The Role of Repair in Oral Fluency and Disfluency

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In the literature on second language oral fluency, the most commonly used measures are temporal variables, based on speech rate and pausing (Lennon 1990). However, repair is also a key aspect of fluency: fast speech with many repeats and false starts is not considered as fluent as speech in which such repair is absent (Tavakoli & Skehan 2005). Yet repair, like pausing, is also a feature of fluent speech, so it is important to investigate how repair is used differently in fluent and disfluent speech. Unfortunately, little work has so far been done on such comparison.

This study is an empirical investigation of how repair relates to other measures of fluency in the speech of a group of 17 Taiwanese university students, ranging from intermediate to advanced level. Working in pairs, they completed two tasks: the first was a narrative task based on a picture story, and the second was a two-way discussion. Rates of repair were calculated and compared for more fluent/ less fluent learners, and for native and non-native speakers.

Results show, not surprisingly, that more fluent speakers have lower rates of repair, but that while repeats are common in fluent speech (as measured by temporal measures), reformulations and false starts are usually more frequent in learner speech, especially at low levels. However, fluent speakers seem to use short repetitions in order to gain time for accessing specific vocabulary, and it may actually help them to maintain their speech rate. Disfluent speakers, on the other hand, tend to rely on repair, mixed with other hesitations, to allow for planning of the next few words, and repair is generally accompanied by a slower speech rate. Grammatical reformulation was found to be absent from this set of native speaker data.

INTRODUCTION

Tavakoli and Skehan (2005) have distinguished three aspects of fluency: speed fluency (the rate of speech), breakdown fluency (relating to pausing), and repair fluency (which relates to the extent to which speech is repeated, reformulated, or left incomplete). Much work has been carried out on speed and breakdown fluency (see, for example, Dechert and Raupach 1980 for a collection of work on temporal variables), but the role of repair in fluency is less clear. Excessive amounts of repair can be expected to result in disfluent sounding speech, yet it also seems likely that a certain amount of repair might actually enhance fluency in that it could help the speaker maintain a higher rate of speech, with fewer pauses, than might otherwise be possible.

This study investigates how various measurements of different kinds of repair correlate with measures of speed fluency. The overall purpose is to discover how repair relates to temporal fluency – in particular, whether more fluent speakers use less repair than less fluent speakers, or alternatively, whether the relationship is more complex, with repair sometimes reflecting disfluency, but sometimes allowing greater fluency than might otherwise be possible.

Measuring Fluency

There have been a variety of studies of oral fluency in a second language. They have generally focused mainly, or exclusively, on temporal measures of fluency. Temporal measures relate to the amount of time spent speaking, the speed of speech, and the occurrence of pausing. Temporal measures generally ignore the quality of speech produced –for example, the accuracy and range of grammar and lexis. This is appropriate, as speaking fluency is generally

considered more a question of how language is produced than of what kind of language is produced.

Temporal measures of fluency can be divided into individual and combined ones. The basic measure of speed is articulation rate (AR), which gives the number of words or syllables produced per minute or per second while the speaker is actually speaking. AR is calculated by dividing the speaking time (total time minus pause time) by the number of words /syllables produced. For pausing, a basic measure is pause time ratio (PTR), which gives the percentage of total time taken up by pauses. A complementary measure for the amount of time spent speaking is phonation time ratio (confusingly, also known as PTR, but which may instead be labelled PhTR).

Combined measures of pausing include speech rate (SR), mean length of run (MLR), and more complex measures of pausing such as pause frequency, average length of pause, and pause and pause distribution statistics. SR refers to the number of words or syllables per minute or per second including pause time, thus combining speaking speed (AR) with pause time (PTR). MLR is one measure of pause frequency in relation to words produced, as it shows the average number of words/ syllables spoken between pauses. These two measures, SR and MLR, have been found to be good indicators of fluency in several studies (e.g. Towell et al,), and this is probably in part due to the fact that they combine at least two aspects of fluency. Measures of pause distribution focus on the location of pauses, and in particular on whether pauses occur between or within clauses, as it seems probable that mid-clause pauses to detract more from fluency than end of clause pauses.

