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Evidence suggests that some cognitive processes are based on sensorimotor systems in the brain (embodied cognition). The premise of this is that 'Biological brains are first and foremost the control systems for biological bodies' (Clark 1998, 506). It has therefore been suggested that both online cognition (processing as we move through the world) and offline cognition (processing through reflection) might be body-based (Wilson 2002). We tested whether acting out, or thinking movements relevant to a poem would therefore improve memory for the poem. Here, we discuss the results of this study in relation to embodied cognition.

Keywords: poetry and memory; embodied cognition; actor training; poetry by heart

Though poetry may be read and enjoyed without an element of performance, it is also fair to say that performers, particularly actors, encounter poetry at every verse end of their training (forgive the pun). These encounters may be rich, but they are not straightforward. Poetic texts can demand a qualitatively different kind of physical and vocal investment from the actor than is required for a play by Ibsen or Chekhov, for example. For the actor, poetry is distinct from dramatic dialogue because it demands more than the "living truthfully under imaginary circumstances", Meisner's oft-repeated definition of acting which emphasises naturalism in performance (Meisner, 1987). Ibsen and Chekhov are primarily concerned with the representation of behaviour in terms of *action*, more than with the creation of poetic image and metaphor, and Stanislavsky's "system" - the foundation of modern actor training - can be traced to the same theatrical tradition; it follows then, that actors continue to be trained to privilege *doing* over *being*, *verb* over *noun*, and *action* over *image*.

Conversely, experience of poetic language helps actors to gain experience in, and develop facility with a range of performance styles and markets. Within the actor training curriculum, poetry might be expressed as "heightened language" or "non-naturalism". The plays of Shakespeare fall into the category of "non-naturalism", not because the Bard fails to "hold the mirror up to nature" (*Hamlet*) but because in doing so, he uses poetry. Given the scope of the international market for Shakespeare's plays alone, proficiency with poetry is considered a must for any actor in training. At the Guildford School of Acting (GSA), for example, poetry is used in a wide range of applied contexts, to train the voice, to generate original contemporary choreography, as the raw material for devised projects in physical theatre, and as the foundation of psycho-physical approaches to characterisation and performance.

It follows then, that the need to memorise poetry is a pre-requisite to the acquisition and development of the kind of acting skills indicated above. Though Bloom's taxonomy recognises remembering as only the lowest level of cognitive learning, actors might prefer to describe the ability to memorise more positively, as the foundation of performance. Getting "off book" can be identified as a moment of liberation. Poetry is generally considered easier to memorise than naturalistic prose dialogue, which relies less on meter, rhythm, image or thematic repetition, and rhetorical schemes to communicate meaning. The regularity of Shakespeare's iambic pentameter is generally acknowledged as an *aide-memoire* in itself. Though most of Shakespeare's verse is unrhymed, its pattern of iambic feet mean that imperfectly memorised variants – for example, accidental paraphrases using synonyms of different syllabic length from the original – will draw attention to themselves when spoken aloud, as departures from the rhythmic norm.

Performance, whether in a voice class or on a stage, is an embodied act. Acting differs from recitation because it requires the actor to learn the text and incorporates this into action, in the form of movement on the stage, or in the studio as part of a classroom exercise. Anecdotally, it appears that, when learning dialogue precedes learning the movement on stage, actors can freeze while they recall the dialogue. Thus, it appears that there is a period during which the dialogue and action become integrated.

In contrast to this, there is anecdotal evidence that when participants are encouraged to put a movement to a poem that they are learning, the learning is assisted. In combination, it appears that movement might be an integral part of the process of learning dialogue and therefore could be used to assist in this process. If movement is integral, it might suggest that actors would benefit from learning dialogue and action in combination rather than separately. This anecdotal evidence can be supported by the authors' experience of the training environment at GSA. In one instance, a group of dancers were asked to choose a Shakespeare sonnet at random, as the basis for a choreography exercise. The dancers had no previous experience of the particular sonnet, and each were asked to generate four bars of choreography using lines from the sonnet as a starting point. It was observed that the intense physical commitment given to individual words and phrases as a result appeared to rapidly accelerate the process of memorisation (though this was not the aim of the exercise), and in a matter of minutes the dancers could dance /speak their way through the sonnet.

