The verse-line as a whole unit in working memory, ease of processing, and the aesthetic effects of form.

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Abstract

Verse, defined as a spoken or written text divided into lines, is often assigned high cultural value. This paper argues that metrical and parallelistic verse texts are processed line-by-line in working memory. Treatment of the line as a whole unit is necessary for the processing of the regular patterned forms which hold of the verse. In turn, these regular patterned forms make the processing of the text easer and produce other effects which have been experimentally shown to produce interconnected low-level aesthetic effects of pleasure, familiarity and truth. This may in part explain why verse is often given a higher cultural value than prose, and hence why verse is found throughout the spoken and written literatures of the world.

1.   Verse

Verse is text which is divided into lines.[1] In this paper I explore a psychological account of how verse is processed, and specifically the hypothesis that the text is processed line by line, such that each line is held as a whole sequence in the limited capacity of working memory. I will argue that because the line is processed in this way, certain low-level aesthetic effects are thereby produced, thus giving a partial explanation for why verse is often a highly valued type of verbal behaviour. The general goal is to address the question of what literary form is, from a psychological perspective, and how the textual presence and psychological processing of form can contribute to particular aspects of the aesthetic experience of verse.

This greater value can be seen for example in Shakespeare's *Henry IV Part 1*, where 'the scapegrace fun is in prose, but when Hal faces the outer world his different status calls for verse'.[2] Similarly, though in a very different context, McCreery describes a Chinese exorcism in which the magician Ong performs a healing ritual in which he speaks to the demons in prose and switches to syllable–counting verse when he speaks to the gods.[3] Turning to written

[1] Thanks to Alan Baddeley, Rip Cohen, Greg Currie, Graham Hitch, Jonathan Hope, Elspeth Jajdelska, Christian Obermeier, Sinead Rhodes, Gary Thoms, Barbara Tillmann, Stefano Versace, and two anonymous reviewers.

[2] A. R. Humphries, (ed) The first part of King Henry IV. The Arden Edition of the Works of William Shakespeare (London: Methuen, 1960).

[3] John L. McCreery, 'Negotiating with Demons: The Uses of Magical Language', *American Ethnologist* **22** (1995) 144–164.

Chinese literature, we find that the genre of *fu* mixes prose and verse, where verse is used in 'the more rhapsodic and emotionally charged passages'. [4] It is not only metrical verse which is valued; thus Martin discusses a conversation amongst Mocho speakers in Chiapas Mexico which, when it touches on ritual topics relating to a potential volcanic eruption shifts into verse based on systematic parallelism. [5] Similarly, Forth says that the Rindi (Sumba, Indonesia) type of speaking which is organized into pairs of lines, based on parallelism, is called *bahasa dalam* 'deep, profound speech'. [6]

In this paper I address the question of why the division of a text into lines often correlates with its being assigned higher value, a question which I have elsewhere phrased as 'why is verse poetry?'.[7] In that paper I suggested that

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[4] Burton Watson, Chinese Rhyme–Prose. Poems in the Fu Form from the Han and Six Dynasties Period (New York: Columbia University Press, 1971).

[5] Laura Martin, 'Parallelism and the spontaneous ritualization of ordinary talk: three Mocho friends discuss a volcano', in Sammons, Kay and Joel Sherzer (eds) 2000. *Translating Native Latin American Verbal Art: Ethnopoetics and Ethnography of Speaking.*   (Washington: Smithsonian Institution Press, 2000) 104–124.

[6] Gregory Forth 'Fashioned speech, full communication: aspects of eastern Sumbanese ritual language', in James J. Fox (Ed.) *To speak in pairs. Essays on the ritual languages of Eastern Indonesia* (Cambridge: Cambridge University Press, 1988) 129–160.

[7] Nigel Fabb, 'Why is verse poetry?' *PN Review* **36** (2009), 52–57. The philosophical question of the value of verse is also extensively discussed in Alex

verse is composed line-by-line, and that since the line is not a linguistic constituent, this encourages the production of speech or writing in a way which bypasses ordinary semantically-driven and syntactically-driven processes of speech production, and that this has a range of aesthetic consequences. In the present paper, I focus on the role of working memory capacity in processing verse line-by-line. I point to psychological experiments which show that the forms of verse can produce effects of familiarity, truth and pleasure, and I suggest that these are particularly enabled by processing the text line by line, such that each line is processed as a whole unit in working memory capacity. Much of what I have to say in this paper is quite speculative; though it draws on experimental evidence, the experimental evidence produced so far is limited to a few traditions, and touches only a few parts of the great variety of verse in the literatures of the world.

A text divided into lines is a text divided into sub-sequences. There are many ways of dividing a text into sub-sequences, not all of which are verse: for example, written prose is in sub-sequences, divided by punctuation marks. In this paper, I focus on metrical and parallelistic verse. These are types of verse in which the sub-sequences which are lines are subject to generalizations, patterns which hold repeatedly over the lines. These generalizations are forms such as metre, rhyme, and systematic parallelism, which hold of the verse text, and which do not hold of prose.

Neill 'Poetry' in Jerrold Levinson (ed) *The Oxford Handbook of Aesthetics* (Oxford: OUP, 2003), though not with reference to the issues raised in the present paper.

Roman Jakobson makes a useful distinction between the verse design and verse instance of a text (abstracted away from performance) as opposed to the delivery design and delivery instance of the text (the text as performed). [8] I will suggest that the line is a characteristic of the text at the level of verse design/instance, which may or may not be manifested in the text at the level of delivery design/instance. This distinction is relevant for thinking about the psychological status of the line: it means that at the relevant psychological level, the listener attends to the (abstract) verse design/instance and not on the actually heard delivery design/instance.   To clarify the meaning of Jakobson's terms, consider the following four lines from Shakespeare's eighteenth sonnet.