All of the measures mentioned so far are temporal ones, and none of them address the area of repair. The commonest measure of repair is repair frequency, where the incidence of repair is set against the number of words produced, or the time spent speaking. This kind of measure is rarely found to correlate with other measures of fluency or with raters' fluency judgements. However, there is one fluency measure which combines speed fluency and breakdown fluency (as represented by SR) with repair fluency –namely, pruned speech rate (Lennon 1990; Derwing et al 2004). This is the rate of speech produced once all repair has been removed. A high rate of pruned speech indicates that a speaker has a good balance of speed, the ability to keep talking, and minimal reliance on repair.

Research on Repair

Maclay & Osgood (1959) carried out an early and in-depth study of repair in native speaker speech, introducing many of the key notions and distinctions used in more recent research, such as retraced and unretraced false starts (explained below, in the description of Riggenbach's research), and the distinction between repetitions before lexical items (where there is a search for an appropriate word) and repetitions before form words (where the reason must be distinct). These researchers found that the former were much more frequent than the latter in native speaker speech: i.e., repetitions were usually <u>of</u> form words, and occurred <u>before</u> lexical words. They also claimed that reformulations were usually <u>of</u> lexical items, occurring <u>before</u> lexical items. Their most general observation with respect to repair was of a negative correlation between speech rate and combined total hesitations – that faster speakers hesitated less. Nevertheless, there was no such correlation between speech rate and any individual kind of hesitation, including repair.

Olynyk, M., A. d'Anglejan and D. Sankoff (1990) investigated the use of "speech markers", defined as: filled pauses, transitions, repetitions, repair conversions, cut-offs. The last two of these are their labels for what are elsewhere called reformulations and false starts. Their subjects were L2 learners of English. The authors distinguish between progressive or prepositioned repair, which includes repetitions, and regressive or postpositioned repair, which includes reformulations. The claim is that each type behaves differently, with progressive repair not reducing fluency, but regressive repair having a negative effect. High fluency

speakers were found to use more repeats and transitions, while low fluency speakers' speech featured more repair conversions and cut-offs.

Lennon (1980) investigated detailed changes in the speech of four German students of English as a foreign language who were judged to have become more fluent after a period of study in England. Pruned speech was found to be one of the best indicators of fluency, along with filled pauses per unit and the percentage of T-units followed by a silent pause.. Repetitions and self-corrections per unit were also measured, but these were not found to improve for all four of the participants.

Riggenbach (1991), following Maclay and Osgood (1959) categorises repair into two categories: retraced and unretraced false starts. Retraced false starts are where part or all of the original utterance is repeated. Where repetition is total, the repair is a repetition. Where the speaker partly repeats what has been said, while making some change(s) of grammar or vocabulary, we have an "insertion", or what is generally termed a reformulation elsewhere. An unretraced false start occurs when the speaker completely abandons an utterance that is incomplete, and embarks on a new one which is lexically and syntactically distinct. The latter is what I describe as a false start in this paper. Riggenbach found repair measures did not correlate with fluency, partly because faster speech was sometimes characterised by frequent and extensive repair. A measure of pruned speech might have been useful here to reflect these conflicting aspects of fluency.

Freed (1995) investigated changes in the speech of American learners of French who spent a semester abroad and were expected to have improved in oral fluency (although rater judgements did not actually confirm this). Only speech rate was found to have improved significantly after the period abroad, while, with respect to repair, Freed concludes: "In most cases the speech of the Abroad group is characterised by more speech markers of this type than is the speech of the At Home group." (Freed 1995: 141). Thus it is concluded that repairs are not necessarily indicative of a lack of fluency.

