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Measuring emotional temperatures in Shakespeare's drama

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This paper demonstrates how the computational analysis of Shakespeare's plays can map the emotional language used across individual plays and across the canon more broadly, affording new insights. It explains how we adapted the "sentiment analysis" tool *SentiStrength* for use with Early Modern English. Our analyses allow us to test out the long-held critical hypothesis that Shakespeare's work moved from a comic to a "problem" and tragic period, and thence to a more optimistic redemptive mood in his last plays. The paper will also suggest how computational techniques can further understanding of genre, in particular the relationship between history and tragedy in Shakespeare's work.

1. Introduction

Our paper takes the line "What means this passionate discourse?" (*Henry VI, Part II*, 1.1.101) as a cue to use a computer program to explore the language of emotion across Shakespeare's entire dramatic canon. Our endeavour is interdisciplinary, drawing on work in literary studies, linguistics and computer science. The study of emotion has become increasingly popular in all three fields. In literary studies it has long been appreciated, almost as a point of common sense, that emotion is a key factor in determining the effects created in prose, poetry and performance texts, but only more recently have scholars engaged explicitly with "affect" as a phenomenon (Clough & Halley 2007). Theorising emotion, in order to fashion a critical framework and vocabulary to discuss it, has provoked a lively debate. Are emotions shaped by human physiology and thus innate and transhistorical (Evans 2001)? Alternatively, are they constructed differently over time, by social and linguistic conventions, or by a mixture of all these (Matt 2011)? Literary scholars have drawn attention to the difficulties of assessing and quantifying feelings: phenomena that are fluid, shifting and can only be materialised for discussion through substitute representations (Reddy 2001; Meek 2012). Nevertheless, the "emotional turn" in early modern studies has become an international phenomenon itself, receiving support from the world-leading, interdisciplinary Australian National Centre for the History of Emotions. Regarding linguistics, the idea of language being connected with emotion must be one of the most resilient assumptions behind rhetorical discussions from the time of Aristotle to the present day. Modern linguistics has long been concerned with language and emotion, although it is only recent decades that see a marked increase in activity. Emotion in the context of computer science has seen a surge in popularity driven by commercial applications; the commercial world has much to gain through tracking the emotional colouring of people's responses to products.

We used the "sentiment analysis" tool *SentiStrength* (see, e.g., Thelwall et al. 2010; henceforth, we will use "sentiment" in the specific contexts involving computer analysis, but elsewhere we use the synonym "emotion"). Analysing the emotions expressed by language via a computer is difficult enough. Our problems are multiplied by the fact that Shakespeare wrote in

an earlier form of English. We will explain how we adapted *SentiStrength* for use with Early Modern English, so that it could then be used to examine texts from the First Folio of Shakespeare's dramatic works (1623). Our analysis of the whole canon is broad and therefore cannot register that the emotional impact of a play is always one of mixed emotions, "both a sum of, and greater than, each individual's limited but strongly felt, affective perspective" (White & Rawnsley 2015: 244). Although we do look at the mix of positive and negative emotion in the script overall, we do not consider the emotional registers of individual speakers. Nevertheless, we argue that such a methodology can offer new insights to studies of affect in Shakespeare, allowing us to test out, for example, critical assumptions about genre, or the long-held critical hypothesis that Shakespeare's work moved from a comic to a "problem" and tragic period, and thence to a more optimistic redemptive mood in his last plays, as first proposed by Edward Dowden in 1877. Statistical data about emotional temperature in the plays has also provided support for the generic hybridity of Shakespeare's texts and some surprising insights about which topics rouse the strongest passions. We conclude with brief remarks on the potential for developing a tool like *SentiStrength* and its further uses for research on Shakespeare.

2. Emotion in language and literature

2.1 Emotion, language and computers

Psycholinguists have been interested in the underlying dimensions of emotive meaning, that is, the affective states stimulated in the hearer by language. Osgood et al. (1957) proposed that emotive meaning varied along three dimensions: (1) positive or negative evaluation, (2) the degree of control one has over affective states, and (3) the degree of intensity. The first and third dimensions, which in the following decades came to dominate work on emotion by linguists and indeed other scholars, will be of particular relevance to this paper. Moving to the other end of communication, that is, the speaker, we find, for example, Roman Jakobson, a member of the Prague School. Amongst his well-known six functions of language, he proposed the "expressive or emotive" function, which "aims at a direct expression of the speaker's attitude toward what he is speaking about" (Jakobson 1960: 354). As we move into the 1980s, the focus is increasingly on both the speaker and the hearer, and on both how language is used to communicate emotion and how it is understood in social interactions (see the review in Caffi & Janney 1994).

Regarding the deployment of computers in the realm of language and emotion, two overlapping fields have been pushing the boundaries forwards: computational linguistics and corpus linguistics. The emphasis in computational linguistics has been on the substance – the algorithms, statistics, computer code, and so on – of the programs that analyse emotional language or, to give the more common label in this field, programs that do sentiment analysis. Typically, those programs tried to capture the polarity of the language (i.e. whether it is emotionally positive or negative). An early example is Turney (2002), which attempted to identify whether product reviews were positive or negative. Later work expanded its horizons to include specific kinds of emotional state (e.g. happy, sad, angry, fearful) and emotional intensity. It has also moved beyond simply identifying emotion words to including, for example, words statistically associated with emotion words. In corpus linguistics, the emphasis shifts from the substance of these programs to using them to analyse emotion in naturally-occurring language data, especially how it varies across different registers. A good example is Bednarek (2008), who "profiles" the emotional characteristics of academic discourse, conversation, fiction and news reports, not only with respect to lexical emotional terms, but also associated parts of speech and syntactic variation.

2.2 Emotion, literature and Shakespeare

Since emotion was not a word that Shakespeare would have used, research has focused on early modern understandings of the "passions": feelings produced and experienced corporeally. Gail Kern Paster's pioneering definition in *Humouring the Body* argued that emotions flood the body "literally as the humors course through the bloodstream carrying choler, melancholy, blood and phlegm to the parts" (Paster 2004: 14). Subsequent critical work on Shakespeare has explored the combination of physiological, social and linguistic factors through which the passions are expressed. *The Renaissance of Emotion: Understanding Affect in Shakespeare and His Contemporaries* (Meek & Sullivan 2015) reveals the "multiple intellectual frameworks and aesthetic strategies" through which the passions are represented. A special issue of *Shakespeare,* the British Shakespeare Association journal, *Shakespeare and the Culture of Emotion* (Meek 2012), showed how Shakespeare's scripts illuminate the complex interaction between emotional experience and emotional expression. R. S. White (2012) has paid special attention to the changing language of emotion in the early modern period, cautioning us to remember meanings that may have been lost in translation to a modern context, such as the religious connotations of the word "passion", and arguing that "Shakespeare reshaped and refined the meaning of certain emotion words that audiences could, in turn, use to articulate their emotional states" (2012: 282). Recent studies have thus illuminated the "complex affective technologies" (Mullaney 2015: 8) that underlie the "passions" as represented by Shakespeare.

Our opening phrase, "What means this passionate discourse?", is the Bishop of Winchester's cryptic response to the Duke of Gloucester who, at the opening of *Henry VI Part II,* laments the loss of English territories in France. Gloucester uses 26 lines of blank verse to "unload his grief, / Your grief, the common grief of all the land" (*2 Henry VI* 1.1.72-101). His words offer a striking example of early modern understandings of the emotions. The grief felt by Gloucester is also experienced communally by the body politic – the collected nobles – and is shared through the body of the kingdom as the "common grief of all the land". Words are the means by which passions are externalised to be apprehended feelingly by listeners on stage and in the audience. The speaker's grief contaminates listeners and, in turn, expresses the emotions excited in them. "Passionate discourse" enables the translation of feeling between individuals, thus creating sympathetic communities.

Exploring what this "passionate discourse" means in Shakespeare is a critical tradition dating back to the author-based studies by Edward Dowden whose aim in *Shakspere: A Critical Study of His Mind and Art* (1875) was to read Shakespeare's work to access "the man himself, who is certainly the biggest problem in modern literature".[1] Dowden's Shakespeare *Primer* (1877) summarised his findings by grouping the plays chronologically into four periods to chart the Bard's emotional and artistic journey. The first, "apprenticeship", and second, "development as a playwright in touch with the world", are characterised by the development of emotional "energy and subtilty" into a swifter and more ample form in manhood according to Dowden. This was followed by Shakespeare's tragic period, "out of the depths", third period, in which evil and suffering were confronted. Finally, the fourth, "on the heights", period emerges in the Romances at the end of his career, marked by an appreciation of the power of repentance and forgiveness. Dowden (1875: 60) categorised the emotional landscape of the canon by genre too, proposing that Shakespeare "found rest and freedom and pleasure" in writing comedies such as *As You Like It* or *The Winter's Tale* when his imagination needed a rest from the emotional exigencies of history play or of a tragedy like *Timon of Athens.*

Although Dowden's hugely influential work was eclipsed in the twentieth century by the modernist focus on form and structure and by new historicism's fascination with politics and power, its recurrence in the more recent "corporeal" and "emotional turn" in literary studies has

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[1] *Fragments from Old Letters E.D. to E.D.W. 1869–1892*, 2 vols [ed. Elizabeth Dickinson Dowden] (London: Dent, 1914), Vol. 1, p. 82, cited in Murphy (2010). We are grateful to Andrew Murphy for informing us of this comment in the correspondence.

converged to refocus attention on the passions in Shakespeare's texts. In plays designed for live performance by actors' bodies and voices phenomenological studies following the pioneering work by Gail Kern Paster, Katherine Rowe and Mary Floyd Wilson (2004) and Bruce R. Smith (1999, 2010) are obviously significant.