> Shall I compare thee to a Summers day?
> Thou art more lovely and more temperate:
> Rough winds do shake the darling buds of May,
> And Summer's lease hath all too short a date:

These four lines share the same verse design: they are all in iambic pentameter, a metre which specifies that the normative line should be ten syllables long and even-numbered syllables should be stressed and which also allows variations on this pattern. Each of the four lines is a different verse instance of that verse design, manifesting the metre in a different sequence of specific words, each

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[8] Roman Jakobson, 'Closing statement: Linguistics and Poetics.' In T. Sebeok, (Ed.) *Style in Language*. (Cambridge MA: MIT Press, 1960). 350-377.

word having an invariant stress pattern, which enables us to predict at least part of the overall stress pattern of each line and thus see how it varies from the iambic pentameter of the verse design.   The verse design and verse instances for this text have in principle remained the same since the text was composed: verse design and instance do not vary, because they are abstract characteristics of the text, analogous to the linguistic forms of the text, which are not dependent on context of performance.

In contrast, a text can be realized as any number of different delivery instances, which are the unique and actual manifestations of the text. For example, David Tennant has recorded a performance of these lines pausing in the following places and for the following times (shown in parentheses in tenths of a second): [9]

Shall I compare thee to a Summers day? [1.1]

Thou art more lovely [0.1] and more temperate: [0.8]

Rough winds do shake the darling buds of May, [0.6]

And Summer's lease hath all too short a date: [0.8]

In actual performance, if we think of this as a sequence of lines, then this is a sequence of four delivery instances, with slightly different final pauses, and a pause midway through the second line (plus all the other surface features not transcribed here, including specific intonation contours). Another performance is likely to produce four different delivery instances for these four lines. The

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[9] On the CD, *From Shakespeare with Love.* (Naxos AudioBooks, 2009).

delivery design is the generalization over the delivery instances, which in this case may be a generalization that there is a pause of half a second or longer at the end of every line (which is not necessarily the case for every performance of this text). We can say that this text as delivered by Tennant is in lines; that is, that lineation is part of its delivery design. This is because there are pauses at the end of every line, and though there is also a pause midway through line 2 it is much shorter and so clearly differentiated from the line-final pauses. But in principle performance can erase line boundaries, or break lines up, such that it is no longer clear that the text as performed is in lines. Lineation is thus an obligatory characteristic of the verse design/instance but only optionally a characteristic of the delivery design/instance. An originally verse text could be called 'de-lineated' in delivery if divided into sub-sequences which are no longer subject to the types of generalization which are characteristic of verse (essentially, repeated patterns).

When we hear spoken poetry, if lineation is not salient in the speech stream (e.g., by being marked by pauses), then lines will have a special status for working memory only if the hearer can abstract out the verse design/instance from the delivery instance. This leads to the important hypothesis that even when lineation is not salient in the speech stream, it may be extracted during processing. This may be similar to the way in which lexical and syntactic structure can be extracted from speech streams which provide no direct evidence of them: in processing language, the forms that we establish are not directly heard, and they can be unevidenced, partially evidenced or inconsistently evidenced, just like the discrete unit of the verse line in delivery.

2.   The varieties of verse

Most of the psychological experimental work on verse has been on English, German or other European-language verse which is metrical in rather specific ways (based on syllable counting and stress) and has rhyme.   In this section I illustrate two other types of verse, with the goal of illustrating the range of forms, all of which we would expect to be able to explain in a fundamentally similar way.

The first example comes from Classical Sanskrit, which includes many distinct metres, and had significant influence on metrical traditions in India and South-East Asia. Here is a four line stanza in the *sragdharā* metre.

saṃbhrāntadroṇam udyacchakunikalakalaṃ vihvalolūkasārthaṃ

sadyovikṣiptagulmaṃkṣapitanṛ pataru kṣuṇṇapunnāgapūgam :

addhā nunnāśvakarṇaṃ pramathitavipulaśrīphalaṃ dhūtadhātrī-

cakraṃ cakre saśokāspadam arigahanaṃ prāg aśokābhirāmam. [10]

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[10] 'The garden of the enemy, formerly delightful with its Aśoka trees, he made a place of sorrow, its ravens frightened, with a confused noise of birds flying up, its flocks of owls terrified, in an instant its clumps of trees scattered, its royal trees smashed, its Punnāga trees and betel-nut trees broken, its Aśvakarṇa trees straightway overturned, its thick clumps of Bilva trees crushed, its ring of Myrobalan trees thrown down.' from Rāghavapāṇḍavīya by Kavirāja. This is one of two possible translations of the text, which throughout can always be read

In this metre, every line must have twenty-one syllables. Syllables are differentiated by syllable weight, into heavy syllables (H) and light syllables (L); a light syllable consists of a short vowel separated by at most one consonant from the following vowel, and all other syllables are heavy. Every line has exactly the same pattern of heavy and light syllables: HHHHLHHLLLLLLHHLHHLHH. The seventh and fourteenth syllables normally come at the end of one of the words, or at a word boundary inside a compound word. This typical Classical Sanskrit metre reminds us how different metrical verse can be from the familiar English pattern. In English, the rhythm is based on stress and can vary from line to line while maintaining a roughly periodic pattern (i.e., repeating a small rhythmic pattern throughout the line), but in contrast the Classical Sanskrit metre has an unvarying aperiodic rhythm (i.e., which does not repeat a small rhythmic pattern) based on syllable weight. Prose never has regular aperiodic rhythms of this kind; they are found only in verse.

The second example comes from a petition in the Rotinese language (spoken on the Island of Roti in the Indonesian archipelago).

Lena–lena ngala lemin	All you great ones
Lesi–lesi ngala lemin	All you superior ones
Sadi mafandendelek	Do remember this

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with two differnet meanings John Brough, *Selections from Classical Sanskrit literature* (London: SOAS, 1978) p.136.