Tavakoli, P. and Skehan, P. (2005) tackle repair fluency by measuring the frequencies of repetitions, reformulations, false starts, and substitutions (substitutions are reformulations involving only a change of lexical item). Using factor analysis, they find repair behaves differently from breakdown and speed fluency, and comment: "The repair fluency group loads together consistently, and separately from other aspects of fluency suggesting that a concern to modify utterances on-line is somewhat distinct from a capacity to organise speech in real time."

METHODOLOGY

Data

Learner Data

The data comes from speech samples taken from 17 Taiwanese university students majoring in English language and literature. Students worked in pairs, each student telling a story to their partner based on a set of pictures, after which they completed a collaborative discussion task. The total time allocated for both tasks was 8-10 minutes, and each pair was given 10 minutes of preparation time. The same tasks were repeated with the same students in year 1 and year 4 at university, so that in total each student produced two narratives and was involved in two discussions. The narrative picture stories were taken from Fletcher and Birt (1982), while the discussions typically involved reaching agreement on a set of priorities (e.g. the characteristics most wanted in friends), a desirable order (e.g. the stages of a relationship), or a list of items to select from (e.g. products that should or should not be allowed to be advertised).

A comparison group of eight British mother-tongue speakers of English, all between the ages of 20 and 30, were also asked to compete the same tasks, so that native speaker and non-native speaker performances could be compared.

Processing & Analysis

The output from the native speaker and non-native speaker participants was transcribed, first of all using "Stop-Start" proprietary software, and later using "Transcriber" open-source software which allows calculation of the timing of the length pauses and individual runs of speech. Transcriptions were based on conventions described in Foster et al. (2000). Temporal fluency measures obtained included articulation rate (AR), speech rate (SR), mean length of run (MLR), phonation/ pause time ratio (PTR), pause frequency, average length of pause, and pause distribution (the proportions of pauses occurring within and between clauses).

The initial measures of repair involved the concept of "pruned words" (Lennon 1990). Pruned words are the words that remain after repair and filled pauses have been removed. Pruned speech rate is thus speech rate for pruned words only, and is probably a better indicator of fluency in that pruned speech has had all redundant words removed, and therefore reflects the more communicatively useful sections of speech. Some fast speakers may rely heavily on large numbers of repetitions, reformulations and false starts, while others may not, and in such cases the latter would generally in such cases be judged more fluent than the former. The second measure of repair was "the percentage of pruned speech", which represents the proportion of total words left after repair has been removed, and so is an indicator of the amount of repair – a high percentage meaning low levels of repair, and a low percentage indicating greater amounts of repair.

For the present study, the aim was to investigate in more detail the occurrence of different types of repair, looking at both their frequency and the total number of words for each. This required tagging of each instance of repair, in order to record four key features: its location (within or between clauses), the number of words, the repair type (repetition, reformulation or false start), and the context of the repair (e.g. the kind of word that follows a repetition, or the kind of change in a reformulation).

Categorization of Repair

The first feature of repair that was recorded specifically for this study was based on the distinction between external and internal repair, which mirrors another distinction often made - between pauses within and pauses between clauses. External repair falls between clauses, at the beginning or end of a clause or speech unit, while internal repair occurs after at least one key element of the clause – e.g. the subject, or an adverbial phrase which modifies the subject, predicate or element thereof, rather than simply serving as a link between clauses. External repair may still occur after clause initial discourse markers which serve to link clauses or speech units, such as *and*, *then*, or *however.* But repair after adverbials that modify the whole or part of the clause, such as *at 8 o'clock*, *in the office*, *after the robbery*, is considered internal.

The second recorded feature of repair was the number of words in each instance of repair, i.e. the number of words which were later repeated, reformulated or left incomplete. Usually this was one or two words, and repeats were rarely longer than this, but on occasion 8-10 words might be reformulated or abandoned as a false start.

The third focus was upon the overall category of repair, of which there were three: repeats, reformulations and false starts. The fourth feature of repairs was the context of the repair: the following words, the last word or the reformulated words. The contexts are described together with their respective repair categories.

