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Second language attrition and the Savings Paradigm: an exploration of long-term retention of a minority language learned in an educational context

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Abstract Explorations of attrition attempt to gain insight into linguistic representations in the brain and to understand what supports the consolidation of information in memory so that language knowledge is retained, even after long periods of language disuse. In this study the role of extra-linguistic factors in influencing levels of knowledge retention over a long period of incubation is investigated along with the question if support for savings can be found, i.e., is seemingly forgotten knowledge in fact still intact and, therefore, may be accessed again. Four adults from Ireland currently living in Germany who had not had contact with the Irish language in approximately 30 years were tested on their knowledge of Irish lexical items and interviewed in depth on their experiences of learning Irish. Understanding language loss has important implications for the L2/FL education domain and pedagogy. If it can be established what impacts greater retention of knowledge, teaching curricula and methodologies can be revised accordingly to make them more effective with respect to long-term knowledge retention.

Keywords language attrition, the Savings Paradigm, minority languages, Irish language, learning experience, attitudes and motivation

1. Introduction

Traditionally and in general terms, language attrition has been understood as a complex, non-linear process whereby knowledge (in part or complete) of a particular language once known is lost or "forgotten" over time. This leads to the question whether this decay is permanent or whether linguistic information can be accessed again and if so, what might cause some linguistic information to be more easily retrieved.

This paper presents an overview of a study conducted by the author (Geary 2022) in which it is explored whether or not second language (L2) lexical knowledge acquired in childhood and puberty has been completely erased after a prolonged period of inactivity or whether it has merely become inaccessible, i.e., whether residual levels of linguistic knowledge are still present and available and through re-exposure can be reactivated. The L2 in question is Irish, a language that is learned throughout one's entire school education in the Republic of Ireland, starting in the first year of primary

school. It is a compulsory subject for the majority of pupils and has to be taken in the state examination, the Leaving Certificate, at the end of the final secondary school year.

Moreover, claims proposed in language attrition research regarding the role played by extra-linguistic factors in the attrition process and how these may account for variation in performance across individuals are also investigated. These factors include proficiency level at onset of attrition, age at the start of learning as well as age at the onset of attrition, learning context, attitude and motivation, length of learning/exposure, levels of literacy, time since the onset of attrition, and frequency as well as recency of use (Bardovi-Harlig & Springer 2013; Bahrick 1984b; Murtagh 2003; Paradis 2007; Schmid & Mehotcheva 2012).

1.1. Research objectives

Specifically, the objectives of the study are as follows:

1. To assess levels of retention of lexical items of school-learned Irish after an incubation period of approximately 30 years.
2. To ascertain what factors might account for difference in performance across individuals.
3. To test the Savings Paradigm with respect to Irish lexical knowledge. According to this paradigm, there is a learning advantage for previously known but seemingly forgotten knowledge compared to information learned for the first time.
4. To determine whether levels of retention parallel performance in relearning.

Four adults (2 males and 2 females) were tested. For reasons of data protection, they were given the pseudonyms, Enda (male), Ellen (female), Brendan (male) and Cathy (female). Whilst they are currently resident in Germany and fluent speakers of German, all grew up in Ireland and completed their education there (including university). They all followed the same Irish language syllabus (Curriculum and Examinations Board 1984), with one of the participants starting to learn Irish later, i.e., at the age of 10 years, after

her family moved to the Republic of Ireland from Northern Ireland. The other participants began Irish lessons as soon as they started primary school, which was at the age of four or five years. The participants were in the age range 45 to 50 years at the time of testing and had had no official contact with Irish (i.e., in an instructional context) and little to no contact with the language in a natural setting in 25 to 30 years.

1.2 Uniqueness of the present study

While first language (L1) attrition among individuals living in an L2 environment has constituted a central focus in attrition research to date (for a comprehensive overview of L1 attrition studies, see Schmid & Köpke 2019), fewer studies have been conducted on attrition of an L2 acquired in a natural setting (examples, Cohen 1989; Graham 2012; Hansen *et al.* 2012; Olshtain 1986; Taura 2008) and even fewer again on attrition of a language learned in an instruction setting (examples, Bahrick 1984a, b; Cohen 1989; Grendel 1993; Murtagh 2003; Weltens 1988; Weltens & Grendel 1993).