3. The computational analysis of emotion: *SentiStrength* and Early Modern English

3.1 The data for our study and its preparation: Shakespearean English

Our study uses Jane Demmen's (2009) adapted version of Mike Scott's Shakespeare corpus (http://www.lexically.net/wordsmith/support/shakespeare.html), which in turn is drawn from the 1916 edition of The Oxford Shakespeare edited by W.J. Craig (publicly available from the Online Library of Liberty at http://oll.libertyfund.org/). Scott's corpus contains a text file for each of the 36 plays in the First Folio plus *Pericles*, a text file of each individual character's dialogue for each play, and a list of dramatis personae for each play. The particular attraction of Scott's Shakespeare corpus is that it has been annotated to make the play-texts more suitable for investigation using corpus linguistic software tools. Additionally, Demmen undertook considerable work on the text to regularise Scott's corpus. Although the spelling in Scott's Shakespeare corpus is relatively regular, because it is based on a modernised version of the plays, it is not – like other modern versions – free from archaisms. For example, modern editions typically retain the apostrophe for the -*ed* suffix (e.g. *bless'd* rather than *blessed*). Such items pose no issue of comprehension to the modern reader. However, computers are less forgiving: for a word to be matched with a word, the string of letters that comprise it must be identical. Demmen deployed the VARD spelling regularisation programme, developed by generations of researchers at Lancaster University, but given a considerable boost in recent years to make it what it is by Alistair Baron (cf. http://ucrel.lancs.ac.uk/vard/about/). It is possible to use VARD in a fully automated fashion, but for best results a component of "training" is required. Training here means enacting specific solutions for issues identified by the program (e.g. one would not want to regularise *thou* forms to *you*, because *thou* forms had meanings that were somewhat different to *you* forms). The chief merit of Demmen's corpus is that it is the result of much training.

3.2 Sentiment strength detection with *SentiStrength*

SentiStrength (http://sentistrength.wlv.ac.uk/) is a computer program that was designed to classify the strength of positive and negative sentiment in short informal texts, such as in Twitter and elsewhere in the social web (Thelwall et al. 2010; Thelwall, Buckley & Paltoglou 2012). It gives each text a positive sentiment strength score of 1 (no positive sentiment) to 5 (very strong positive sentiment) and a negative sentiment strength score of -1 (no negative sentiment) to -5 (very strong negative sentiment). It works primarily through a lexicon of 2,608 terms and term stems, each of which has been assigned a positive or negative score, by a human judge, to represent its typical sentiment meaning in social web text. For example, *love* is in the lexicon with a score of +3 because it is used to express both strong and weak sentiment, so +3 represents its average use. When fed with a new text, *SentiStrength* looks for words in its lexicon and assigns the text the highest positive and negative score of the words that it finds. This score might be modified by one of *SentiStrength*'s additional rules that cover negation, booster words (e.g. *very*), idioms, multiple consecutive sentiment terms and some social web devices, such as emoticons, sentiment spelling (e.g., "I am haaaaapy"), and multiple punctuation. Full details are available elsewhere (Thelwall, Buckley & Paltoglou 2012). To illustrate the method, "I love and hate you" scores (+3,-4) because *love* is a +3 term and *hate* is a -4 term and no other rules apply. In contrast, "We are not amused" scores (+1,-1) because, although *amused* scores +2, it is negated by *not*. *SentiStrength* has a

number of limitations that cause it to give incorrect scores in some cases, however. It can be fooled by figurative language, such as sarcasm and irony, by words with meanings that depend on context (e.g., *wicked* could be positive or negative depending on the social situation) and by minority meanings of sentiment words (e.g., *fat* can be used as an insult although it is normally neutral).

Although *SentiStrength* is designed primarily for social web texts, its lexicon is derived mainly from general purpose linguistic sources (Pennebaker, Mehl & Niederhoffer, 2003; Stone et al. 1966), and so it may work reasonably well on other genres of modern English, but, hitherto, it has not been clear whether it would also work on Shakespearean English.

3.3 Adapting *SentiStrength* to Early Modern English: The lexicon

Given R. S. White's (2012: 287) argument that "[t]horough analysis might reveal that most if not all words used by Shakespeare to describe states of mood and emotions are false friends in carrying meanings or at least connotations differing from those we assume today", the modern values attached to the terms in *SentiStrength* needed to be scrutinised and altered for a more successful application to Early Modern English. The basis of a new version of *SentiStrength* was constructed by an expert on Early Modern English examining *SentiStrength*'s lexicon and adjusting sentiment strengths for early modern usage (e.g., *swore* was changed from mildly negative -2 to moderately positive +3). The early modern period is obviously rather broad, accommodating many shifts of meaning within it, so we focused on a narrower timeframe. The starting point was 1550; the end point was 1700.

The main challenge in creating an early modern lexicon was categorising words which had multiple meanings which differed greatly in their emotional or sentiment strength. An example is the word *killing* which could be used positively to refer, for example, to Christ "killing sin" as in Lewis Bayley's *The practise of pietie* (1613: 471-2), or music "killing care and grief of heart" (Shakespeare and Fletcher *Henry VIII* III.1.14), in addition to its negative connotations. Where the weight of usage was roughly equal, we could adopt the solution noted in the above section of taking an average score. However, generally we combated this obstacle by supplying the value of the most common usage suggested by the Oxford English Dictionary, The Historical Thesaurus of English (http://historicalthesaurus.arts.gla.ac.uk/), and our own knowledge of literature in the period (we also made a note of all such cases).

Word groups which had a particularly high emotional temperature in the early modern period are, notably, those to do with honour, love and superstition. Examples include: *revenge*, which is graded as -2 in the 21st century, but changed to a more appropriate -4 for the early modern period, as can be seen in Ghost's petition to Hamlet to "revenge his most foul and unnatural murder" (I.V.25); *wrong/ed*, which we moved from -1 to -4; and *obsess*, which was often used to refer to "possession of men's bodies by Devils", and hence we moved from -3 to -5 (see Sclater 1612: 2). Words which are typical of the -5 category included those which were associated with violence, pain or extreme sadness and suffering such as *excruciate*, *violate*, *woe*, *screech*, *anguish* and *massacre*, as illustrated by "murders, rapes, [...] massacres/Acts of black night [and] abominable deeds" (*Titus Andronicus* V.I.64-65). We upgraded *animosity* from -4 to -5 as it was often used strongly to refer to conflict between the King and State, rather than merely disputes amongst individuals: "We desire...that they would lovingly become partakers with us: and not (pursued to the death, by the animosity wherewith the Rebels follow both them and us)" (Munday 1605: S4v). In addition to this, *animosity* was associated with highly negative synonyms such as *hate*. In contrast, *bliss* scored +5 as its meaning was highly positive, whilst *ecstasy* was kept at +4 as, although it was classified as a "violent emotion" in The Historical Thesaurus of English (http://historicalthesaurus.arts.gla.ac.uk/), its meaning was not as consistently positive as *bliss*. This is apparent from Ophelia's reference to Hamlet's "sovereign reason" being out of tune and "blasted with extasie" (III.I.160-163). Word searches on particular ranting speeches from Shakespeare's tragedies drew attention to important words associated with sound to be added to

the database, such as "groan": "Horses do neigh, and dying Men did groan/ And Ghosts did shriek and squeal about the Streets" (*Julius Caesar* II.II.23-24).

We also adjusted words whose subsequent shift in core meanings has led to a shift in emotional value. An obvious instance of this is the word *gay*, meaning "happy" in the early modern period and thus gaining a higher rating of +4. Others include *volatile* and *lure*, which used to be associated with falconry and thus were graded as neutral: "O for a Falconer's voice, / To *lure* this Tassell gentle back again" (our emphasis, *Romeo and Juliet* I.I.198-199). Similarly, *upset* used to be a neutral word, as it meant to "set" or "raise up" in an early modern context, and therefore had little emotional value. Another neutral word in an early modern context was *segregation*, which in contrast scored -2 in its 21st century context due to its connotations of discrimination and exclusion.