Sadi masanenedak	Do bear this in mind:
Fo ana–ma tua fude	Save the froth of the cooking syrup for the orphans
Ma falu–ina beba langa la	And the heads of the palm leaf–stalks for the widows. [11]

The major type of form holding of these lines is systematic 'parallelism'. In parallelistic verse, pairs of lines have similar syntactic structures, usually with some variation in a specific word or phrase.   The varying words can form a stereotyped pair called a 'dyad' which can have similar meanings as in the first and second line, or third and fourth line, or different but related meanings such as *ana* 'orphan' and *falu* 'widow' in the fifth and sixth line,   The latter is an example of a dyad which has a combined meaning which is idiomatic; for example this pair has a combined meaning of 'the bereaved' of any gender or age. In the literatures of the world, parallelism is certainly found in prose: there are familiar examples in famous English language speeches. But systematic parallelism of this kind appears to be found only in verse, where there is independent evidence for the line as a division of the text, relative to which the parallelism is structured. (English does not have systematic parallelism of this type in verse. Though some poets such as Pope or Dryden use parallelism extensively, they do not use it regularly as a predictable form holding of the verse line.)

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[11] From a petition by Old Meno, quoted in James J. Fox, (Ed.) 1988. *To Speak in Pairs. Essays on the Ritual Languages of Eastern Indonesia* (Cambridge: Cambridge University Press, 1988), p. 167.

Verse is found even in the most ancient or isolated cultures. Some of the earliest preserved texts, in Sumerian, have lines 'laid out on the clay tablet exactly as in modern European poetry'. [12] The Suyá of Brazil have songs in lines organized by parallelism (like Rotinese). [13] Songs in Dyirbal (an Australian aboriginal language of the Queensland area) are organized into lines with fixed syllable counts and fixed stress patterns, in a metre which is strict and aperiodic like Classical Sanskrit but based on stress like English. [14] Ku Waru songs from the Western New Guinea highlands have songs in five-beat lines, each ending in an added vowel, and with extensive parallelism, thus combining both metre and parallelism in the same tradition. [15] The associated formal features of verse vary from culture to culture. The characteristic which connects them all is that the sequence of lines making up the text repeats some pattern, whether metrical or

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[12] Jeremy Black, *Reading Sumerian Poetry* (Ithaca: Cornell University Press, 1998).

[13] Anthony Seeger, 'Oratory Is Spoken, Myth Is Told, and Song Is Sung, But They Are All Music to My Ears', in Joel Sherzer and Greg Urban eds*. Native South American Discourse* (Berlin: Mouton de Gruyter, 1986) 59–82.

[14] R. M. W. Dixon and Grace Koch, G. *Dyirbal song poetry. The oral literature of an Australian rainforest people* (St Lucia: University of Queensland Press, 1996)

[15] Alan Rumsey, 'A metrical system that defies description by ordinary means', in John Bowden and Nikolaus Himmelmann and Malcolm Ross eds. *A Journey through Austronesian and Papuan Linguistic and Cultural Space: Papers in Honour of Andrew K. Pawley* (Canberra: Pacific Linguistics, 2010).

based on sound patterning or parallelism: that is, the texts are all characterized by what Jakobson called a verse design.

3.   The line is treated as a whole unit in working memory capacity

In this section I discuss evidence which suggests that the line is treated as a whole unit in working memory capacity. The hypothesis is that the sequence of words in the currently processed line, from the first word up to and including the last word in the line, are held all at one time in working memory, before moving on to the next line. The account of working memory used here is the model developed by Alan Baddeley and Graham Hitch over the past forty years, which is widely used in psychological research; I use the version described in Baddeley (2012).[16]

Working memory is the system which takes heard or read language as input, and from which meaning and other information is extracted into long term memory. The current model of working memory structures it into four parts: the phonological loop, the visuo-spatial sketchpad, the episodic buffer, and the central executive. The phonological loop takes as input phonological (spoken, heard) material – about as much as can be spoken in two seconds - and the visuo-spatial sketchpad takes as input visual material. Both of these components

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[16] A.D. Baddeley and G.J. Hitch, G.J., 'Working memory.' In *The Psychology of Learning and Motivation: Advances in Research and Theory*, ed. G A Bower, 47-89. (New York: Academic, 1984). Alan Baddeley, 'Working Memory: Theories, Models, and Controversies.' *Annual Review of Psychology* **63** (2012), 1–29.

take sensory input as well taking input from long term memory (which is necessary in order to give form to the sensory input). The material from the phonological loop and visuo-spatial sketchpad are fed into the episodic buffer, which integrates material from different sources including from long term memory. The central executive is an attentional system which manages the holding and transfer of information between the component parts. The parts of particular interest for the argument of the present paper are the phonological loop and the episodic buffer.

The sounds of speech enter working memory via the phonological loop. The phonological loop is maintained by subvocalization: that is, the hearer 'speaks silently' to herself. About two seconds duration of subvocalized speech can be held at one time. However, the actual durations of spoken lines can in fact often be much longer than two seconds. For example, in the performance cited earlier of the first four lines of Shakespeare's sonnet 18, David Tennant produces lines with durations of 2.3, 2.4, 2.8 and 3.1 seconds. [17] When speech is heard, it can in principle be remembered faster than it is spoken: for example, the ten

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[17] In a corpus of recorded English poetry (54 poems), consisting of 1155 metrical lines: 59% of the lines are longer than 3 seconds, 40% are longer than 3.5 seconds, and 26% are longer than 4 seconds. See Nigel Fabb, 'There is no psychological limit on the duration of metrical lines in performance: against Turner and Pöppel.' International Journal of Literary Linguistics (2013). This paper argues against a durational constraint on the line proposed by Frederick Turner and Ernst Pöppel, 'The Neural Lyre: Poetic Meter, the Brain, and Time. Poetry' **142** (1983), 277-307.

syllables of the sonnet's iambic pentameter line might be delivered at a tempo such that they take 2.3 seconds, but the same ten syllables could be held in the phonological loop by accelerated subvocalization, thus fitting them into the two second loop. Thus the timing of delivery and the timing of memorizing of lines would be partially desynchronized. It is thus not impossible that lines, most of which are longer in delivery than two seconds, could be held as wholes in the phonological loop. But there are several reasons for thinking that this is unlikely. First, it is phenomenologically alien: we certainly do not experience any accelerated subvocalization while we listen to verse. Second, as I will shortly discuss, we actually need to hold more than a single line in working memory in many cases, and this puts increasing strain on the very limited capacity of the phonological loop. Third, the phonological loop may not be complex enough in its operations to be able to process the line as a whole, e.g., establishing its metrical form.