Research on savings and relearning effects in the case of an L2 or foreign language (FL) specifically is scant, with these predominantly reporting on the attrition of majority languages. Hansen et al. (2002) looked at savings with respect to L2 Japanese and L2 Korean acquired through a combination of formal and incidental learning among L1 English missionaries during their time in Japan and South Korea respectively. De Bot & Stoessel (2000) examined relearning effects in the case of two L1 German attriters of L2 Dutch and De Bot *et al.* (2004) investigated possible savings among L1 English learners of German as well as L1 Dutch learners of French.

The Irish language provides an interesting and unique focus for attrition analysis because unlike languages typically explored in attrition research, a monolingual Irish speaker does not exist, i.e., all Irish L1 speakers are also English L1 speakers.

Another factor that distinguishes the study of attrition of Irish from other studies on L2 attrition is that it is a not a *modern foreign language*, as is typically taught in school, such as French or German. Its status as a minority language, therefore, affects curriculum planning and design and the particular motivations that manifest in learning it and eventually

maintaining contact with it on leaving school. Such a study can thereby add more comprehensive insight into the complex nature of language learning motivation considering that typically motives are examined within the modern foreign language learning milieu, with such observations generally being assumed to be conclusive. This study, therefore, prompts a review of such interpretations.

The case of the Irish language also presents an invaluable opportunity for the study of attrition since many speakers, especially those who leave Ireland to live and work abroad after their education, experience complete isolation from the language with little to no exposure to it over prolonged periods. This eliminates the problem highlighted by De Bot *et al.* (2004) which is that relatively easy access to second and foreign languages in multilingual countries makes it difficult to locate clear cases of attrition.

Another advantage of this study is the long period of incubation in which the language has not been used. Only a handful of studies have dealt with long periods of disuse (for example, Bahrick 1984a, b; De Bot & Stoessel 2000; Hansen *et al.* 2002) with the majority of L2/FL attrition studies looking at incubation periods ranging from 3 months to 4 years (see Mehotcheva & Mytara 2019 for an overview).

What is also particular about the present study is that it is an exploration of L2/FL loss starting in an L1 environment and proceeding in an L3 environment. All participants in the study are fluent German L3 speakers.

1.3. Establishing a knowledge baseline

As Tomiyama (2000: 310) states, establishing attrition is not straightforward. To find what was lost, one must be sure that it was there in the first place. Pan & Berko-Gleason (1986: 198) also refer to the challenge of establishing a knowledge baseline and a reference point with respect to proficiency against which current levels of language knowledge can be compared. This challenge has been overcome in the present study as each of the participants had attended school within a relatively similar time-span and learned Irish according to same uniform, standard curriculum. All of them had studied the texts from which the vocabulary items for the present study were taken, therefore, ensuring that they had been previously known.

Moreover, their Leaving Certificate Irish grades were available so that retrospective self-estimates with respect to previous proficiency levels which are vulnerable to unreliability did not have to be made by the participants. Whilst the participants took the final state examination in different years, the standard was quite consistent overall year to year.

1.4 The role of qualitative analysis in attrition research

Considering the heterogenous nature of attriting groups and the interaction of individual factors leading to their distinct end-states, it has been widely argued that qualitative research focused on individual profiles can potentially provide fruitful insights into understanding the process of attrition (Pan & Berko-Gleason 1986; Herdina & Jessner 2013; Yilmaz & Schmid 2018). Herdina & Jessner (2013: 753) also suggest, considering the dynamic nature of attrition, that "qualitative research suggested by language biographies might be favoured compared to more conventional quantitative methods." Graham (2012: 151) correspondingly highlights the "different history of involvement" with the language that each individual attriter incorporates and even when a language has been acquired or learned under similar circumstances, the experience of this is distinct to each individual. Adopting a case study approach, as is done in the present study, presents an invaluable opportunity to explore individual attrition trajectories and the unique interplay of variables that impact them.