In addition to removing words coined after 1700 (e.g. *talentless*) from the original *SentiStrength* lexicon, we added a total of 65 words to the lexicon (e.g., *smite*). Of course, this by no means accounts for all emotion words in Early Modern English. Nevertheless, a combination of the original *SentiStrength* lexicon, a lexicon that has proven utility in analysing present-day English, adjusted to Early Modern English and the 65 additional words, selected mainly because of their early modern significance (e.g. they embody debates to do with conflict within the family and the state), should create a powerful tool. The final lexicon included 2,538 terms. The new version of *SentiStrength* incorporating these changes is called hereafter *Early Modern SentiStrength*. Of course, as we noted above, it does not cover the full span of Early Modern English (variously dated, but 1500 to 1750 is typical). Furthermore, the language of our focal period, 1550 to 1700, was subject to continual change. To gain a sense of the scale of the semantic changes across that period, we generated emotionality scores for a sample of 50 words specifically used in the period 1550-1591, and then compared them with the scores for the same words as used at the end of the seventeenth century. 12 words had a different score. However, in almost all cases the differences are subtle (i.e. involved a shift of one point on our scale). No case involved a wholesale shift from positive to negative. In sum, we concluded that *Early Modern SentiStrength* would reliably reveal broad patterns in texts of the period 1550-1591.

3.4 Initial testing of *SentiStrength* on Shakespearean English

The initial starting point for our testing was a baseline comprising 11,790 present-day texts coded by three humans. Subsequent test scores could then be compared with that baseline using a Pearson correlation, separately for positive and negative sentiment/emotion (a perfect correlation would result in a score of "1"). This statistic is more suitable for comparisons than calculating the rate of agreement between *SentiStrength*'s scores and those of a human, because it takes into account the degree to which *SentiStrength* is incorrect when a disagreement occurs. *SentiStrength* was set to a neutral mood (Thelwall & Buckley 2013), so that it would not assume that sentiment indicators without polarity, such as exclamation marks, were either positive or negative. The first row of Table 1 displays the correlation scores for *Original SentiStrength* compared with a human baseline (taken from Thelwall & Buckley 2013). These scores give an indication of how good *SentiStrength* can be when operating on present-day English, and offer a point of comparison for our applications to early modern data.

Table 1. A comparison of versions of *SentiStrength* on social web texts and Shakespearean English

Source	Number of texts	Positive sentiment strength correlation	Negative sentiment strength correlation

Original SentiStrength applied to six social web sources coded by up to 3 humans	11,790	0.556	0.565
Original SentiStrength applied to random Shakespearean sentences coded by one expert	1,607	0.459	0.516
Supervised (i.e., with automatic adjustments) *Original SentiStrength* applied to random Shakespearean sentences coded by one expert	1,607	0.440	0.538
Early Modern SentiStrength (i.e., with a lexicon of Early Modern English words) applied to random Shakespearean sentences coded by one expert	1,607	0.470	0.536
Shakespearean SentiStrength (i.e., with a lexicon of Early Modern English words and automatic sentiment adjustments learned from human-classified Shakespearean texts) applied to random Shakespearean sentences coded by one expert	1,607	0.552*	0.673*

*These scores are misleadingly high because they are derived from analyses of the test corpus.

In order to test whether *SentiStrength* gives reasonable results for Shakespearean English, its results must be compared against a baseline set of human-classified Shakespearean texts. To achieve this, Shakespeare's plays were split into sentences. A sentence was taken as the contribution (usually a "turn") of a single character in the play, except that lines were also split at colons, semi-colons, exclamation marks and question marks. These sentences were then arranged at random and given to an expert on Early Modern English (not the same person who had created the basis of *Early Modern SentiStrength*), who classified them on the basis of their own understandings of the words with the *SentiStrength* scheme of 1 to 5 for positive sentiment and -1 to -5 for negative sentiment. More specifically, the expert was given a spreadsheet with the texts in random order along with a code book of instructions, and was not shown the *SentiStrength* results or told about how *SentiStrength* works. The expert coded the first 1,607 sentences in the list. The second row (not including the headings row) of Table 1 compares the results of the original *SentiStrength* against this baseline. As one can see, and not surprisingly, they are worse (have lower correlation scores) than the present-day English results for both positive and negative sentiment. Still, the differences are not huge, and the scores are substantially higher than zero, which would indicate random guessing, suggesting that the original version of *SentiStrength* has some accuracy at detecting sentiment strength in Shakespearean English.

SentiStrength has a "supervised mode" function that attempts to automatically adjust the weights of words in its sentiment lexicon in order to make them match the typical uses of the word in a corpus of texts. If it applied this method to a full set of texts then its results would naturally improve, but the new scores would be misleading because it is taking advantage of prior knowledge about the texts to be classified. To get round this problem, in supervised mode *SentiStrength* adjusts its weights on 90% of the texts and then classifies only the remaining 10%, repeating the process ten times for each different 10%. As shown in Table 1, the *Original*

SentiStrength supervised mode results given in row three for the Shakespearean test sentences show a slight reduction in the correlation for positive sentiment but a larger increase in the correlation for negative sentiment. So, overall supervised mode is beneficial. Hence a *Shakespearean SentiStrength* was built with the automatic lexicon adjustment method.
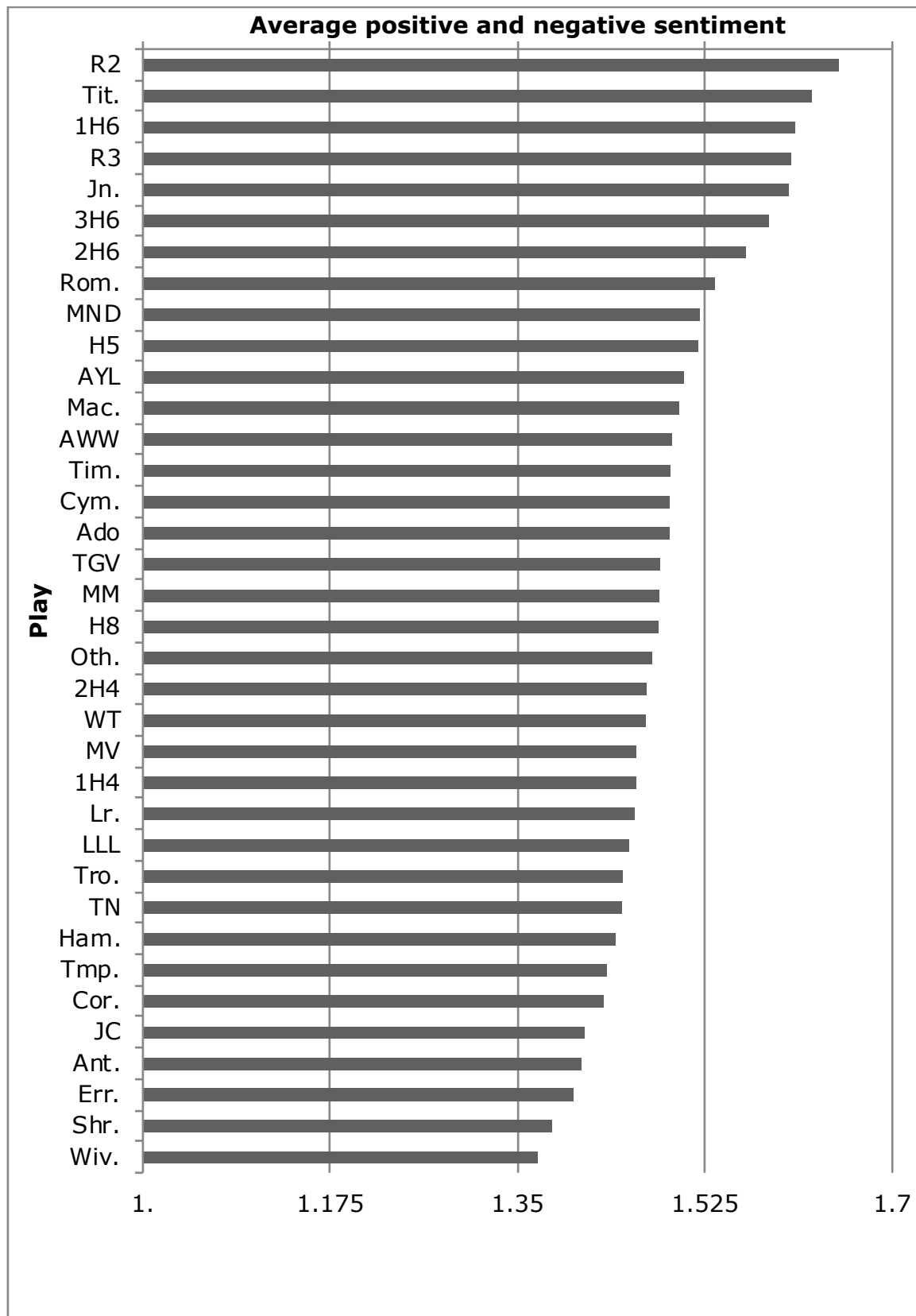
Nevertheless, a key disadvantage of the automatic adjustment method is that it does not recommend new terms to add to the lexicon. In addition, it does not address the myriad of other semantic changes to the lexicon that have occurred over the last four hundred years, as exemplified in section 3.3. Consequently, what *Original SentiStrength* gives is the language of early modern emotion seen through the prism of the present-day. Not surprisingly, *Early Modern SentiStrength*, which uses our Early Modern lexicon, and *Shakespearean SentiStrength*, which uses our Early Modern lexicon and the automatic adjustments of "supervised mode", perform much better on the Shakespearean test corpus than any of the other versions, as can be seen from the fourth and fifth rows of Table 1.