Repeats are words which are exactly repeated immediately after they are uttered. Where repetition has a rhetorical effect (*very, very long*), or is considered to reflect normal usage (*No, no...*), it is not counted as repair. Repeat context is classified according to the following word:

RPL is a repeat followed by a lexical word (a word which carries essential meaning in the utterance), while RPF is a repeat followed by a form/ function word (a word playing a functional word in the utterance, as for example an auxiliary or modal verb, an article, or a preposition). The distinction into form/function and lexical words follows O'Loughlin (1995). The distinction is made because, as argued by Osgood and Maclay (1959), some repetitions often serve to make time while a lexical item is searched for, while others may reflect more global problems in planning a clause or speech unit. Below are examples, taken from the data used in this study, of repeats before lexical and form/function words:

RPL: so he ‘s made up his mind ::{to …...er} to lose weight.
RPF: {and they are they are} …..they are very scared
{maybe t-h-e-y**}** ….maybe they didn ‘t have anything

False starts are words left as incomplete clauses, and followed by a new start involving different lexis and syntax. False starts may end in either a form/function word or a lexical word, and so the context is categorised as either FSF or FSL. A false start ending in a form/ function word may indicate a problem finding the following (lexical) word, while one ending in a lexical word suggests a more general difficulty in formulation.

FSF: {maybe they didn ‘t have anything to er they} maybe they ,,,,didn ‘t have the ...right knowledge

Reformulations are false starts followed by something very similar to the previous words, except that either the lexis or the grammar (morphology or syntax) have been changed. RFL represents cases where the lexis is changed, while RFG is used where only grammar is modified. The examples below illustrate the two categories:

RFG: but he still {keeps on keep on} kept on walking
RFL: and .....{er} the robber told {one of the bank …..er} one of the workers

Where both grammar and lexis are changed, the repair is considered a false start. A reformulation always involves a repetition of either lexis or sentence structure from the previous utterance, and sometimes both (as when only morphology is changed). In some cases it may be unclear whether a repair is a reformulation or a false start, as when lexical items are rearranged in a new syntactic pattern requiring the addition of one or two new form words – articles, auxiliaries etc. This area of ambivalence is not surprising as reformulation is one kind of false start, and both types of repair represent what Olynyk et al. call regressive repair, as opposed to repeats which look forward to the next word and are termed progressive repair. For this reason, in analysis false starts and reformulations are considered both separately and together.

The final aspect of repair categorisation is the repair context, and has already been alluded to in the discussion above. Repair context refers to what is considered the essential context of the repair: the kind of word following a repeat, the nature of a reformulation, or the last word of a false start.

Classification and Measurement of Repair

As a result of the way in which repair was classified, three major approaches to repair analysis were possible. All repairs could be measured together, and compared both between participants, and to other fluency measures such as speech rate; the different kinds of repair—repetitions, reformulations, substitutions, false starts—could be analysed separately and compared; and the figures for repair in different contexts could also be compared.

In each case, both frequency and extent of repair could be analysed. Frequency is defined as the mean number of words produced without a given type of repair, or the number-of-occurrences-of-the-repair-plus-one divided by the total number of words. A high number here therefore reflects a low frequency of repair, as many words are spoken with few (or no) incidences of repair. Extent of repair is defined as the percentage of total words accounted for by repair, or the particular type of repair. Here a higher number reflects a higher percentage of repair, and a greater proportion of total speech being "lost".

RESULTS AND DISCUSSION

Comparing Learners and Native Speakers

Table 1a. Learner and native speaker repair means.