Indications for why this might be come from the literature on embodied cognition. The premise of embodied cognition is that "Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings" (Clark, 1998: P. 506). This reframes the mind and cognitive function as having developed as a means to control action rather than as a

means to create thought and therefore suggests that thought might be based in action. Indeed, some theories make no separation between organism and environment (e.g. Gibson & Gibson, 1955). It has therefore been suggested that both online cognition (processing as we move through the world) and offline cognition (processing that we do through reflection) might be body based (Wilson, 2002).

Glenberg (1997) reviewed the function of memory and argued that our memory for the environment was dependent on both the structure of the environment and the structure of our bodies. He noted that this framework had the potential to solve an outstanding problem in cognitive psychology, namely how we translate between arbitrary symbols (such as words) and their meaning. If meaning is based in the structure of objects and the actions they afford, then the connection between the symbol and its meaning can be coded through this representation. In this framework, memory for poetry or lines in a play would be enhanced by providing a structure through action.

In the Psychology literature, the enactment effect refers to the finding that when participants are instructed to perform action phrases (such as "reach for the mug"), these phrases are better remembered after a delay than similar phrases which are read or heard but not acted (Knopf, 1991; Engelkamp & Zimmer, 2001). Research into the effect of enactment on subsequent memory performance has demonstrated memory improvements in both healthy young adults (Kubik, Soderlund, Nilsson & Jonsson, 2014) and in adults with memory deficits (Hainselin et al., 2014). This research, however, is limited in that it only addressed the recall of action phrases or object-action pairs rather than memory for narrative-based actions. Since our specific interest is in the link between movement and memory for poetry, we were interested in extending this work by testing memory for actions that are embodied in poems.

We thought it might be possible that the link between structure and meaning would not require actual movement, but only the representation of movement. For instance, imagining a movement might involve making appropriate eye movements to the relative positions of objects to be remembered in the poem. Research has demonstrated that appropriate eye movements in the direction of to-be-remembered objects enhances recall (Johansson & Johansson, 2014). In this case, imagining a movement might have the same effect as actually performing the movement. However, we acknowledged that it was also possible that stronger associations are made when the movement is performed (Daprati, Nico, Saimpont, Franck & Siriqu, 2005).

To test these hypotheses, we proposed a series of tests to compare the ability to learn a new poem in participants across three conditions:

(1) Participants were given a poem to learn and asked to do this by copying the poem out. This provides a control for action but ensures that the action is not related to the structure of the content.
(2) Participants were given a poem to learn and asked to form movements that represent the content. This is the index condition which tests the role of enactment in recall.
(3) Participants were given a poem to learn and asked to imagine movements that represent the content. This condition tests whether e.g. the eye movements associated with enactment are sufficient to improve recall.

We ran several studies to look at the effect of enactment on memorisation. The first of these involved 27 drama students at the Guildford School of Acting (GSA) – a cohort very practised in memorisation techniques. Participants were given 5 minutes to learn a short poem, "War" (1918) by the WW1 poet known as Woodbine Willie. We measured the number of words and lines correctly recalled in each condition to

determine the relative efficacy of the methods. We predicted that participants who enacted the poem would remember more than those that wrote out the poem, and hypothesised that participants who imagined movements related to the poem would remember more than those in the writing condition.

In this sample, there was no significant difference in number of words or lines recalled between conditions. Whether writing, imagining or enacting the poem, the participants recalled close to 100% of the poem in each instance. This represents a ceiling effect and suggests that the time available to memorise the poem was too long.

Despite the lack of significant results, some interesting comments emerged: one participant noted that her preferred memorisation method was to sing the lines, in other words, reciting aloud to a given or improvised tune. Research into the role of music in aiding memory has suggested that music improves memory through its effect on emotions (Jancke, 2008), reward (Salimpoor, et al., 2013) and positive arousal (Judde & Rickard, 2010). Ferreri, Autocouturier, Mathalib, Bigand and Bugaiska (2013) demonstrated that there is a decrease in activation in the prefrontal cortex (suggesting a reduction in effort) when verbal memory is tested with a musical background in healthy young adults.

Another participant commented that though he had not been able to visualise movements in isolation, he had been able to create a very detailed visual image in his mind, a sort of "video" corresponding to the narrative of the poem. He added that he found this more vivid and effective than other methods he had tried before. Previous research has demonstrated that mental imagery is a critical component of remembering and that imagining new scenarios involves areas of the brain involved in reconstructing memory of the past (Deselaar et al., 2008). Thus, visualisation is a useful tool in remembering narrative structures.

