly. In slightly different terms, the items in the high-anxiety situation involve more elements of betrayal than the other situations, and past research (DePrince & Freyd, 2002; Gilligan, 1982) suggests that women may be more sensitized to betrayal than men due to the socialization of women to place more value on interpersonal relationships. It is also possible that women are particularly anxious in conflict interactions, as implied by our previous analysis of situational responding in undergraduates, which indicated that women displayed more anxiety than men in conflict interactions with friends (Boettcher, LaPlante, Lieberman, McCarthy, Mosbacher, & Russell, 2010).

Our analysis of the interaction of relationship satisfaction and attachment style is supported by past research that links greater relationship satisfaction with more secure attachment (Simpson, 2002; Hazan & Shaver, 1987). It is not clear, however, whether this correlation is causal, and if so, in which direction it runs. It is possible, for example, that securely attached people are better equipped to make a relationship work, but it is also possible that a more satisfying relationship causes a person to feel more secure. Alternatively, the correlation could be explained by a confounding variable, such as optimism, and further research would be required to resolve this ambiguity.

In our analysis of situation 13 (“Your partner tells you that he/she loves you”), we found that people who had been with their partner for less than six months responded more anxiously than did those who had been with their partner for more than a year. However, this finding may be confounded by attachment style in that securely attached people are more likely to be satisfied in their relationship and therefore stay in that relationship for a longer period of time; they are also likely to respond with less anxiety than insecurely attached people (Hazan & Shaver, 1987). Moreover, for this item there was an unexpected interaction between gender and security: insecure men were more anxious than secure men, whereas insecure women were less anxious than secure women.
although not significantly. One explanation that would account for this is differences in anxious and avoidant attachment styles within the insecure group. Whereas anxiously attached individuals would appreciate the validation of being told they were loved, avoidant individuals might be bothered by it (Collins & Read, 1990). Thus, it is possible that females are more anxiously attached and males are more avoidantly attached within insecure attachment, but further research would be necessary to test this hypothesis.

There are several limitations to our work. Firstly, our sample was not representative of the larger population, or even of undergraduates in general, so our ability to extrapolate from our results is limited. Thirty-seven (59 percent) of the 63 participants were female, indicating that our results might be slightly more representative of females than of males. Furthermore, all participants were Brown students roughly between the ages of 18-22 years old who were at the time of taking the survey in a 3-month or longer heterosexual romantic relationship, and the sample was further narrowed in that participants were recruited via the social networking site Facebook; all participants were acquaintances of the researchers. Using all Brown University students could have skewed the results, especially since the competitiveness of the school may mean that its students are distinct from the general population in aspects that could affect attachment style or relationship interactions (e.g., intelligence, affluence). The authors’ previous work examining self and observer ratings of Brown students on the NEO-PI-R (Costa & McCrae, 1992) also indicated that Brown students have above-average T-scores ($M = 58.1$, $SD = 11.6$) in the Neuroticism domain, of which anxiety is a significant facet (Boettcher, Lieberman, McCarthy, Mosbacher, & Russell, 2010). It is therefore plausible that Brown students are more anxious than the general population.

There were also several weaknesses with our assessment tool. Our measure of relationship longevity did not distinguish between relationships of a single year and much longer relationships, nor did we collect data on how long the couple had known each other prior to beginning a relationship, which could have impacted their attachment style and ways of interacting. Furthermore, a sizeable number of respondents (42 out of an original 105 respondents) failed to complete the survey. These cases were discarded, meaning that our final respondent pool was affected by voluntary response bias.

It is also important to note that we generated the situations for low, moderate and high-anxiety interactions ourselves, and these situations were not tested for predictive validity for anxiety. Although we did find significant differences in the amount of anxiety evoked by the low-, moderate-, and high-anxiety situations, they are not necessarily representative of the interactions a couple has. We recommend more in-depth analysis of these and other situations to develop a set of situations whose potentials for causing anxiety in the general population are known, such that later use of the situations would allow for comparisons of a given attachment style to a large, representative norm group. Our results would also be informed by analyses of individual situations. For example, the finding that situation 9 (“Your partner asks you how your day was”) was significantly more anxiety-producing than the other low-anxiety situations was unexpected and merits further attention.