2. Understanding Attrition

Herdina & Jessner (2013: 753) describe language attrition as a dynamic, persistent yet irregular phenomenon, emerging as a consequence of the load experienced by the individual speaker when managing two or more languages leading to an imbalance in the command of each language (Herdina & Jessner 2013: 752). They refer to Opitz (2013: 702) who explains attrition as emanating from modifications in the overall multilingual linguistic system, for example, as a result of the sequential acquisition of another language, so that mastery of each language in the system may change as a result. Herdina & Jessner (2013: 753) state that attrition comprises reduction or simplification of language systems and/or the impairment of access to them, emphasizing

that it is a normal, and often unavoidable, consequence of bilingual language development.

Stemming from this is the question if certain knowledge is less vulnerable to attrition and if so what causes this. Bahrick (1984a: 111) refers to a permastore, i.e., linguistic knowledge that endures and is retrievable even after 25 years despite disuse. Schmid (2007:150) speaks of a "saturation threshold", a level of linguistic knowledge attained that makes it immune to complete loss. Mehotcheva & Köpke (2019: 20) refer to Neisser (1984: 33) who speaks of a critical threshold of strength whereby information becomes consolidated and steadfast in memory making it immune to decay.

Köpke (2004: 14) argues that although productive skills have been shown to be more affected by attrition compared to receptive skills, this might be due to problems in simultaneously controlling each system as the individual strives to access and process the appropriate information in real-time instead of being indicative of loss in long-term memory. Observations of problems in perception might consequently offer insight into how deeper level knowledge has changed or deteriorated and help establish attrition effects that looking at production alone might not ascertain.

2.1. The Activation Threshold Hypothesis

Paradis (2004: 28) explains attrition as resulting from "long-term lack of stimulation". Within the context of his Neurolinguistic Theory of Bilingualism (NTB), according to which Paradis (2004) views the two languages of a bilingual as existing as two independent subsystems within the general language network in the brain, he put forward the Activation Threshold Hypothesis (ATH) which suggests that each linguistic item or structure necessitates a degree of impulse for it to become activated; the level at which this occurs constituting its activation threshold. With each further activation of the item or structure, the activation threshold is lowered as are the cognitive costs associated with its stimulation, so that it may be accessed more easily and quickly. Paradis states that the activation level of any item changes constantly because the threshold rises again gradually after an activation. However, once activated anew, the threshold drops once more.

Köpke & Keijzer (2019: 68) state that lexical item retrieval is more prone to frequency effects (considering the declarative quality of lexical knowledge) than grammatical knowledge that is deemed procedural in nature and consequentially generally more readily available for activation. Schmid (2019: 290) also refers to the declarative/procedural nature of stored linguistic information in understanding frequency of use effects and refers to Paradis (2007) who likewise argues that activation levels of lexical items are more affected by frequency of use than grammar or phonology.

In adopting the interpretation of attrition as a process characterised by difficulties in accessing information, according to the ATH, therefore, lack of use suffices for a language to attrite since this leads to a rise in the activation threshold, whereby more impulse and greater effort is required for an item to be accessed or reactivated. Mehotcheva (2010: 30) also states that in compliance with the ATH, total loss of linguistic knowledge does not occur; the issue is instead one of accessibility. On the other hand, she states that if learning of the L2 or FL ceases prematurely, i.e., before this knowledge has a chance to become consolidated in long-term memory, this can lead to complete loss of this knowledge (Mehotcheva 2010: 32).

2.2. The Savings Paradigm

Central to the Savings Paradigm is the issue of accessibility. Originally proposed as a theory to explore and understand forgetting in general, the paradigm was also later applied to language loss and the idea of a possible reactivation of what seems to be forgotten linguistic knowledge. According to the Savings Paradigm, linguistic items and structures have merely become inaccessible in real time as opposed to erased from memory (Nelson 1978). With respect to lexical attrition, for example, subconscious residual linguistic knowledge is said to still remain which should make it easier to relearn words which could neither be recalled nor recognised (but which had been known in the past) than to learn new, previously unknown ones (De Bot & Stoessel 2000). According to the paradigm, and in keeping with Paradis's Activation Threshold Hypothesis, different levels of activation (higher) are needed for recall, meaning that words in the attriting language can be readily produced and/or translated from the dominant language, and recognition (lower),

meaning words from the attriting language can be translated into the non-attriting language or matched with words from the non-attriting language or pictures.