4. Emotional temperature across the canon

4.1 Intensity of emotion

In this section, we consider the overall intensity of emotion in each of Shakespeare's plays. Figure 1 displays the averaged average (mean) scores for positive and negative sentiment. The fact that negative sentiment was scored as a negative number is ignored here, as we are not interested in polarity but intensity of emotion. Thus, for example, a play which scored an average of 3 for positive sentiment and -1 for negative sentiment, would score an overall average of 2 for intensity of emotion. (The abbreviations for play titles follows those suggested by the *MLA Handbook*, and are widely available on the internet, e.g. http://internetshakespeare.uvic.ca/Foyer/guidelines/abbreviations/).

Figure 1. Intensity of emotion across Shakespeare's plays (for each play, the averaged means of positive and negative sentiment per sentence; the minimum possible is 1 and the maximum possible is 5)

Average positive and negative sentiment

(Horizontal axis: Play — R2, Tit., 1H6, R3, Jn., 3H6, 2H6, Rom., MND, H5, AYL, Mac., AWW, Tim., Cym., Ado, TGV, MM, H8, Oth., 2H4, WT, MV, 1H4, Lr., LLL, Tro., TN, Ham., Tmp., Cor., JC, Ant., Err., Shr., Wiv.)

(Scale: 1., 1.175, 1.35, 1.525, 1.7)

One might expect that the advertisement of a love so deep that it "hath an unknown bottom like the Bay of Portugal" (*As You Like It,* 4.1.181) in the comedies or the "extremes of passion, joy and grief" (*King Lear* 5.3.190) that tear hearts apart in the tragedies, would create the strongest emotional genres in the Shakespeare canon. However, all but one of the seven most emotionally intense plays are dramatisations of English history. Indeed, seven of the top ten are histories.

Relative to this, both the tragedies and comedies are rather evenly dispersed. The least emotionally marked plays are in fact comedies, but there are only three of them; in other words, lack of emotional intensity is not a general characteristic of comedies.

In order to better visualise the patterns, we created two further figures. Figure 2 displays intensity of emotion across Shakespeare's play genres, that is, across tragedies, histories and comedies. These genres are defined according to the First Folio (1623) with the exception of *Cymbeline* which we have classed with comedies rather than tragedies, following critical tradition, and *Troilus and Cressida,* inserted late into the Folio between histories and tragedies and not included in the "Catalogue of the Severall Comedies, Histories, and Tragedies contained in this volume".

Figure 2. Intensity of emotion across Shakespeare's play genres (for each play, the averaged means of positive and negative sentiment per sentence; the minimum possible is 1 and the maximum possible is 5)

Average positive and negative sentiment
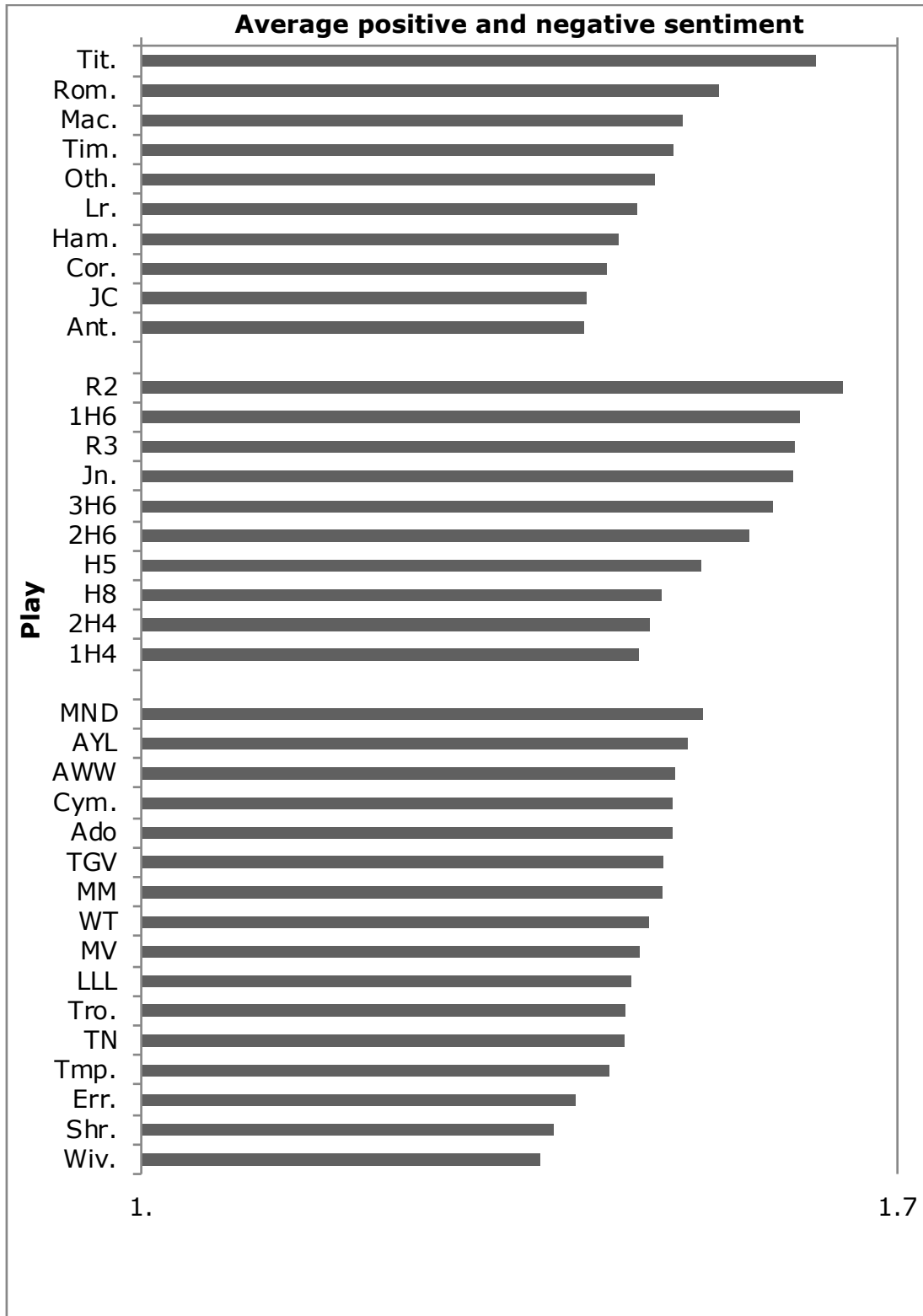
The histories indeed constitute the most emotionally intense genre. Six of them are more emotionally intense than any other play, with the single exception of *Titus Andronicus*. This suggests that the focus of emotional intensity in Shakespeare is associated less with individual experiences than with communal, specifically English, circumstances. Steven Mullaney remarks that drama is "deeply and complexly engaged with what is at risk in the historical moment, unsettled in the collective identity or unmoored in the cognitive and imagined and emotional communities that constitute the social body" (2015: 5). By recreating the usurpation of the crown

by the Duke of Lancaster and the ensuing Wars of the Roses, Shakespeare's history plays dramatise what "is at risk in the historical moment" of the 1590s, when the question of succession was unresolved by the ageing Elizabeth I. The representation of rebellion and civil war on stage provided a focus for the anxieties of her subjects, evoking a complex mixture of emotions. Celebration of the relative security established under the Tudors is tinged with nostalgia at the end of *Richard III* and in *Henry VIII*, while the plots of conspiracy and violence from the past reminded late Elizabethan spectators that history could easily be repeated in the late Elizabethan present.