In a second pilot experiment, we asked a group of 13 postgraduate students at the Shakespeare Institute (University of Birmingham) to memorise a poem using the same conditions as the GSA students. We reduced the time allowed to memorise the poem to 3 minutes per participant. In this case, the participants who were asked to enact the poem remembered 100% of the poem with participants in other conditions remembering less than 100%. Participants in the group who were asked to imagine movements recalled the lowest percentage overall.

We were surprised that the group who were asked to write out the poem scored relatively highly. One explanation for this is that the mechanical activity of copying out lines was in itself a sufficiently embodied activity to constitute something of a physical engagement with the poem. It is also possible that the cohort – many of whom were scholars, textual editors and masters students of literature – were so adept in taking in visual information from print sources, and so used to the act of writing (note-taking, etc.) that the copying experiment played to existing natural /cultivated memorisation habits. It would be necessary to test different cohorts to confirm possible interpretations of this data.

Comments from the Stratford group suggested that it was "almost impossible" to separate the activity of reading and visualising (in the case of those either copying or enacting) and many agreed that they were not able to focus on a single memorisation strategy to the exclusion of those which they knew already to be successful for them.

From the pilot data, we were able to conclude that there were significant group differences in activating different memory strategies that might depend on both age and occupation. Thus, younger participants in the first pilot study had better memory than the older participant involved in the second study. However, these groups also differed in occupation (drama students versus English students and people with professions

involving text editing). Our pilot studies also demonstrated that a shorter time for memorisation was more effective in allowing us to differentiate memory performance across conditions.

Phase 2

On the basis of our pilot work, we conducted a second experiment. Taking advantage of a research impact "Think Tank" initiative sponsored by the University of Birmingham, we tested a group of shoppers at a pop-up research hub, in a shopping mall in Birmingham's city centre (n = 8), as well as an additional cohort of GSA students in Guildford (n = 47). Data from the group tested at the Shakespeare Institute in Stratford (n = 12) was also included in this analysis since participants were tested in the same paradigm. We tested the participants' abilities to recall a poem which they studied for 5 minutes (n = 27) or 3 minutes (n = 40). This time was sufficiently short to produce group differences in our pilot studies. Participants were randomly allocated to one of three groups: a control group who were asked to imagine the poem while memorising it (n = 23), a group who were asked to write the poem out as an aide to memory (n = 25); and the index group who were asked to enact the poem physically (n = 19).

Once the data had been collected, an ANOVA was run to determine whether participants who were students at GSA (mean errors = 6.55, n = 47) produced different levels of errors than participants tested at the Shakespeare Institute (mean errors = 5.33, n = 12) or members of the public (mean errors = 8.25, n = 8). There was no significant different between groups ($F_{2,64} = 0.29$, n.s.), and so data were pooled for the next analysis.

An independent T-test was run to determine whether there was a difference in error score between participants who waited for 3 minutes before recalling the poem (mean error score = 7.00, n = 40) and those that waited for 5 minutes (mean error score = 5.89, n = 27). There was no significant difference between groups (t = 0.51, n.s.), and so data were pooled for the next analysis.