Larson-Hall (2019: 378) argues that lexical attrition pertains not to a loss of lexical items and a terminal dissolution of structures but a weakening and deterioration in connections, as also demonstrated in studies by De Bot & Stoessel (2000) and Hansen *et al.* (2002), in which it emerged that memory traces of vocabulary do indeed exist despite long periods of disuse and claims by the participants that this knowledge had completely dissipated. Instead, it was found that there is a relearning advantage for previously known knowledge compared to the learning of completely new content. See also studies by Taura (2019) and Isurin & Seidel (2015).

3. Study design

Four sessions of testing took place over a period of 13.5 months and were conducted at the University of Cologne. Each participant was tested individually in every session. In each testing session, lexical items were shown in isolation against a white background on a screen. The language of testing was English. A detailed interview was also conducted in the first session. The breakdown of each testing session is presented in Table 1.

Table 1. Breakdown of testing sessions (Geary 2022: 122)

Session 1 Pretest of 200 items	**Session 2 (Two weeks after session 1)**	**Session 3 (Four weeks after session 2)**	**Session 4 (One year after session 3)**
Recall	Relearning	Recall	Relearning
Questionnaire and Interview	Distraction activity	Recognition	Distraction activity
Recognition	Recall		Recall
	Recognition		Recognition

3.1. Session 1

To get a general estimation of amount of retention of lexical items, participants had to take an initial productive and receptive vocabulary test. This also served to filter out words still known to the participants, thereby eliminating them for the savings/relearning testing sessions. 200 words were selected for the test. Most of the items were taken from the compulsory reading, *Peig*, that all participants had read in school in preparation for the Leaving Certificate. Published in 1936, Peig Sayers offers an autobiographical account of her difficult and tragic life on a small island off the south-west coast of Ireland. The remaining items were taken from various other obligatory texts.

A large number of words was used to ensure that enough words would be left over for the relearning phase of testing. The 200 words selected consisted of 50 concrete nouns, 50 abstract nouns, 50 verbs and 50 adjectives, as guided by Hansen *et al.* (2012). Also, since Irish is a noun-centred language, it was decided to have nouns constituting 50% of the words (split evenly between concrete and abstract nouns). Unlike English, which has an SVO (Subject–Verb–Object) word order and is considered to be verb-centred, Irish has a VSO (Verb–Subject–Object) word order and is a noun-centred language. In this respect, it is not uncommon in Irish for actions to be conveyed through the nominalisation of a verb combined with a particular preposition and a support verb. In the case of a verbal noun, whilst describing an action, it is nonetheless deemed nominal in that it behaves like nouns with respect to its morphology and case-marking attributes.

It is also important to note that Irish verbs do not have an infinitive. Instead, the root of the verb as represented in the 2nd person singular imperative is that which offers the basis for further conjugation in the majority of cases. Therefore, in the present study the imperative form was always given, i.e., the verb root, in the listings of the verbs in Irish with the equivalent translation in English given in the infinitive in each case.

A time restraint on responses was not set to give participants time to deal with possible competition from other languages.

Participants were first tested on recall (production). Each of the 200 items was shown individually in English and the participant had to give the Irish equivalent or an appropriate synonym in Irish. Those items successfully recalled were removed from the list before the recognition test. In this

phase, the participants were shown the Irish translations of the remaining words individually and had to offer the English translation or an appropriate synonym in English. The remaining unknown items were then set aside for the subsequent testing sessions on relearning and savings.