	Learner freq: words per repair	NS freq: words words per repair	Learner repair as % of words	NS repair as % of words
All repaired words	15.2 (7.7)	66.4 (56.0)	14.3 (8.1,)	4.0 (4.4)
Repeated words	31 (32.6)	81.6 (48.5)	7.4 (5.8)	1.9 (2.7)
Reformulated words	55 (31.5)	118.6 (60.9)	4.6 (3.2)	1.4 (2.6)
False starts:	96.5 (66.4)	116.0 (53.5)	2.4 (2.2)	0.7 (1.2)
External repair	29.3 (19.9) (.)	90.0 (53.6)	8.4 (5.2)	2,3 (3.1)
Internal repair	32.6 (21.8)	82.4 (50.1)	5.8 (3.9)	1.7 (1.9)
Repetit - form	71.7 (57.4)	110.0 (48.9)	2.6 (2.1)	0.6 (0.8)
Repetit - lexis	57.5 (40.6)	102.0 (53.7)	3.4 (2.9)	1.2 (1.9)
Repetit - rept	161.5 (110.1)	197.9 (130.5)	-	-
Reform - lexis	102.3 (68.2)	118.6 (60.9.)	2.2 (2.1)	1.4 (2.6)
Reform- gram	102.4 (69.3)	234.8 (169.0)	2.3 (2.2)	0.0 (0.0)

Seventeen learners: two stories and two discussions recorded from each participant. Seven native speakers: two stories and one discussion recorded from each participant.
Standard deviations in (brackets).

Table 3 shows native speaker and non-native speaker means for repair measures, together with the respective standard deviations. Mean figures are given for repair frequency (the mean number of words spoken between repairs) and repair words (repair words as a percentage of total words) for native speakers (NS) and non-native speakers (NNS). Note that the repair frequency number increases as frequency decreases, so a higher number reflects less frequent repair, while the figure for "repair as a percentage of words" increases as the number of words involved in repair increases. Some patterns can be seen in both sets of data. For example, repeats are the most frequent kind of repair, followed by reformulations, with false starts being the least frequent. Also, repetition before lexical words is more frequent than before form words for both participant groups.

Several areas of contrast between learners and native speakers can be identified, however. First, repair is more frequent and involves a higher percentage of words for the learners. This applies to all categories of repair, and on average the learner speech features between two and four times as much repair as the native speakers. Second, there is more external repair than

internal repair for learners, while for native speakers the reverse is true. Third, and perhaps most strikingly, while for the learners about half of all reformulations involve grammatical changes, for the native speakers there are no cases of reformulation of grammar at all. It is unusual for native speakers to need to correct themselves in such areas as subject-verb agreement or tense, which are typical reasons for learner reformulations. This is not to say that native speakers do not make mistakes, but these tend to go uncorrected, and to occur in more complex utterances, where, for instance, a speech unit is long and ends in a way incommensurate with its beginning. Here are two examples from the data of learners' reformulations of grammar, of a kind that would be unusual in native speaker speech:

|{er .....it is a bank}it was a bank|
|so they could find out ....::{er who the robber is} .....who the robbers are|

Reformulation of lexis, on the other hand, is fairly frequent for the native speakers, and typically involves the speaker searching for more precise or expressive vocabulary, as in the example below:

|{his arm hurt} his arm ached|

Contrast this with an example of learner reformulation of lexis, where there is a difficulty in finding the right expression, which is reached at the third attempt, despite not being an unusual or difficult word:

and {try to ….....try t-o ….do} …try to {jog**}** do jogging

Table 1b. The proportions of repair categories for native and non-native speakers. Each repair is given as a percentage of all repair.

	External repair freq/words	Internal repair freq/words	Rept freq/words	Reform. freq./wds	False strt: freq/wds
Native speaker	52.9 / 57.0	48.1 / 42.3	49.0 / 44.4	31.5 / 35.6	19.6 / 19.9
Non-native speaker	45.7 / 49.6	54.3 / 50.4	56.7 / 48.3	28.2 / 33.4	15.1 / 18.6

NS=17 (4 tasks each), NNS=7 (3 tasks each).

Table 1b shows the proportions of repetitions, reformulations and false starts as a percentage of total repair. The balance between clause-external and clause-internal repair is slightly different, with native speakers having a greater proportion of internal repair, while non-native speakers have a larger percentage of external repair. As for the three types of repair, the differences in proportions are small, and do not seem to indicate any significant trends. It is in the overall quantity of repair that the two groups can be most easily distinguished, rather than in the distribution of repair types.