Thus on present evidence we should conclude that the line cannot fit as a whole into the phonological loop. However, it could fit into the episodic buffer. This is the working memory component which takes information from the phonological loop, and other sources including long term memory. Information is combined from different sources, and bound into chunks or episodes, with about four or five chunks being held at any one time. The chunks can each contain several words if the words can be bound together (e.g., if they are syntactically related), with the result that 'memory span for unrelated words is around 5, increasing to 15 when the words make up a sentence'. Words in a line of poetry are usually syntactically related, and the upper limit of 15 words is

much longer than almost any line of metrical poetry in any language.[18] Each of

the four lines of Shakespeare's sonnet, quoted above, could clearly fit as a whole

syntactically related sequence into the episodic buffer: at 8 words, 7 words, 9

words, 9 words, they will each individually fit into the episodic buffer limit of

about 15 syntactically related words. An important point to note is that each line

will fit into working memory with room to spare; some material from a

preceding line could be kept as well.

The notion that the line is treated as a whole unit in working memory

capacity (or an equivalent mental capacity in some other model) has been

proposed by others. Thus Reuven Tsur argues that the line is a whole unit in

'short term memory'.[19] He draws on Gestalt theory to suggest that the line is a

psychological whole against which variation is established. One of his arguments

involves iambic pentameter, an English language metre in which there is some

allowed variation away from a regular even-beat binary rhythm. Tsur notes that

the variation is more common in specific places in the line: for example, seventh

position syllables in iambic pentameter lines are particularly likely to be stressed

against the metrical expectation. Tsur comments 'In order to account for this

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[18] Very few metres allow more than 15 syllables to the line, hence no more than

15 words. The major exception is the metres of Classical Sanskrit, as cited

earlier; note however that the longest line quoted here is 21 syllables by metre,

but only five and a half words long, because of the extremely long words of the

language.

[19] Reuven Tsur, *Poetic Rhythm: Structure And Performance. An Empirical Study In*

Cognitive Poetics. (Berne: Peter Lang, 1998).

uneven distribution of stress maxima in weak positions, one must assume that

the line constitutes a *whole*, that is, a system that determines the character of its

parts'.[20] Steven Willett has drawn on Tsur's proposal to argue that in Greek verse,

the (multi-line) period is too long to fit into working memory, and hence that a

smaller unit such as the line or colon must be the relevant memory unit.[21]

Previous accounts of the line as a whole unit in working memory have however

underestimated the capacity of working memory. Thus Tsur suggests that short

term memory can contain 5-9 monosyllables at a time (i.e., what George Miller

called 'the magic number seven plus or minus two' [22]), saying 'that is why the

longest verse line that can be perceived as a rhythmic unit without an obligatory

break is ten syllables long'.[23] Similarly Hogan (1997: 242) suggests that

'rehearsal memory' contains 'five to nine chunks of information – and thus,

typically, five to nine words – at any given time' adding that 'standard line

lengths for poetry in a wide range of traditions tend to fall between five and nine

words'. [24] Tsur and Hogan thus treat the line as fitting rather tightly into

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[20] Op cit. note 19, p.33.

[21] Steven J. Willett, 'Working Memory and Its Constraints on Colometry'.

Quaderni Urbinati di Cultura Classica. New Series **71** (2002), 7-19.

[22] George A. Miller, 'The Magical Number Seven, Plus or Minus Two Some Limits

on Our Capacity for Processing Information.' *Psychological Review* **101** (1956)

343-352.   Baddeley argues against this way of measuring capacity.

[23] Op cit. note 19, p.15.

[24] Patrick Colm Hogan, 'Literary Universals', *Poetics Today*, **18** (1997) 223–249.

[p.242]

working memory with little room to spare; I will shortly argue that this is incorrect.

I will now develop further evidence that the whole line might need to fit into the episodic buffer in working memory. The most straightforward evidence involves the forms which hold of lines, such as metre. We will later see evidence that the language of a line is more easily processed if it is structured by regular forms (such as metre) and that this produces low-level aesthetic effects; this gives some reason to think that the regular forms of lines, such as metre, are computed by hearers. Metre is a characteristic of a whole line. If the hearer is to compute the metrical form of the line, the whole line may need to be held in one place: a good candidate for this place is the episodic buffer. There is evidence from the formal analysis of metre that the line must be processed 'quantally' as a whole unit, rather than incrementally as the line proceeds. For example, many metres set a pattern which can be deviated from, with deviation more likely towards the beginning of the line, and less likely towards the metrically rigid end of the line. The conformity of any part of the line with the metre must therefore be assessed relative to where that part is placed in the line as a whole, meaning that the line as a whole must be taken into account in assessing the metricality of the parts: this is essentially Tsur's argument.   The theory of metre which Morris Halle and I have developed is founded on the proposal that the line is processed metrically as a single whole unit and not in parts. [25]

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[25] Nigel Fabb and Morris Halle, *Meter in Poetry: A New Theory* (Cambridge, Cambridge University Press, 2008).

Metre is not the only formal characteristic of verse which is best analyzed by processing lines as whole units in the episodic buffer. Dyadic parallelism of the type described for Roti is a characteristic of a pair of lines; in order for the hearer to recognize parallelism, it is necessary to hold the relevant information all in one place, which will often mean holding two whole lines at a time in the buffer. It is notable that in traditions with parallelism of this type, lines are often short and so in principle two lines at a time could be held in the buffer.