The questionnaire and detailed interview were completed between the recall and recognition test. There was no time limitation in completing the questionnaire and answering the interview questions. The questionnaire consisted of questions pertaining to background information which the participants completed in written form on site. The interview questions were presented in printed form which participants answered orally in the presence of two research assistants. The interview was recorded and responses subsequently transcribed. Participants' experiences in learning Irish, including their attitudes regarding the content of the syllabus, the learning situation, and teaching methodologies, constituted key areas of exploration. (See Table 7 for an overview of participant profiles and section 5 for a discussion of the commentary and reflections that the interviews provided.)

The questionnaire and interview questions were partly guided by R.C. Gardner's (1985) Attitude/Motivation Test Battery that focuses on attitudes and motivation in second language learning and Schmid's sociolinguistic questionnaire from her Language Attrition Test Battery (LATB; Schmid, 2005; cf. https://languageattrition.org/). A number of other existing questionnaires used in the domain of acquisition and attrition research, and in explorations of attitudes to Irish specifically, were also consulted (for example, Harris *et al.* 2006; Harris & Murtagh 1999; Mehotcheva 2010; Murtagh 2003; Schmid 2002).

Considering the long incubation period of the present study and that the learning situation had taken place many years previously, a blurring of memory in the intervening years was expected. It was deemed nonetheless important, despite such limitations, to at least derive an overall *impression* of how participants had felt about learning Irish at the time and to offer them the opportunity to explore and reflect on their learning experiences in hindsight. Despite the vulnerability of memory, this "lasting impression" was, nonetheless, considered meaningful and significant.

3.2. Session 2

Session 2 took place two weeks later. In the relearning phase, Irish lexical items from session 1 that the participants did not know were shown with their English translation. Each word-pair was shown in isolation (Irish - English) for 8 seconds (in keeping with De Bot *et al.* 2004). 26 pseudowords each with an English translation were mixed in with the real word pairs. Pseudowords were used instead of real words to ensure that words were used that the participants could not have known. Participants did not know that pseudowords were used.

After a distractor activity of approximately one hour, participants were tested on the words they had just learned; first on recall, then on recognition for the remaining words that they had not been able to recall. The number of words available for relearning could not be determined in advance as it depended on how participants performed in session 1 when items were filtered accordingly. In cases where a large number of words was unknown in session 1, it was decided that no more than 50 of these unknown words would be reused for relearning. In fact De Bot & Stoessel (2000) and Hansen *et al.* (2002) can be criticised for using a very small number of words for relearning as this might have provided participants with a greater opportunity for "learning" (in freeing up cognitive resources) making it difficult to establish whether or not performance was due to a reactivation of previously known items or in fact pure, first-time learning. On the other hand, it was important not to overtax the participants by using too many items for relearning.

3.3. Session 3

Session 3 took place one month later. In this round, all of the words relearned in session 2 (including the pseudowords) were tested; first for recall followed by a recognition test for those remaining words they had not been able to recall. No relearning took place in this session.

3.4. Session 4

As in De Bot *at al.*'s study (2004), the present study also included a second relearning phase and follow-up test to see if re-exposure had an effect on accessibility. This was conducted one year after session 3. The subjects had

not been informed that there would be another testing session one year later and were asked at short notice to participate. The format of session 4 was the same as that of session 2. The order of test items was randomised in each new round of testing, however, to avoid a test effect.

4. Results of lexical item testing and overview of participant profiles

4.1. Results from session 1

Despite not having had contact with the Irish language over a long time period, lexical item knowledge had not been completely erased although results varied across participants. Table 2 shows individual performance on recall and recognition of Irish lexical items in the pretest.

Table 2. Results from session 1 (Geary 2022: 200)

Pretest (200 words-all previously known)	Recall	Recognition	Recalled or recognised	Neither
Enda	145 (72.5%)	49 (24.5%)	194 (97%)	6 (3%)
Ellen	67 (33.5%)	90 (45%)	157 (78.5%)	43 (21.5%)
Brendan	43 (21.5%)	42 (21%)	85 (42.5%)	115 (57.5%)
Cathy	17 (8.5%)	36 (18%)	53 (26.5%)	147 (73.5%)

Since not enough words were left for relearning in Enda's case, he undertook a second pretest at the start of session 2. This time he was presented with a total of 95 words which included 26 pseudowords so as to not trigger any suspicion in the relearning phase when these words appeared again. The difficulty level of the words selected was adjusted to increase the chances that some words would become available for relearning. On careful analysis of the literature and in consultation with a highly proficient L2 speaker of Irish, 69 words that were deemed to be less frequent were selected. The results are shown in Table 3.