Learners' Pearson Correlations

Table 2. Pearson correlations between repair and speech rate for Taiwanese learners.

	All repair freq./ extent	Av. length of repair	Repetitions freq./ extent	Reform. freq./ extent	False starts freq./ extent	Reform+ false start freq/ext
Pearson correlation with speech rate	.36/ -.47	.04	.12/ -.44	.54/ -.44	.03/ .03	.47/ -.38

	External Repair freq/ext	Internal repair freq/ext	Repetit lexis freq/ext	Repetit form freq/ext	Repetit before repetit	Reform lexis freq/ext	Reform grammar freq/ext
Pearson correlat'n	.22/ -.38	.42/ -.48	.34/ -.56	.17/ -.22	.35 (freq only)	.50/ -.44	.34/ -.22

NS=17 (4 tasks each), NNS=7 (3 tasks each).

Table 2 shows Pearson correlations between repair and speech rate for the group of learners. Except for the false start correlations, which are both weak, it can be seen that the frequency correlations are positive while the extent correlations are negative. This is because the frequency measure represents the number of words per repair, a high number meaning low frequency, while the extent measures stand for repair as a percentage of total words, a high number signifying a high level of repair. These correlations therefore indicate that repair correlates negatively with speech rate, more repair usually going with a slower speech rate. To put it another way, amongst learners, slower speakers rely more on repair than faster speakers.

Another overall point is that repair frequency and repair extent do not always behave in the same way. There are several examples in table 2 (and also table 3) of divergent figures for repair frequency and number of words. For example, repetition frequency correlates only weakly with speech rate (r=.12), but repetition extent correlates strongly (r=.47). For reformulations, the reverse is true - repair frequency correlates more strongly than repair extent. For false starts, frequency and extent correlate equally with speech rate, though in this case the correlation is close to zero. Generally, but not always, it is the extent of repair that correlates more highly with speech rate than repair frequency. With respect to repair frequency, only reformulations correlate significantly (r=.54), while for repair extent both repeats (r= -.44) and reformulations (r= -.44) are significantly correlated with speech rate.

Aspects of repair that show no correlation with speech rate include the frequency and extent of false starts, as already mentioned, together with the average length of repair. In other words, false starts are distributed evenly among faster and slower speakers, unlike repetitions and reformulations, which are more common in slower speech. Meanwhile, and perhaps surprisingly, the average length of repair in general is not relevant here, only frequency and extent, in varying permutations.

Finally, it can be seen that correlations for internal repair are stronger than for external repair. Above it was noted that there was more external than internal repair for learners, yet it seems that it is the internal repair which correlates more strongly, and negatively, with speech rate. This means that, for these learners, internal repair is a stronger predictor of slow speech

rate than external repair.

Native Speaker Repair

Table 2 shows Pearson correlations between native speaker speech rate and repair measures. The most striking difference in the native speaker figures is that there are small negative correlations between repair and speech rate, in contrast to the positive correlations for learners. In other words, for the native speakers, more repair goes with faster speech rates, while for the learners more repair accompanies slower speech rates. The correlation is a relatively weak one, but it is of interest because it is in the opposite direction to that of the learners' repair. This positive correlation with SR applies to repeats and to repair as a whole, but not to reformulations, which are negatively correlated, showing that not all repair behaves in the same way. Where a speaker feels free to repeat or restart a phrase or utterance, this may enhance speed, but where a speaker is concerned with precision and feels the need to reformulate what s/he has already said, this may be detrimental to the speed of speech.