Now, consider rhyme. If rhyme is processed by holding the component parts in working memory capacity, then the first word in a rhyming pair must be retained while waiting for the second word to arrive. In some cases, rhymes can be many words apart, adding up to more words in sequence than can fit into the episodic buffer, so it cannot be that every word between the two rhyming words is recalled. Instead, it might be that the first rhyming word is held continuously (perhaps repeating it in the phonological loop) until the second rhyming word arrives, at which point they can be put together in the episodic buffer. This is again a situation where more than just the line must be retained in working memory capacity: in rhyming verse, the line plus a previous rhyming word must be retained. Sometimes more than one rhyming word from different rhymes must be held simultaneously, as in the intersecting rhymes of the Shakespeare sonnet. There is something to be learned here about the line. Rhyming words do not always have to be line-final; there are traditions (including some Mediaeval Latin poetry) in which a mid-line word rhymes with a word at the end of the same line, and also traditions in which a final word rhymes with a word mid-way through a different line. Vietnamese six-eight metre offers an example of the latter. In this metre, odd-numbered lines are six syllables long and even-

numbered lines eight syllables long; in addition, even-numbered syllables must carry specific tones: this is a tonal metre. The four lines below are two couplets from a long epic poem which is composed in continuous couplets.

Trăm năm trong cõi người ta,	6 syllables
chữ tài chữ mệnh khéo là ghét nhau.	8 syllables
Trái qua một cuộc bể-dâu,	6 syllables
những điều trông thấy mà đau-đớn lòng. [26]	8 syllables

The final syllable in the six-syllable line rhymes with the sixth syllable in the following eight-syllable line (*ta* to *là* and *dâu* to *đau*), and so is an example of a final-to-medial rhyme.   In addition, the final syllable in the eight-syllable line rhymes with the final syllable in the following six-syllable line (*nhau* and *dâu*), which is an example of the more common final-to-final rhyme.   What is interesting about examples of this kind is that the first rhyming word, the one which must be rehearsed in working memory, is always line-final. A medial word does not rhyme with a final word. This suggests that the word at the end of the line is particularly suited to being rehearsed; the preceding words in the line

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[26] 'A hundred years -- in this life span on earth / talent and destiny are apt to feud. / You must go through a play of ebb and flow / and watch such things as make you sick at heart.' Nguyễn Du *The tale of Kiều* lines 1–4. Discussed in Nigel Fabb, 'Formal interactions in poetic meter.' in Tonya Kim Dewey and Frog (eds) *Versatility in Versification: Multidisciplinary Approaches to Metrics* (New York: Peter Lang, 2009) 147–165.

can be moved out of working memory and only this line-final word retained. This may explain why alliterating words (words beginning on the same consonant) must always be relatively close to one another while rhymes can be separated quite far apart. Because alliterating words cannot be line-final, they are not as easily rehearsed over a span of several lines. [27]

In sum, there are formal reasons to think that the whole line, and often all or part of a previous line must be held at the same time in the episodic buffer. I now explore evidence that the line has in some traditions acquired design features appropriate to its being treated as a whole unit by working memory. This relates to the 'recency' effect in working memory, which is that more recently heard material is recalled more accurately than earlier heard material. If the line is treated as a single unit examined all at one time, once it is completely contained in working memory, then (all other things being equal) recall of the most recently heard line-final word might be easier than recall of an earlier heard line-medial word. Thus if our hypothesis is right, then the line should be asymmetrical as far as working memory is concerned. This may relate to the fact that lines show various formal asymmetries. For example, in metrical verse, the end tends to be more rhythmically regular. An example of this is found in the metre of Homer, the dactylic hexameter, where the first two thirds of the line can vary in their rhythm but where the final five syllables have a fixed heavy-

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[27] Nigel Fabb, 'Verse Constituency and the Locality of Alliteration' *Lingua* **108** (1999) 223–245.

light-light-heavy-heavy rhythm. [28] In traditions where there is rhyme, the end of

the line is very often a rhyming word. Both final rhythmic regularity and final

rhyme have the consequence of limiting the selection space for processing, and

this would mean that processing effort is eased towards the end of the line.   The

'selection space' is the set of items, e.g., words, which can be chosen to fill a

particular slot. If a line must end on a word with a particular phonology because

of rhythmic or rhyming expectations, the selection space is thereby reduced. If

processing effort is eased towards the end of the line, this could allow processing

effort to be redistributed to earlier in the line, thus making it easier to remember

the earlier parts. Limiting the selection space at the end of the line thus enables

the earlier part of the line to be better remembered. The evidence that the line is

designed to be remembered as a whole is that the selection space is

systematically restricted at the ends of line; hence this is evidence that the line is

taken as a whole unit for working memory.   Another example of a formal

asymmetry within the line is in the Finnish *Kalevala*, where 'longer words tend to

occur towards the end of the line and shorter ones at the beginning'. [29] This

would be functional as a way of remembering longer sections of the line word–

by–word; if the final word is longer, then more of the line is remembered by

remembering just the final unit.

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[28] Complicated by the fact that the final syllable can substitute light for heavy

('anceps').

[29] Pentti Leino, *Language and metre: metrics and the metrical system of Finnish.*

(Helsinki: Suomalaisen Kirjallusuuden Seura, 1986).

Tsur argues that iambic pentameter lines which have a significant degree of variation away from the basic pattern of stressing even-numbered syllables are performed in ways which articulate word boundaries more clearly: he suggests that the processing of linguistic form is eased by this clearer articulation, in order to compensate for the greater difficulty of processing the metrical form. We might however invert his proposal, to match it to my proposal in the previous paragraph. We could say that when the metrical form is unclear, it thereby fails to ease processing of the linguistic form, and so the linguistic form must be made easier to process by other means, such as clearer articulation. The difference made by my inversion of Tsur's proposal is that the goal of processing becomes always the extraction of linguistic form: metrical and other literary form is not extracted for its own sake, but only to ease the processing of linguistic form.