In such a context, it is not surprising that *Richard II*, the play which symbolically enacts the breakdown of royal authority and marks a shift in the meaning of sovereignty from divinely sanctioned government to rampant individualism, is the most emotionally intense of the histories. As an illustration, consider the following extract spoken by the Bishop of Carlisle (emotion words scored by *Shakespearean SentiStrength* are in bold):

(1)

> My Lord of Hereford here whom you call King,
> Is a **foule traitour** to **proud** Herefords King,
> And if you crown him let me prophesie,
> The **bloud** of English shall **manure** the ground,
> And future ages **groan** for this **foule** act,
> Peace shall go **sleepe** with **turkes** and **infidels,**
> And in this seate of peace, **tumultuous warres**,
> Shall kin with kin, and kinde with kind **confound:**
> **Disorder, horror, feare,** and **mutiny,**
> Shall heere inhabit, and this land be cald,
> The field of **Golgotha** and **dead** mens **sculs.**
> Oh if yon raise this house **against** this house,
> It will the **wofullest diuision** proue,
> That euer **fell** vpon this **cursed** earth:
> **Preuent** it, **resist** it, let it not be so,
> Lest child, childs children **crie against** you **wo.**
>
> (*Richard II* IV.i)

Richard II advertises its emotion so flamboyantly that it is impossible to ignore, although critical responses to the protagonist have varied from strong critiques of his weakness to sympathy for his situation. Richard Meek's focus on the way sympathy and emotion are represented in order to manipulate the responses of audiences on and off stage argues that "Shakespeare highlights the ways in which pity and compassion are complex imaginative processes, rather than simply automatic or humoral phenomena" (Meek 2015: 131-132). Such a focus need not ignore the political agenda of the play, which shows how the manipulation of sympathies in *Richard II* is itself politically strategic. In contrast with *Richard II*, *Henry IV Parts 1 & 2* are the least emotionally marked histories. This is probably due to two factors: (1) the figure of Falstaff and the setting of many scenes in the saturnalian, comic world of the tavern in Eastcheap, rather than just the court, and (2) the prince's narrative of reformation is already advertised in the second scene of *Henry IV Part 1* and was well known to the audience, thus giving both plays a sense of security that the historical narrative would culminate with the glorious victories of Henry V as ruler of the kingdom and conqueror of France.
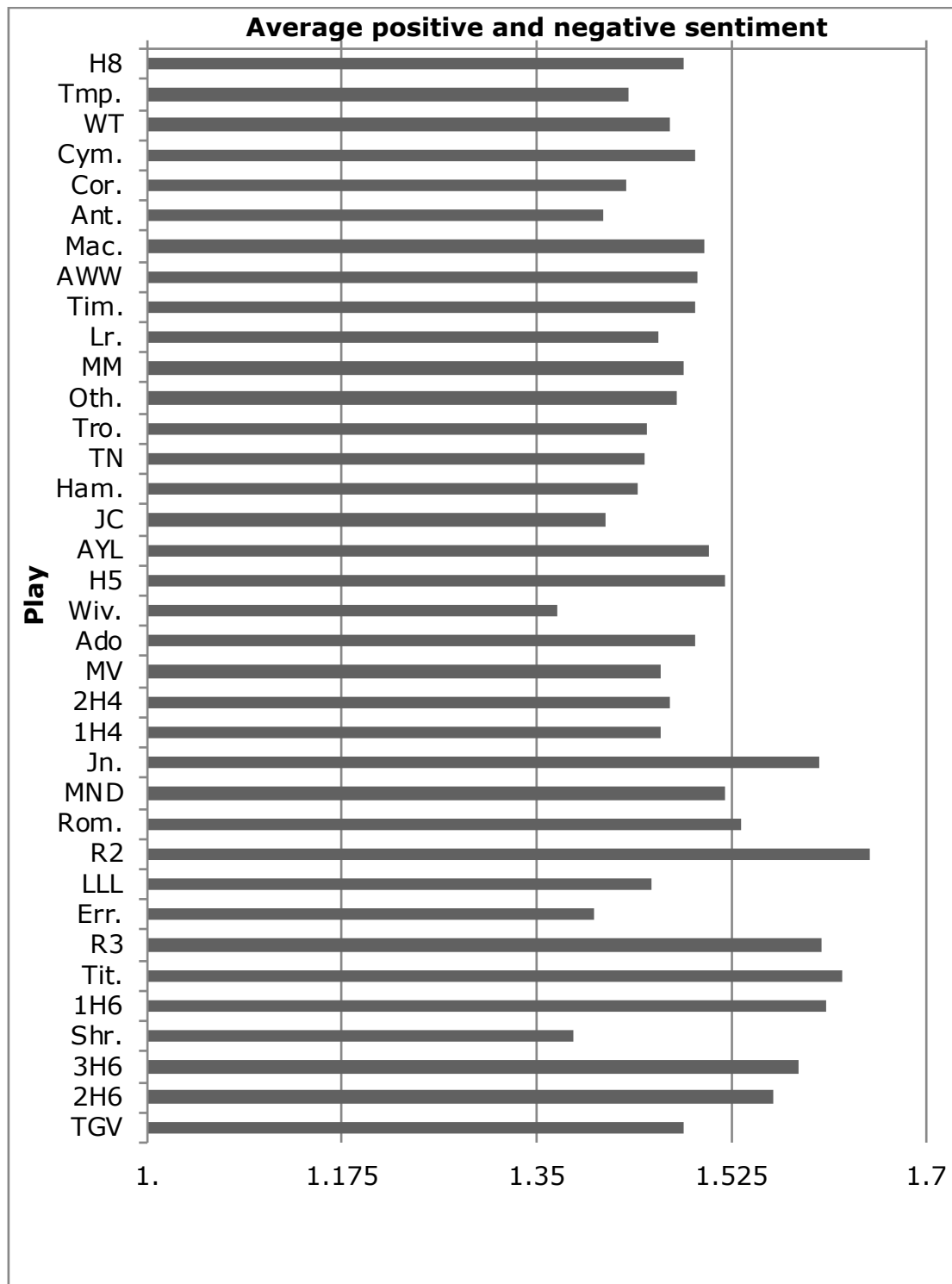
Turning to the tragedies, *Titus Andronicus* stands out above the norm for emotional intensity in the tragedies and, in fact, for all the plays, only being eclipsed by *Richard II*. The next highest plays are *Romeo and Juliet*, *Macbeth* and *Timon of Athens*. One might speculate that that this partly correlates with the "body count" of the plays. This certainly seems to be a factor in

positioning *Titus Andronicus* at the top, with its multiple deaths and mutilations. However, it cannot be the only factor, as it does not account for *Timon of Athens*, a play in which there is one death. What matters is not just deaths but how much emotional upset those deaths cause. This is consistent with *Antony and Cleopatra* being the least emotionally marked tragedy in Figure 2, closely followed by *Julius Caesar*. Although deaths occur in both, neither contain explicit and markedly prolonged (or serial) agonising, pitying, lamenting or tormenting. We will return to some of these tragedies when we discuss negative emotion in section 4.2.

The comedies vary in degree of emotional intensity somewhat less than histories or tragedies, that is to say, they are a rather more cohesive set. *A Midsummer Night's Dream* is the most emotionally intense comedy. One possible factor behind this is that it is an early comedy, and, as we will demonstrate in our next Figure, Shakespeare tended to write his more emotionally extreme plays in the early stages of his career. More than this, however, *A Midsummer Night's Dream* was testing generic boundaries, as it explicitly advertises in its internal play, *Pyramus and Thisbe*, "tragical mirth". That play is also a mirror image to *Romeo and Juliet*, the second most emotionally intense tragedy. *Merry Wives of Windsor* is the least emotionally marked comedy, closely followed by the *Taming of the Shrew*. This may be because in each case, the plots dramatise the rigorous containment of excessive emotions by social conventions governing early modern behaviour. R. S. White (1991) drew attention to the parallel speeches of submission by Katherina in the *Taming of the Shrew* and Ford in *Merry Wives,* the latter interrupted by Master Page who says "Be not as extreme in submission as in offense" (4.4.9-10), because its expression of husbandly deference is inappropriate.

Finally in this section, we turn to chronology. Figure 3 displays intensity of emotion across the period in which Shakespeare's plays were written and performed (the earliest play is at the bottom of the Figure, and vice versa for the latest). The dating of Shakespeare's plays is not, of course, an exact science. What we display should be considered approximations based on the evidence we have.