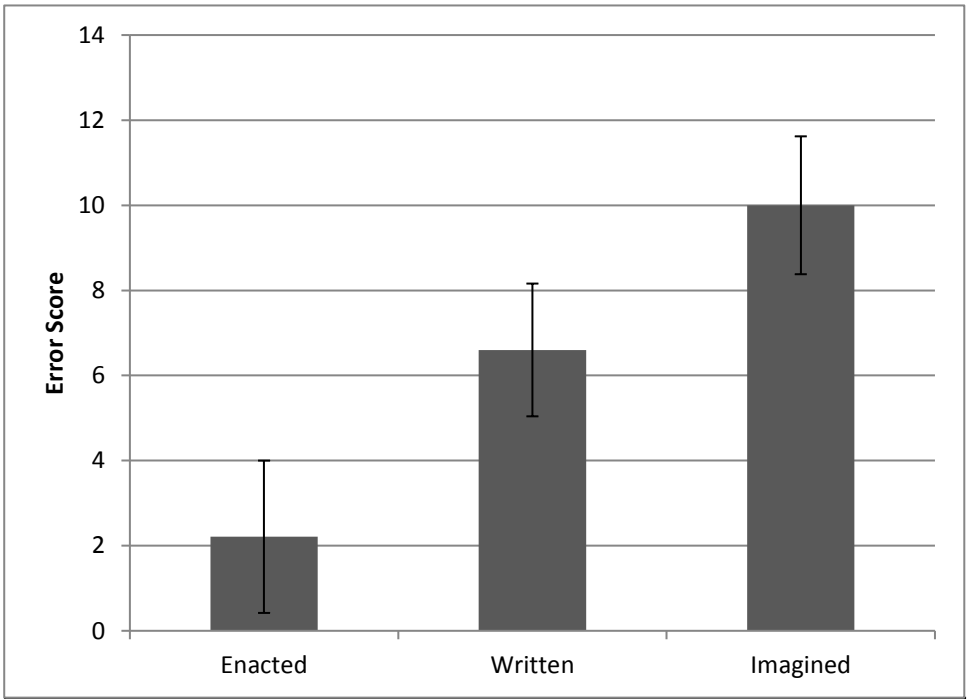

Figure 1: Mean error scores (with standard errors of the mean) for three conditions: remembering through enactment, writing out the poem or a control condition where participants imagined the poem. Participants in the enacted condition made significantly fewer errors than in the other two conditions.

We had hypothesised that participants who were allowed to enact the poem (mean error score = 2.21, n = 19) would remember it better than those who either wrote the poem out (mean error score = 6.6, n = 25) or sat quietly rehearsing it (mean error score = 10.05, n = 23). Figure 1 shows the mean error scores for each condition. A one-way ANOVA with error score as the outcome measure and memory condition as a between-subjects factor showed a significant main effect of memory condition ($F_{2,64} = 5.27$, $p = 0.008$). Pairwise comparisons demonstrated that there were significantly fewer errors in the enacted condition than in the imagined condition ($p = 0.02$) and a

marginally significant difference between the enacted condition and the written condition ($p = 0.069$). There was no significant different between the written and imagined conditions. Thus, participants who were allowed to enact the poem were significantly better at remembering after a delay than those who did not.

Discussion

Our results demonstrate that participants who are encouraged to create movements while remembering a short poem are better able to remember the poem than those who either write the poem out or imagine movements for the poem.

These results are aligned with those of a study by Noice and Noice (2001) which tests the enactment effect in the context of dramatic dialogue written for the stage, rather than poetry. In this study, non-actors were tested on their ability to remember a script with movement directions, verbal directions or deliberate memorisation without direction. Those who recalled the dialogue with movement directions showed significantly better memory for speeches than those in the other two groups. The authors suggest that Glenberg's theory of embodied cognition can be used to explain these results (Glenberg, 1997). As proposed by the action-centred theory of embodiment, words in the dialogue will be indexed to objects and actions in the environment. In the next phase, the affordances of the indexed words (i.e. the possible uses of objects or movements available to a particular operator) are identified. Affordances are then combined to create the means to accomplish a goal. By acting out the dialogue, these processes become explicit and so are proposed to aid memory for the dialogue.

A similar process could be occurring in the research presented here. By requiring participants to create actions to describe the lines of the poem, the participants consider the words are related to objects and actions, the affordances will be created and

then these will be related to potential goals. This process is likely to aid memory for the words through the process of embodiment. In the case of poetry, however, the movements created are unlikely to all be related to the literal interpretation of the words.

Connections between stage movement (or "blocking") and the dialogue in a naturalistic play can often be straightforward; for example a line such as "Don't shoot!" might be read as an embodied stage direction for a recognised behavioural gesture - [*She raises her hands]* – and this concrete connection between intention, action and language will therefore enhance recollection. In the case of the first line of our poem ("There's a soul in the Eternal") several of our participants noted that the line required some "unpacking" before a suitable movement or gesture could be found. We observed that participants enacting the poem tended to favour expressive gestures which communicated an emotional state in broader terms. Put another way, "heightened" poetic language seemed to prompt symbolic rather than literal gestures and movement patterns.

We have yet to tease out the implications in full, but our results so far suggest that, whether the gestural language of enactment is specifically behavioural or broadly expressive, the connection between enactment, embodiment and the capacity to remember poetry, is strong. Though Hamlet's concern is surely for aesthetics and performance - rather than for memory and cognition - when he urges the players to "Suit the action to the word, the word to the action", it is nonetheless ironic that he urges them not in blank verse, but in prose.

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