In this section I have suggested that the line is processed as a whole unit in the episodic buffer in working memory, and that in many cases additional material such as a previous line-final word, or sometimes the whole previous line, must be included at the same time. Unlike earlier proposals, I have suggested that in the Baddeley-Hitch account of working memory, there is sufficient capacity in the episodic buffer to hold this material. Does this have consequences for long term memory of verse (as opposed to prose)? Tillmann and Dowling have reported an experiment in which they show that unfamiliar lines can be recalled verbatim after a stretch of time (whereas similar sections of unfamiliar prose can not). This supports the idea that the line is a whole unit for working memory, since it is whole units which are remembered, but for present purposes it is particularly worth noting that in one of their experiments it is a

whole rhyming couplet which is reported verbatim. [30] Long term memory for verse, specifically for oral narrative poetry, is the subject of a major work by David Rubin, who suggests various means by which the forms holding of verse enable memory for content and form.[31] (Rubin does not, however, treat the line as a crucial factor in memorizing verse; instead he allows smaller intonational units to be the remembered items; his approach does not directly engage with many of the issues discussed here.)

In the next section, I discuss some of the experimental evidence which shows that the forms added to verse are able to produce effects of familiarity, truth and pleasure, and I consider the relation between this evidence and the possibility that the line is treated as a whole unit in working memory capacity.

4.   Ease of processing and low level aesthetic effects

In this section, I will summarize some reasons for thinking that the characteristic forms which hold of the line, including rhythm, sound patterning, and parallelism, may produce specific psychological effects, relating to familiarity, truth, and pleasure. I propose to call these 'shallow end' effects since they arise in in the early stages of processing the input, the stages at which the hearer is still identifying which words have been spoken.   The shallow end effects and their

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[30] Barbara Tillmann and W. Jay Dowling, 'Memory decreases for prose, but not for poetry', *Memory & Cognition* **35** (2007), 628–639.

[31] David C. Rubin, *Memory in Oral Traditions. The Cognitive Psychology of Epic, Ballads, and Counting-out Rhymes* (New York: Oxford University Press, 1995). Rubin does not treat the line as a distinct unit for memory.

relation to deeper effects which arise during inferencing are the topic of an interesting survey article by Reber, Schwarz and Winkielman on the ways in which processing fluency can stimulate aesthetic pleasure, published in 2004.[32]

The linguistic material which constitutes the verse text is processed by establishing its two types of form. Like all verbal input, processing determines the linguistic form of the text, identifying the words and their syntactic relations, and producing a meaning from the input. If this processing is made easier, an interesting result follows: the hearer experiences effects of familiarity, truth, and pleasure. This increased ease of processing of the linguistic material is enabled by the processing of the other type of form which holds specifically in verse: the identification of regular literary form in the text, including the metre, rhyme, parallelism, and so on. [33] Because these forms are regular, they enable the

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[32] Rolf Reber, Norbert Schwarz, and Piotr Winkielman, 'Processing Fluency and Aesthetic Pleasure: Is Beauty in the Perceiver's Processing Experience?' *Personality and Social Psychology Review* **8** (2004) 364–382. More recent research in this area is reported in Christian Obermeier, Winfried Menninghaus, Martin von Koppenfels, Tim Raettig, Maren Schmidt-Kassow, Sascha Otterbein, Sonja Kotz. 'Aesthetic and emotional effects of meter and rhyme in poetry.' *Frontiers in Psychology* **4** (2013) 1-10.

[33] There is a complex difference between the processing of linguistic form and the processing of literary form. Whereas the processing of linguistic form can depend entirely on covert linguistic processing, the processing of literary form must reflect overt convention: what counts as a rhyme for example can vary

hearer to predict what will come next. For example, in a text in rhyming couplets, the second line in each pair must end in a word which rhymes with the final word of the previous line. Because literary form enables prediction, it thereby eases the processing of the text. The final word in the second line must be identified from the incoming speech stream, but when there is an expectation of rhyme the word to be identified is selected from a reduced set of possibilities (the set of words which rhyme with the final word of the preceding line), and so the task of identifying that word is simplified.   The selection space for that part of the line is reduced by the presence of rhyme, thus easing processing. Similar consequences are known to follow once the hearer identifies the metre of the line, which reduces the selection space for words by limiting potential syllable counts or rhythms. I do not think there has been any experimental work on parallelistic verse, but we would predict parallelistic verse also to reduce the selection space, so easing processing.

Reber et.al. show that there is experimental support for a correlation between easing a subject's processing of language (e.g., reducing processing time) and producing specific effects in the subject, including pleasure and a sense that the content of the text is familiar and true. Where the input is easier to process, there is a 'hedonic effect', where the subject both reports greater pleasure, and manifests this as activity in the region of the so-called 'smiling muscle' (the zygomaticus major, measured by facial electromyography). Subjects also interpret ease of processing as indicating that the content of the

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from tradition to tradition, and does not simply reflect the sound structure of the word.

text is familiar, or is true. Thus for example McGlone and Tofighbakhsh showed experimentally that aphorisms which rhyme such as 'birds of a feather flock together' were in an experiment considered by subjects to be truer than aphorisms which do not rhyme such as 'rolling stones gather no moss'. McGlone and Tofighbakhsh attribute this differential attribution of truth to the greater ease of processing enabled by the rhyme.[34]

A sense of familiarity is also produced by ease of processing, even for inputs which are in fact not familiar.   A person's sense that the information presented to them is familiar involves a feeling of knowing that they have encountered it before; it is distinct from recollection, which is the ability to recall it. Thus for example we may have a sense that we know someone because their face is familiar (familiarity) as opposed to being able to recall exactly who they are. Experiences of familiarity and recollection have different neural correlates, such that it is possible to test for the generation of familiarity versus recollection by using event–related potentials (ERPs).[35] Familiarity can be a 'false alarm' in the sense that we may have the sense that information is familiar when in fact it has not been previously presented to the subject. The particular relevance of

[34] Matthew S. McGlone and Jessica Tofighbakhsh. 'Birds of a Feather Flock Conjointly (?): Rhyme as Reason in Aphorisms.' *Psychological Science* **11** (2000) 424–428.