Figure 3. Intensity of emotion across the period in which Shakespeare's plays were produced (for each play, the averaged means of positive and negative sentiment per sentence; the minimum possible is 1 and the maximum possible is 5)

Average positive and negative sentiment

Play	
H8	
Tmp.	
WT	
Cym.	
Cor.	
Ant.	
Mac.	
AWW	
Tim.	
Lr.	
MM	
Oth.	
Tro.	
TN	
Ham.	
JC	
AYL	
H5	
Wiv.	
Ado	
MV	
2H4	
1H4	
Jn.	
MND	
Rom.	
R2	
LLL	
Err.	
R3	
Tit.	
1H6	
Shr.	
3H6	
2H6	
TGV	

Horizontal axis labels: 1. — 1.175 — 1.35 — 1.525 — 1.7

There is no consistent pattern across the entire chronology of Shakespeare's plays. Dowden, as noted in section 2.2, conceives of comedies as "resting place" between the emotional exigencies of other plays, perhaps for the audiences as much as for Shakespeare. This may account for some of the variation, though there is no strict pattern such that one emotionally intense play is followed by one that is less so. However, there is another relatively clear pattern: Shakespeare's earlier output – specifically up to and including *King John* – contains his most emotionally marked plays. Of those first 13 plays, nine contain a higher score for emotional intensity than any play written after. The statistical pattern corroborates critical views that Shakespeare's apprentice work as playwright demonstrates the influence of the classical writers Plautus, for comedy, and Seneca,
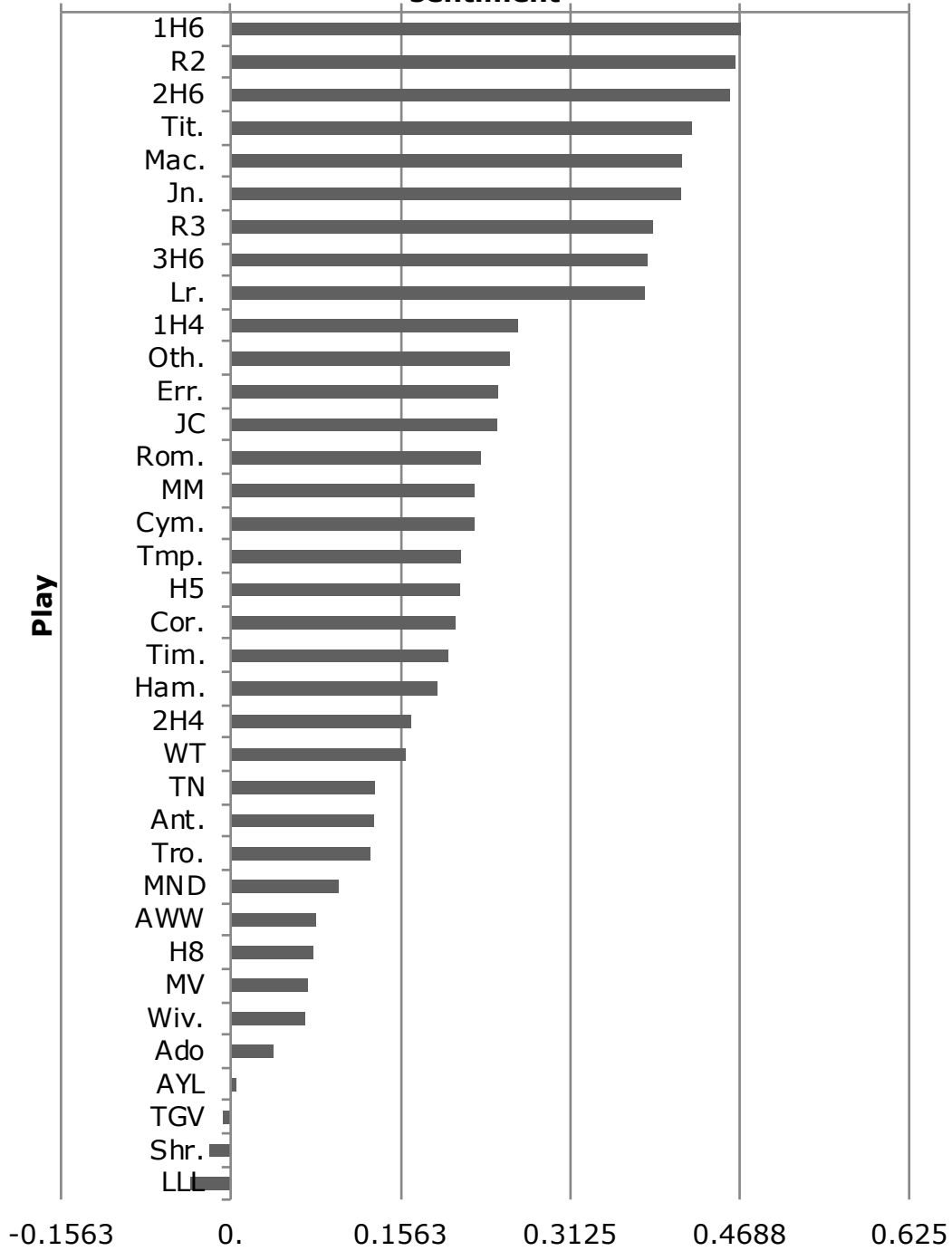
whose *Tenne Tragedies,* translated and published in 1580, set a pattern for revenge drama and an extravagant declamatory style. Van Es (2013: 21-36) has argued that the apprentice Shakespeare was also imitating contemporary writers from the highly-successful Admiral's Men Company. Thomas Kyd's highly popular bloody revenge *The Spanish Tragedy* (1592) and tragedies by Christopher Marlowe developed an English version of the Senecan style. In 1598 Francis Meres observed that "As Plautus and Seneca are accounted the best for comedy and tragedy among the Latins, so Shakespeare among the English is the most excellent in both kinds for the stage". Fascinatingly, Meres cites tragedies which come at the top of the list for emotionality in the *Shakespearean SentiStrength* results: "his *Richard the 2, Richard the 3, Henry the 4* [this may be a mistake for Henry VI] *King John, Titus Andronicus* and his *Romeo and Juliet.*" (Meres 1598: 292, cited in Greenblatt et al. 2015: A22).

4.2 Degree of negative emotion

In this section, we turn to the overall degree of negative emotion in each of Shakespeare's plays. Figure 4 displays the average (mean) scores for negative sentiment for each play with the average scores for positive sentiment subtracted. Given that the scores for negative emotion generally far outweigh positive, the results generally indicate the degree of negative emotion.

Figure 4. Overall negative sentiment across Shakespeare's plays (average negative sentiment minus average positive sentiment)

Average negative sentiment minus average positive sentiment

Play
1H6
R2
2H6
Tit.
Mac.
Jn.
R3
3H6
Lr.
1H4
Oth.
Err.
JC
Rom.
MM
Cym.
Tmp.
H5
Cor.
Tim.
Ham.
2H4
WT
TN
Ant.
Tro.
MND
AWW
H8
MV
Wiv.
Ado
AYL
TGV
Shr.
LLL

-0.1563   0.   0.1563   0.3125   0.4688   0.625

A group of nine plays emerge as distinctly marked for negative emotion. Two-thirds are histories; the remainder tragedies. Of these top nine, all except *Titus Andronicus* are concerned with national history. In addition to the English history plays of the Elizabethan period, *Macbeth* and *King Lear* dramatise anxieties about the expansion of the nation state as Britain after the accession of King James, a monarch who had published on the responsibilities and power of sovereignty, including the absolute authority of the monarch as divine deputy of God and father to his subjects. Clearly then, there is a correlation amongst high emotional intensity, high degree of negative emotion and the history plays. In contrast, and unsurprisingly, comedies contain the least marking for negative emotion. Given the lack of the conventional comic ending of marriage in *Love's Labour's Lost,* and the uneasiness modern readers often feel at the romantic resolution of *Two Gentlemen of Verona,* or the subjection of Katherina that ultimately fulfils the title of *The Taming of The Shrew,* the result that these are the only three plays that have an overall balance of positive emotion may be useful in drawing attention to their fulfilling of positive emotional affect that is often eclipsed by the current politically-correct focus of criticism.

Just as for intensity of emotion, in order to better visualise the patterns, we created two further figures. Figure 5 displays the degree of negative emotion across Shakespeare's play genres.

Figure 5. Overall negative sentiment across Shakespeare's play genres (average negative sentiment minus average positive sentiment)