Table 3. Results from second pretest – Enda only (Geary 2022: 164)

Second pretest (95 items)	Recall	Recognition	Recalled or recognised	Neither
69 real, previously known words	17 (25%)	27 (39%)	44 (64%)	25 (36%)
26 pseudo-words	0	0	0	0

4.2. Results from session 2 – after relearning

Table 4. Participant performance after relearning – Session 2 (Geary 2022: 202)

Session 2b - Enda				
Relearning (51 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
25 real, previously known words	17 (68%)	8 (32%)	25 (100%)	0
26 pseudo-words	4 (15%)	5 (19%)	9 (35%)	17 (65%)
Session 2 - Ellen				
Relearning (69 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
43 real, previously known words	21 (49%)	5 (12%)	26 (61%)	17 (39%)
26 pseudo-words	1 (4 %)	0	1 (4 %)	25 (96%)
Session 2 - Brendan				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	30 (60%)	9 (18%)	39 (78%)	11 (22%)
26 pseudo-words	0	0	0	26 (100%)

Session 2 - Cathy				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	27 (54%)	6 (12%)	33 (66%)	17 (34%)
26 pseudo-words	0	2 (8%)	2 (8%)	24 (92%)

There was a clear relearning advantage in all cases for previously known words compared to pseudowords lending support to the Savings Paradigm. The detailed results are presented in Table 4.

With respect to the real, previously known words, considering that each of the participants not only had different *items* in the relearning session but also, apart from Brendan and Cathy, a different *number* of words, the candidates cannot be compared in terms of relative performance since it is anticipated that those with more items to relearn would have had a greater cognitive load to process.

Despite this divergence, some general observations can, nonetheless, be made. While Enda was able to recall or recognise all of the real words, one could argue that he had a certain advantage compared to the other participants in that he had fewer words to relearn and, thus, less of a cognitive load. The question also arises whether Enda employed effective learning strategies or whether it was indeed a case of reactivation prompted by re-exposure. That he also managed to recall or recognise approximately one third of the pseudowords lends support to the suggestion that he, despite having more ready access to previously known items due to lower threshold levels, may also avail of certain strategies to promote successful learning.

While Ellen had seven fewer real items than Brendan and Cathy to relearn, it is interesting to look at performance across these three participants. Brendan, who had recalled or recognised 42% of previously known items in the pretest compared to 78.5% for Ellen, was able to recall or recognise 78% after relearning in round 2, compared to 61% for Ellen, even though he had more items to relearn. Cathy, who likewise had more items to relearn than Ellen, was also more successful in the subsequent test even though she had

only been able to recall or recognise 26% of previously known items in the pretest.

However, the question of whether some participants availed of more effective learning strategies needs to be treated with caution considering that each had different words for relearning. It could be that some items were more easily relearned because their threshold level in the mental lexicon was lower, thereby making them more readily accessible on re-exposure.

4.3 Results from session 3 – no relearning

Table 5. Participant performance in session 3 (Geary 2022: 205)

Session 3 - Enda				
Relearning (51 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
25 real, previously known words	4 (16%)	12 (48%)	16 (64%)	9 (36%)
26 pseudo-words	0	2 (8%)	2 (8%)	24 (92%)
Session 3 - Ellen				
Relearning (69 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
43 real, previously known words	19 (44%)	9 (21%)	28 (65%)	15 (35%)
26 pseudo-words	1 (4%)	1 (4 %)	2 (8 %)	24 (92%)
Session 3 - Brendan				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	9 (18%)	16 (32%)	25 (50%)	25 (50%)
26 pseudo-words	0	0	0	26 (100%)

Session 3 - Cathy				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	5 (10%)	17 (34%)	22 (44%)	28 (56%)
26 pseudo-words	0	2 (8%)	2 (8%)	24 (92%)

With respect to the real items, apart from Ellen (whose performance improved slightly), the participants demonstrated a weaker performance in session 3 when no relearning took place (cf. Table 5). Overall performance appears to provide support for the Activation Threshold Hypothesis, whereby once an item is activated through re-exposure (e.g., in the case of relearning in session 2) its threshold is lowered only to rise again in the absence of contact with the language as appears to have happened in the interlude of one month between testing in session 2 and session 3.