[35] Sinéad M. Rhodes and David I. Donaldson, 'Electrophysiological evidence for the effect of interactive imagery on episodic memory: Encouraging familiarity for non–unitized stimuli during associative recognition', *NeuroImage* **39** (2008) 873–884.

this for our purposes is that one source of the psychological effect of familiarity is ease or fluency of processing, which Kelley and Jacoby call the 'fluency heuristic' as a basis for judgments of familiarity. [36] Familiarity feels different from recollection and so the effect of familiarity, which might be generated by verse, can be thought of both as an epistemic and an emotional effect. Effects of familiarity and truth are both part of the 'shallow-end' aesthetic experience of verse, produced in first stages of processing. There are reinforcing or consequential relations between familiarity and truth and pleasure. Thus for example a sense of familiarity can lead to a sense of truth: 'a statement will seem true if it expresses facts that feel familiar', [37] and familiarity can also lead to liking, such that the text is positively valued. [38]

Experimental investigations of how familiarity, truth and pleasure are produced by verse have all involved metrical verse. I now consider the possibility that similar results might be produced in non-metrical parallelistic verse (such as the Rotinese example quoted earlier), where parallelism is a

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[36] Colleen M. Kelley and Larry L. Jacoby, 'Recollection and familiarity: process–dissociation', in Endel Tulving and Fergus I. M. Craik. *The Oxford Handbook of Memory* (Oxford: Oxford University Press, 2000) 215–228.

[37] Ian Maynard Begg, Ann Anas, Suzanne Farinacci, 'Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth' *Journal of Experimental Psychology: General* **121** (1992), 446–458.

[38] Hal R. Arkes, Catherine Hackett and Larry Boehm. 'The generality of the relation between familiarity and judged validity' *Journal of Behavioral Decision Making* **2** (1989), 81–94.

device for framing a pair of words. Rhodes and Donaldson show that there are psychological differences between different kinds of pairs of words in ordinary language. [39] In one kind of pair, two semantically unrelated words form a commonly associated pair: the words 'traffic' and 'jam' form such a pair, in the common association of 'traffic-jam'. In another kind of pair, the words are related semantically but do not form a stereotyped pair: an example would be 'violin' and 'guitar'. Rhodes and Donaldson argue that associated word pairs such as 'traffic' and 'jam' are able to be 'unitized', a term that they use to describe the pair being treated as a unit by the language processor. Unitization enables faster retrieval of the words from memory and thus should produce the ease-of-processing effects described above. Furthermore, they argue that unitization appears to stimulate the effect of familiarity, manifested as the impression that we have seen *this* associated word pair before. This is true both for already-unitized pairs of words such as 'traffic-jam', but also for associated pairs of words which have not been previously seen before (and thus should not actually seem familiar) but which are put into contexts which encourage unitization (and just for this reason appear to be a familiar pair). Rhodes and Donaldson say for example that 'the creation of a sentence that combines two words could lead to a process of placing the two items in the same context, thus creating an association', and hence producing an effect that the association is already familiar.

Though Rhodes and Donaldson do not discuss verse, associated word pairs are very common in verse, and are the basis of many traditions of

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[39] Op cit. note 35, 883.

parallelistic verse. James J. Fox, in his discussion of Rotinese and other
Austronesian parallelistic verse, uses the term 'dyad' to describe a pair of words
which are characteristically associated and put into similar syntactic contexts in
parallel lines. Similarly, the term 'difrasismo' is used by critics for associated
word pairs in Mayan and other Central American verse. [40] I suggest that the
dyad and the difrasismo are examples of what Rhodes and Donaldson call
'unitization' of an associated word pair. Unitization is a feature of ordinary
language which is thus put to special use in parallelistic verse. Strong evidence
for unitization of word-pairs in poetry is that in many cases, the pair has a
combined meaning which is not derivable from the meaning of the parts. Thus
the Nahuatl difrasismo combination *in xochitl in cuicatl*, literally 'flower and song'
means 'poetry', while the Rotinese dyad combination of 'widows' and 'orphans'
means 'the bereaved'. Though unitized word pairs can be found in prose, the
organization of verse into lines is particularly suited to creating rigid contexts
within which the pair of words can be inserted: the two lines have identical
syntactic structures, differing only in the dyad. It is possible that by treating the
line – or perhaps in this case the line-pair – as a unit within working memory, the
effect of the dyad is enhanced.   I predict that we should find that dyads in
parallelistic verse produce a range of effects: they should ease processing (with
consequential effects), and should also give rise to the feeling that the dyad is
familiar.

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[40] The term was introduced for Nahuatl literature in K. Angel María Garibay,
Historia de la Literatura Náhuatl (Mexico City: Porrúa, 1953–1954)

In this section I have reviewed experimental evidence which directly or indirectly suggests that the added forms of verse are able to produce three types of subjective or phenomenological effect, which can be mutually reinforcing: the effects of familiarity, truth and pleasure. I suggest that these might be thought of as low-level aesthetic effects, either hedonic or epistemic.