Average negative sentiment minus average positive sentiment
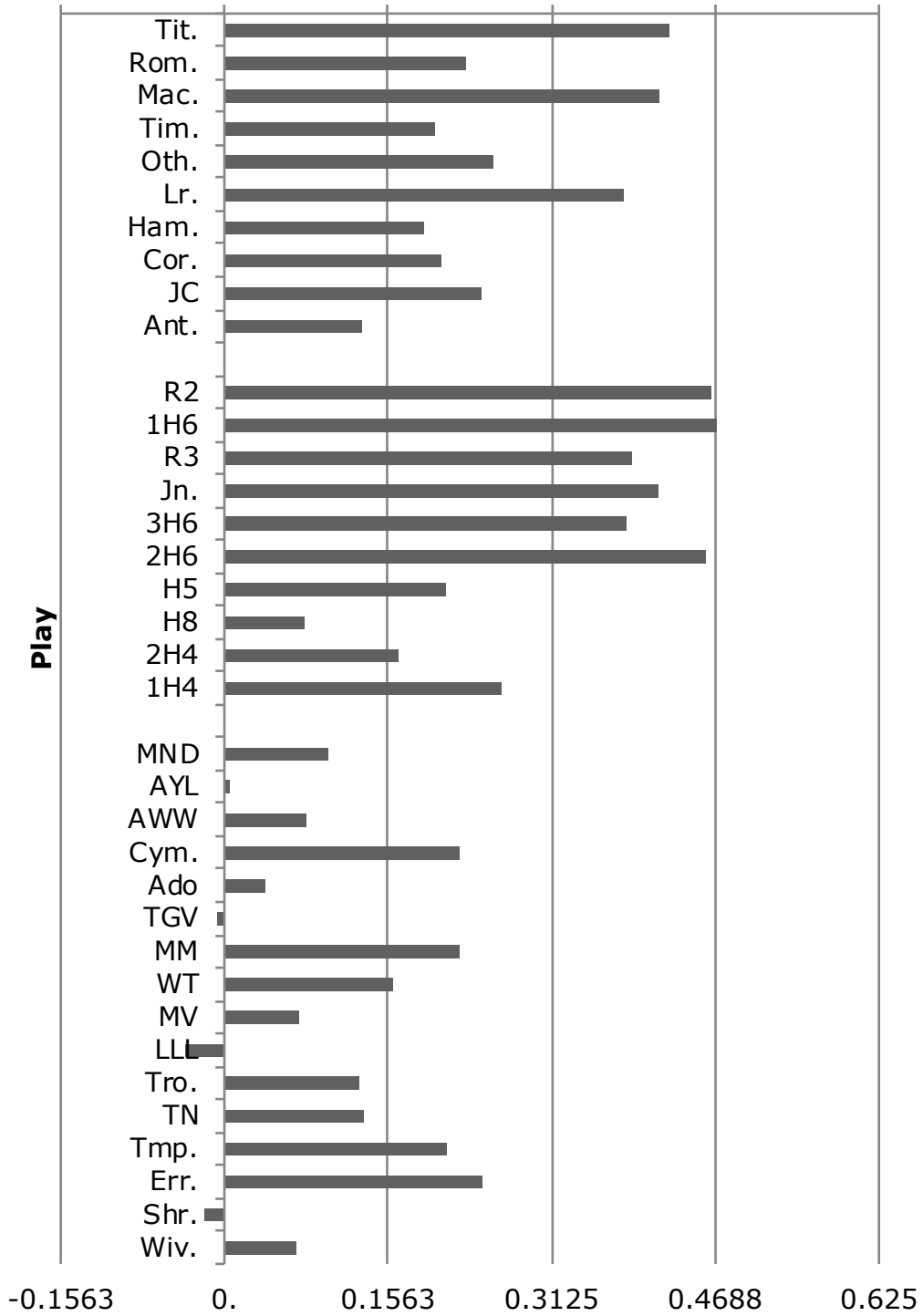
Three tragedies are strikingly rich in negative emotion: *Titus Andronicus, Macbeth* and *King Lear*. This is not dictated by relatively high occurrences of words ranked with a maximum - 5 score by *Shakespearean SentiStrength*; rather, the averaged score registers a higher proportion of negatively charged emotion as a predominant mood across speakers and script. *Titus Andronicus* follows the Senecan tradition of lengthy monologues by protagonists expressing their grief and the Ovidian narrative tradition. The role of Titus has been regarded by both critics and actors as a prototype of Lear's suffering and Keith Linley (2015) notes the likely influence of Seneca's essay *De Ira* (On Anger), a powerful argument for stoic restraint, on *King Lear*. Much earlier, A. C Bradley (1905/1960) had likewise observed that *Macbeth* contained Senecan elements that were a throwback to Shakespeare's youth and untypical of his later tragedies. *Macbeth*, Shakespeare's shortest tragedy, is characterised by intensity, as noted in the previous section, so much so that L. C. Knights characterised it as a dramatic poem. Moreover, that intensity involves negative emotion, as we see from Figure 5. The emotion-laden nature of Macbeth's soliloquies is well-known, but the intensity of negative emotion permeates the play, including the dialogue of other characters:

(2)

> *Malcom.*
> Alas I find my Nature so inclin'd
> To **Vice**, that **foul** *Macbeth* when I shall rule,
> Will seem as white as Snow.
> *Macduff.*
> There cannot in all **ransackt Hell** be found
> A **Devil** equal to *Macbeth*.
> *Malcom.*
> I grant him **bloody false, deceiptful malitious,**
> And participating in some **sins** too **horrid** to name;
> But there's no **bottom**, no **depths** in my **ill appetite,**
> If such a one be fit to govern, speak?
>
> (*Macbeth* IV.iii)

In contrast, one tragedy, *Antony and Cleopatra*, stands out because it has less negative emotion than the other. The balance of tragedy between two protagonists and the fact that Antony and Cleopatra speak more frequently in dialogue than soliloquy may partly explain this.

The histories are particularly dense in negative emotion, compared to the other genres, as we already noted. Looking more closely, this conclusion is largely due to a cluster of six histories, *Henry VI Part 1*, *Richard II*, *Henry VI Part 2*, *King John*, *Richard III* and *Henry VI Part 3*, all of which exceed the quantity of negative emotion in all comedies and the lowest of which (*Henry VI Part 3*) exceeds the lowest in the top group of the tragedies mentioned above. Significantly, all these plays deal with crises in English government, a "division of the kingdom" that led to either civil war, loss of English territory and even foreign invasion in *King John*. Four of them – *Henry VI, Parts I, II,* and *III* and *Richard III* – dramatise the Wars of the Roses, the most recent history depicted in Shakespeare. The traumatic consequences of these events were felt down the generations as part of living memory (Schwyzer 2010), and a comment by one of Shakespeare's contemporaries, Thomas Nashe, testifies to the emotional power of the hero Talbot's death in *Henry VI Part I* on contemporary spectators:

> How would it have joyed brave Talbot (the terror of the French) to thinke that after he had lyne two hundred yeares in his Tombe, hee should triumphe againe on the Stage, and have

his bones newe embalmed with the teares of ten thousand spectators at least (at severall times), who, in the Tragedian that represents his person, imagine they behold him with fresh bleeding. (Nashe 1592)
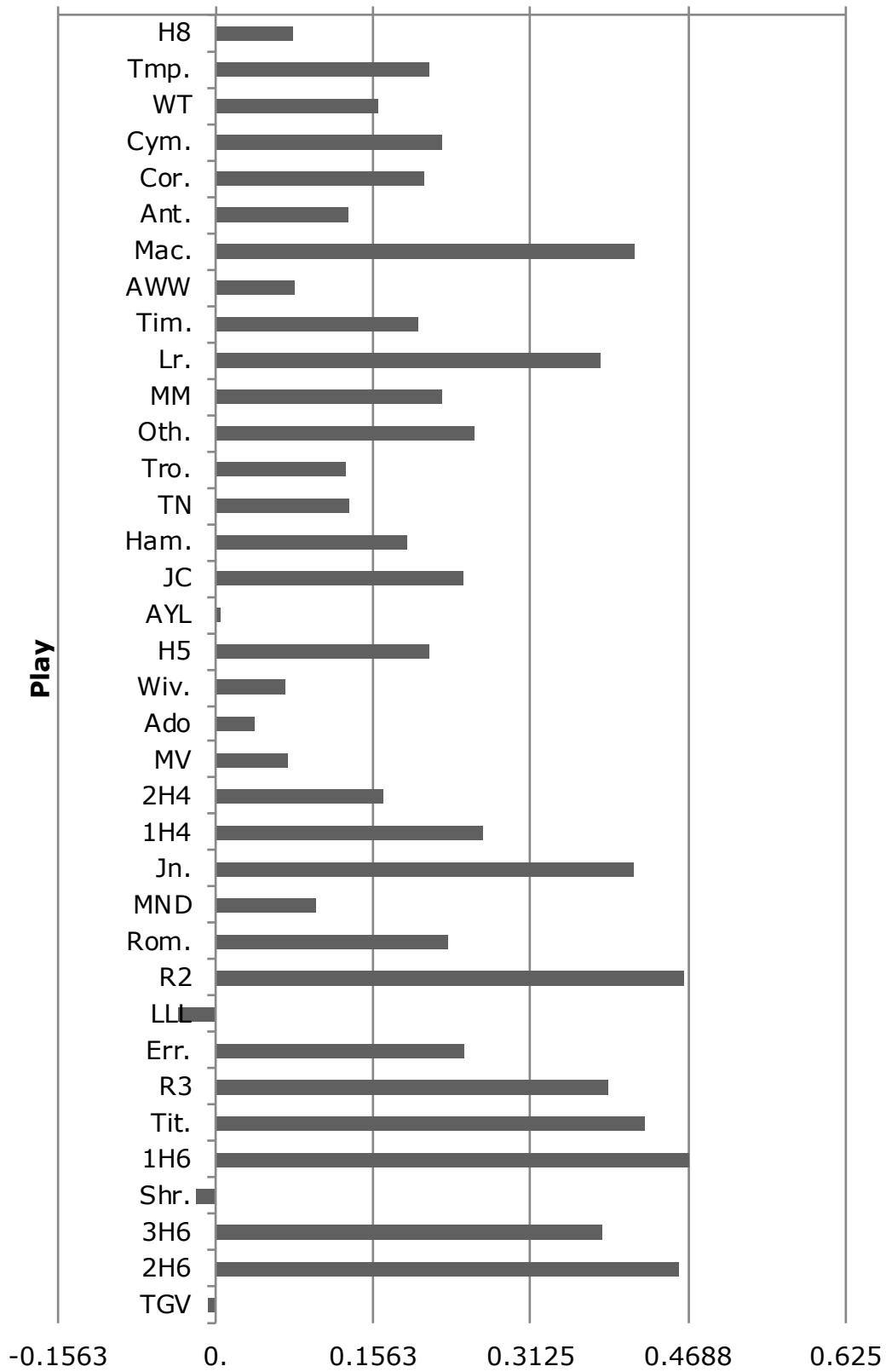
The Wars of the Roses ended with the foundation of the Tudor dynasty, overall a much more secure and prosperous period, but in the 1590s, fears of a return to the bloody civil conflicts of the past undoubtedly returned since Elizabeth I, the last Tudor monarch, was childless and had refused to name a successor. *Richard II,* the slightly later English history play, depicts the point of origin of the Wars of the Roses in the usurpation of the English throne by the Lancastrian Henry Bolingbroke. The fact that Shakespeare's company were apparently paid to perform *Richard II* to coincide with an attempted coup by the Earl of Essex in 1601 testifies to the contemporary political resonance of its treatment of government. Amongst the history plays, the one that is outstanding for lack of negative emotion is *Henry VIII*, and other histories with little marking for negative emotion are *Henry IV Part 2*, *Henry V* and *Henry IV Part 1*. As briefly noted above, ultimate victory in *Henry V* and the focus on the tavern scenes of saturnalian recreation rather than exclusively on the court and court politics in both parts of *Henry IV* would seem to account for this result.