Table 3. Pearson Correlations between repair and speech rate for native speakers

	All repair freq./extent	Av. length of repair	Repetitions freq./extent	Reform. freq./extent	False starts freq./extent	Reform+false start freq/ext
Pearson correlation with speech rate	-.22/ .24	.10	-.27/ .51	.27/ -.27	.03/ .03	.25/ -.27

	External Repair freq/ext	Internal repair freq/ext	Repetit lexis freq/ext	Repetit form freq/ext	Repetit before repetit	Reform lexis freq/ext
Pearson correlat'n with speech rate	-.07/ .14	-.18/ .33	-.14/ .50	-.01/ .37	.32	-.27/ -.27

NS=17 (4 tasks each), NNS=7 (3 tasks each).

This is consistent with Olynyk et al.'s notions of regressive and progressive repair. A repetition is a stalling device, whereby the speaker makes time for planning the next words. A reformulation, on the other hand, involves going back to what has already been said and changing it in some way. False starts are also regressive, returning to a previous point in order to start again, but they do not correlate with speech rate at all for native speakers (r=.03).

A further finding of interest is that the only significant correlation for the external/ internal repair distinction is that between internal repair extent (internal repair as a percentage of all words) and speech rate, which correlate positively (r=.33). This is perhaps surprising, but is consistent with the finding mentioned above that native speaker speech features more internal than external repair. One interpretation of this is that mid-clause repair may help to increase speech rate. Most native speaker silent pauses do come between clauses, providing time to plan the following clause, so there is probably less need for repair to help planning at such junctures. However, while mid-clause silent pauses reduce speech rate, mid-clause repair does not – words are still being produced, and silence is avoided. It is therefore at least plausible that a mid-clause repetition is more conducive to fluency than a mid-clause silent pause. It should, however, be remembered that this does not apply to learner speech, where internal repair also correlates with speech rate, and rather more strongly, but in the opposite direction: learners

who repair more within clauses tend to speak slower.

Some of the native speaker data needs to be analysed cautiously, in view of the fact that several speakers have no repair, and some repair types are infrequent (e.g. false starts, repetition before form words) or, as is the case with reformulation of grammar, do not occur at all. This may distort the correlations, for which reason correlations are not given for some categories - e.g. reformulation of grammar.

CONCLUSION

Much work remains to be done in this neglected area of fluency analysis, but this study presents some interesting preliminary findings.

It is instructive for teachers to note differences in how repair behaves in native speaker and non-native speaker speech, so it is very interesting that for these learners, more repair correlates with *slower* speech rates, while for the native speaker data, more repair correlates with *faster* speech rates.

There is partial confirmation of Maclay and Osgood's finding for native speakers of a distinction between repetition before lexical items and repetition before form/ function words. It is not only that the first type is more frequent than the second, but also that lexical repetition correlates more strongly, and positively, with speech rate. In other words, it may actually facilitate fluency.

It is also interesting to note that reformulation correlates negatively with fluency not only for learners, but also for native speakers. Teachers might like to be aware of these results, and to realize that repetitions, which account for about half of all repair, probably detract from fluency much less than reformulations and false starts. Learners may also benefit from knowing that over-zealous efforts to self correct, involving frequent an extensive reformulations, will make their speech sound disfluent. In my own experience, errors in fluent speech are in any case less noticeable than those in slow, less fluent speech.

Reformulation of grammar was found here to be absent from native speaker speech, while correlating negatively with speech rate for learners. On the other hand, thoughtful speech does often involve reformulation of lexis. Probably the clearest and most sensible message to learners is that repair is not intrinsically bad for fluency, but that the overall amount of repair needs to be limited.

Meanwhile, researchers should note that repair frequency and repair extent (the number of words involved in repair) behave differently. Both frequency and extent need to be measured and analysed in studies of repair, if important facts about repair are not to be overlooked.

Further research should involve the collection and analysis of more data, and the comparison of repair between different speakers, different levels, and for the same speakers at different times and on different tasks. It cannot be assumed that the same speaker will rely to the same extent and in the same ways on repair in different contexts. There is also a need to investigate the interaction between silent pauses, filled pauses and repair: these are three kinds of hesitation, and they may play similar roles in enabling speakers to plan and produce speech, with different individuals showing different preferences, and possibly varying these preferences at different times.

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