In this paper I have proposed that the metrical line – or in the case of parallelism, the line-pair – is held as a whole unit in working memory.   Does this contribute to explaining how forms such as metre, parallelism and rhyme produce these low-level aesthetic effects?   As one possible answer to this, we might note that though rhythm and sound patterning are found intermittently in prose, they are regular only in texts which are divided into lines. In part this may be for formal reasons: rhythm in language is dependent on counting, and counting requires starting and end points, which are supplied by line boundaries. Similarly, rhyme and alliteration may only be identifiable as regular if they are located relative to demarcated places within a text, which again are supplied by line boundaries.   But these formal considerations may lead us to a functional explanation for the association of regular forms with the verse line, which is that these regular forms more effectively ease processing if they are processed relative to the line as a whole unit. I have suggested for example that rhyme requires rehearsal in working memory, and that the final word in a line is more available for rehearsal (once the rest of the line is removed from working memory) than other words.   Thus the line boundary enables rhyme to function more effectively, which in turn eases processing, and produces side-effects of familiarity, truth and pleasure.   This suggests that the line must be recognized as

a bounded unit in processing, and this fits with the notion that the line is recognized as a whole unit when processing verse in the episodic buffer.

5.   Inherent and attributed literary form, and the conscious awareness of form

I have in other publications argued that literary form may hold of a text in two quite distinct ways, and have proposed a distinction between inherent form and attributed form. [41]   The distinction between the two kinds of form can be illustrated from ordinary language: a word like 'dog' is a noun in two different ways.   On the one hand, it is processed as a noun by the language processor, the word being stored in the mental lexicon as a noun; this type of form is part of the psychology of language, and is 'inherent form'.   On the other hand, a published grammar or dictionary may call the word a 'noun', which is an explicit attribution of a form to the word: this is 'attributed form'.   Inherent and attributed forms can align, as they do here, and one of the tasks of grammarians is to 'carve language at the joints': to align inherent and attributed form by discovering what the inherent forms are, and bringing them to light by explicitly attributing formal names to them.   However, there are also attributed forms which do not correspond to inherent forms.   If we now turn to literary forms, we might say that they usually exist as attributed forms, in the sense that users are conscious of them, have names for them and so on.   Some types of literary form seem to

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[41] Nigel Fabb, *Language and Literary Structure: The Linguistic Analysis of Form in Verse and Narrative*. (Cambridge: Cambridge University Press 2002). In this book I use the term 'communicated form' for what I here call 'attributed form'.

hold only as attributive form, with no corresponding inherent form, and I argue that this is true of genre: genre names hold of texts only as attributions and not as facts about the text. [42] However, it is possible that some literary forms exist also as inherent form, a possibility which is fundamental to much linguistic work on literary form, particularly on metrical form. For the past forty years, generative linguistic approaches to metrics have sought to demonstrate that metrical forms have much in common with inherent linguistic forms. [43] In the terms of the present paper, we might say that inherent forms are those forms which are produced or manipulated while the line is being processed in working memory capacity.   In contrast, attributed forms are those forms which are assigned to the text as a result of inferencing about the text. A rhyme in a text can be both inherent and attributed, processed first in working memory, and then explicitly identified at a later stage as a characteristic of the text.

This has direct relevant to the fact that verse can be 'de-lineated' in performance. If a verse text is performed such that it is no longer possible to identify sub-sequences which are subject to the generalizations characteristic of verse, then in this delivery it is technically no longer in lines, and thus by the definition of verse as 'text in lines' it is no longer verse. However, such a text can still be inferred as being 'in verse' and so the form of 'verse' can be attributed to it. For example, verse is characteristically performed in a different manner than prose: it is often performed more slowly, with a less varied intonation contour,

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[42] Op cit. note 41, chapter 3.

[43] See for example Kristin Hanson and Paul Kiparsky, 'A Parametric Theory of Poetic Meter', *Language* **72** (1996), 287–335.

various speech effects, various irregularly distributed rhythmic effects, and so on.[44] All of these elements of performance are clues that the text is verse, even if it is difficult or impossible to establish line boundaries. As noted earlier, there is an unexplored question how verse which is de-lineated is processed. We might look to linguistics for an answer: we know that hearers are able to extract linguistic form from spoken texts which do not display these forms on their surface. For example, the speech stream does not saliently indicate every word boundary, but words can still be reliably extracted from it.   Lines are different from words, because unlike words, lines do not already exist in a stored memory; however, similar principles of establishing line boundaries, particularly when forms such as metre or parallelism hold of them, may still exist. This suggests that even when verse is performed in a way which blurs line boundaries, lines may still be extracted out as wholes for processing in working memory: this would mean that even when verse is de-lineated in performance, it might still have lines as inherent forms which are processed as such.

In summary, consider a performance of metrical verse in which lineation no longer exists in the speech stream, in the sense that the boundaries of the metrical lines are not signaled by pausing or any other effect. Such a text might still have 'verse' as an attributed form because of the way it is performed, in a manner which communicates that verse is being spoken (e.g., slower tempo, stylized intonation, etc.). And at the same time, the metrical lines may be extracted out and treated as wholes in the episodic buffer in working memory,

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[44] Prudence P. Byers, 'A Formula for Poetic Intonation.' *Poetics* **8** (1979) 367-380. (1979)

perhaps below the level of consciousness (like inherent linguistic form): in this sense, the text is also in inherent lines. Thus it is inherently verse as well as being attributively verse, both despite its being performed in a manner which does not overtly mark the metrical line boundaries.

Conclusion

In this paper I have proposed that the line of metrical or parallelistic verse is processed as a whole unit in working memory, and have shown that this is both feasible and necessary in order to explain the formal properties of the verse. One side-effect of treating the line as a whole unit for processing the forms of metre, rhyme and parallelism is to produce low-level aesthetic effects, and thus provide a partial explanation for why verse is often especially valued as a type of verbal behaviour. The processing of the text as in lines may proceed in this manner even for performances in which the text as delivered is not in clearly demarcated lines. This is an account of aesthetic form, and of aesthetic experience, which relies on experimental psychology, the psychological theory of working memory, and draws on generative approaches to linguistic (and literary-linguistic) form which allow form to be assigned to a text which on the surface provides no obvious evidence for it. This paper addresses the philosophical interest in cognitive aspects of aesthetic form and experience, drawing on new kinds of psychological evidence which have not previously been the topic of discussion in philosophical aesthetics.

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