A group of four comedies stand out from the rest of the comedies for negative emotion: *Comedy of Errors*, *Measure for Measure*, *Cymbeline* and *The Tempest*. In large part, this result underpins what commentators have said about the status of these plays as semi-tragedies. *Measure for Measure* was classified as a comedy, but is well known for including darker elements, for being one of the "problem plays". *Cymbeline* was in fact first classified by the editors of the First Folio (1623) as a tragedy. *The Tempest* hardly is a prototypical comedy, containing as it does some dark strands (e.g. murder plots). As for the *Comedy of Errors*, its credentials as comedy have not been doubted. However, it is noted for being a "slapstick" comedy, and such comedy often has a darker, violent side. Here, the plot involves a father who has lost a son and wife (and then his remaining son who goes in search of his brother); and also, later, the pending death of the father. From such lows, the happy resolution at the end is all the sweeter. The point, of course, is that these lows seem to be reflected in the language of negative emotion. Three comedies, *Love's Labours Lost*, *Taming of the Shrew* and the *Two Gentlemen of Verona*, are distinctive amongst comedies in that they contain an overall balance of positive emotion. One thing these plays have in common is that they were all written fairly early in Shakespeare's career. We now turn to the chronology of his plays.

Figure 6 displays the degree of negative emotion across the period in which Shakespeare produced his plays (the earliest play is at the bottom of the Figure, and vice versa for the latest).

Figure 6. Overall negative sentiment across the period in which Shakespeare's plays were produced (average negative sentiment minus average positive sentiment)

Average negative sentiment minus average positive sentiment

Play

H8	
Tmp.	
WT	
Cym.	
Cor.	
Ant.	
Mac.	
AWW	
Tim.	
Lr.	
MM	
Oth.	
Tro.	
TN	
Ham.	
JC	
AYL	
H5	
Wiv.	
Ado	
MV	
2H4	
1H4	
Jn.	
MND	
Rom.	
R2	
LLL	
Err.	
R3	
Tit.	
1H6	
Shr.	
3H6	
2H6	
TGV	

-0.1563   0.   0.1563   0.3125   0.4688   0.625

There is no consistent pattern across the entire chronology of Shakespeare's plays. Although that fact confutes the idea of a simple chronological pattern of a "tragic period" followed by a shift to forgiveness, wonder and harmony in the romances as theorised by Dowden (see section 2.2), it supports his idea of Shakespeare using one drama as "resting place" from emotional exigencies in a previous play – usually history or tragedy. Sudden peaks of negative emotion are usually followed by a drop; we do not see a series of rises.

As we briefly observed above, Shakespeare's earlier output – specifically up to and including *King John* – contains his most negative emotionally marked plays. Of those first 13 plays, seven contain a higher score for negative emotion than is generally the case for plays written after *King John*. However, there are notable exceptions. Firstly, *Two Gentlemen of Verona*, *Taming of the Shrew* and *Love's Labours Lost* all appear in the early period yet actually have a balance of positive emotion. Secondly, *Macbeth* and *King Lear* appear in the later period yet have a quantity of negative emotion considerably above the norm for that period.

5. Conclusion

The creation of a version of *SentiStrength* that can be used to interrogate early modern texts reliably has allowed us to investigate both the intensity of emotion across Shakespeare's plays, and also the degree to which they contain negative emotion. We noted how the history plays are outstanding in emotional intensity, with *Richard II* the most emotionally marked of all. We pointed out that this reflected the dramatisation of English historical social and political circumstances, and circumstances that resonated for Elizabethan audiences. Contrary to expectations, it is not the case that tragedies are notable for emotional intensity relative to comedies. Amongst the tragedies, *Titus Andronicus* is outstanding for emotional intensity. That might suggest that death and mutilation is the cause of emotional intensity. That seems to be a factor in the other tragedies, but it is not necessarily a sufficient one, as witnessed by, for example, *Antony and Cleopatra* being the least emotionally marked tragedy. Deaths correlate with emotional intensity if they also involve explicit and prolonged emotional angst. As for comedies, *A Midsummer Night's Dream*'s position as the most emotionally intense probably is due to the "tragical mirth" of its internal play, *Pyramus and Thisbe*. From a chronological point of view, we noted that there is no strikingly consistent pattern across all Shakespeare's plays. We did, however, observe some alternation in the plays, whereby a more emotional play was often followed by a less, thereby partially supporting Dowden's hypothesis that comedies constitute a "resting place". We also noted that the plays up to *King John* tended to be more emotionally marked.

Turning to the degree of negative emotion, it is clear that histories are not merely marked for intensity of emotion, but intensity of negative emotion. Tragedies that appear in the group of plays that are outstanding for negative emotion include *Titus Andronicus*, *Macbeth* and *King Lear* – plays that concern aspects of national history. We suggested that the relative lack of negative emotion in *Antony and Cleopatra* may be due in part to the fact that the protagonists speak more frequently in dialogue than soliloquy. Unsurprisingly, comedies contain least negative emotion. Interestingly, the three plays to achieve an overall balance of positive emotion – *Love's Labours Lost*, *Two Gentlemen of Verona* and *The Taming of the Shrew* – are plays that may not sit entirely positively with a modern audience, yet our analysis draws attention to their overall positive emotional nature. Four comedies, *Comedy of Errors*, *Measure for Measure*, *Cymbeline* and *The*

Tempest, are distinguished from the other comedies by their relative density of negative emotion. These are the very plays that are semi-tragedies, "problem plays" or at least have darker, violent aspects. Regarding chronology and negative emotion, we find no support for Dowden's theory that there was a simple pattern of a tragic period which eventually shifted to harmony. However, it is the case that Shakespeare's earlier output, more specifically up to and including *King John*, contains his most emotionally negative plays.

In addition to insights revealed by the broad survey of the Shakespeare canon conducted here, our initial uses of *Shakespearean SentiStrength* open up promising possibilities for further research. Firstly, the expansion of *Early Modern SentiStrength's* lexicon to include more terms with high emotional resonance for early modern readers, listeners and spectators, would enable more detailed analyses of the emotional landscape displayed in texts by Shakespeare and his contemporaries. The selection of such terms would be possible, for example, using collocation methods applied to the material constituting *Early English Books Online*, especially as transcribed by the Text Creation Partnership. Secondly, further analysis of how words change from material to psychological resonances is needed, following the pattern of R. S. White's case study of "sympathy" (White 2012). Thirdly, *Shakespearean SentiStrength* offers a valuable tool to study individual play scripts in order to consider emotional variations from scene to scene and mixed emotions held by different characters. Analysing the emotional journey of characters using *Shakespearean SentiStrength* will add to existing analysis of their "roles" or parts in isolation from the rest of the playscripts (Stern & Palfrey 2007). *Shakespearean SentiStrength* also has the potential to contribute to authorship studies by comparing emotional temperature of scenes attributed to different authors in collaborative scripts.

Acknowledgement

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