Perhaps the greatest limitation of our work, necessary due to the small sample size, is that we did not distinguish between insecurely attached individuals who are avoidant and those who are anxious in forming our insecurity scale. Many accounts of attachment style divide attachment into secure, anxious, and avoidant attachment, including the inventory that we used (Collins & Read, 1990). Anxious and avoidant attachment styles manifest differently; avoidant individuals are less comfortable with closeness and commitment while anxious individuals are more likely to value closeness to such a degree that they are uncomfortable without it and as such tend to worry about acceptance and abandonment. This could have led to differential responding within our sample of insecurely attached subjects, and grouping them all together could have masked this effect. For example, the high-anxiety situation “Your partner says that he/she loves you so much that life is not worth living without you” would be very troublesome to an avoidant individual, while it could provide validation for an anxiously attached partner.

We recommend that future research involve sample sizes large enough to have a significant number of both avoidantly and anxiously attached individuals. Furthermore, insecure-avoidantly attached individuals may be by definition less likely
to be in romantic relationships in the first place; the sample we have may be skewed significantly toward anxious attachment, and subjects in future research who are avoidantly attached and in romantic relationships may still not be indicative of the true spectrum of avoidant attachment. Additionally, more recent research (Bartholomew & Horowitz, 1991) has posited the further division of the adult insecure-avoidant attachment style into two subtypes, fearful and dismissing: the fearful type feels unlovable, and this is the basis for her avoidance of others; the dismissing type feels loveable but is dismissive and disparaging of others and so is not interested in their affections. There could be important systematic differences according to this subdivision that were also masked by this study’s general grouping of subjects into “secure” or “insecure” attachment style.

Another limitation of this study was the method we used to divide subjects into a “secure” or “insecure” attachment type. The creation of a scale and splitting it at the median merely defines the less-insecure and more-insecure halves of our small sample—it is not necessarily an accurate determination of who is actually technically securely or insecurely attached. However, in a large enough sample of subjects that includes a full spectrum of attachment styles, this technique is likely to be highly accurate: Hazan and Shaver (1987) found 56 percent of participants in their study to be securely attached and 44 percent to be insecurely attached (25 percent avoidant, 19 percent anxious).

In addition, people might differ in their techniques of rating, erring on the side of large or small numbers or on the side of a small or large overall range of rating, in a way that is not necessarily reflective of their actual behavioral patterns. People also differ significantly in base rates of anxious responding; the trends we explored might have been blurred and weakened by this “noise,” given our relatively small sample size. Also, length of relationship does not necessarily predict the seriousness and intimacy of subjects’ relationships. It was, however, the best measure we had available to us.

In addition, we did not have enough homosexual respondents to analyze homosexual relationships separately; therefore, we included responses from only participants in heterosexual relationships. Future research might compare attachment styles in heterosexual and homosexual relationships. A longitudinal study following the same participants over the course of a relationship would be informative as to how attachment and anxious responding change over time, and it would be helpful to collect data from both partners in a relationship to explore how attachment styles interact. Furthermore, we examined attachment within only romantic relationships: we could extend our research to see if participants’ attachment styles mediated anxious responding to a friend or parent.

Our chief recommendation for further research is specialization with respect to a single aspect of attachment or relationship anxiety. Research should address the distinctions among the different subtypes of insecure attachment, as differently insecurely-attached people react and behave in systematically very different ways. In an attempt to take many factors into account, our work is a somewhat superficial appraisal of attachment style and anxious responding, and we lacked the depth to explore particularly nuanced interactions; for the most informative extension of this work, we suggest multiple projects focusing on individual aspects of attachment. An assessment tool to evaluate anxiety in hypothetical romantic situations, such as the tool used in this study, should also be experimentally developed and verified to avoid unintended variation in what the items are truly measuring and to ensure robust results. Nevertheless, this research serves as a useful initial survey of attachment style and anxious responding in a Brown University undergraduate sample, and we anticipate being able to build on these findings in future work.

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