4.4 Results from session 4 – after relearning

Table 6. Participant performance after relearning – Session 4 (Geary 2022: 210)

Session 4 - Enda				
Relearning (51 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
25 real, previously known words	18 (72%)	5 (20%)	23 (92%)	2 (8%)
26 pseudo-words	5 (19%)	8 (31%)	13 (50%)	13 (50%)
Session 4 - Ellen				
Relearning (69 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
43 real, previously known words	28 (65%)	5 (12%)	33 (77%)	10 (23%)
26 pseudo-words	1 (4%)	1 (4%)	2 (8%)	24 (92%)

Session 4 - Brendan				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	29 (58%)	8 (16%)	37 (74%)	13 (26%)
26 pseudo-words	1 (4%)	1 (4%)	2 (8%)	24 (92%)
Session 4 - Cathy				
Relearning (76 items)	**Recall**	**Recognition**	**Recalled or recognised**	**Neither**
50 real, previously known words	27 (54%)	10 (20%)	37 (74%)	13 (26%)
26 pseudo-words	0	2 (8%)	2 (8%)	24 (92%)

In looking at performance across sessions 2, 3 and 4, overall threshold levels rise again when there is no activation (as depicted in results for session 3) and drop on re-exposure (as depicted in results for session 4 in Table 6), in keeping with Paradis's Activation Threshold Hypothesis.

In support of savings and the corresponding assertion that there is a relearning advantage for items that had become more strongly consolidated in memory, all participants succeeded in recalling or recognising considerably more of the real words than pseudowords, demonstrating that re-exposure stimulates ease of retrievability. Words that appeared to have been forgotten over time can be reactivated again on re-exposure.

4.5 Cross-linguistic influence

Failure to successfully recognise or recall the pseudowords in this study was seen as first and foremost to result from their *novelty*, meaning that they had not been accessed enough to leave a trace in memory. It was not considered to be due primarily to cross-linguistic effects stemming from the co-existence of English and German in the linguistic system; otherwise, it would be expected that more difficulties would also have emerged in accessing the previously known words too.

4.6. Summary of observations

Based on the above results and analysis, the following patterns emerged:

1. Evidence of retention of lexical items after an average incubation period of approximately 30 years was established but this varied greatly across participants.
2. Subsequent relearning and testing provide support for the Savings Paradigm.
3. Re-exposure in the form of relearning appears to cause activation threshold levels to drop overall, with these rising again in periods of disuse.

Table 7. Overview of participant profiles (Geary 2022: 222)

	Enda	**Ellen**	**Brendan**	**Cathy**
Percentage of items retained	97%	78,5%	42%	26%
Language Distance	Irish-English	Irish-English	Irish-English	Irish-English
Age at start of learning	4 years and 2 months	4 years and 1 month	5 years and 2 months	10 years and 2 months
Age at onset of attrition	19 years old	18 years old	18 years old	18 years old
Length of learning	15 years	14 years	13 years	8 years
Proficiency level at onset of incubation	Leaving Certificate: Grade **B** in **higher level paper** plus one year at university (exact grade unavailable)	Leaving Certificate: Grade **B** in **higher level paper**	Leaving Certificate: Grade **B** in **lower level paper**	Leaving Certificate: Grade **D** in **higher level paper**
Exposure and learning context	Predominantly in education, intermittent input in home/community	School	School	School
Length of period of disuse	30 years	31 years	33 years	28 years
Rehearsal during incubation	Intermittent (Receptive: listening to Irish-language radio)	No	No	No

Motivation	*	*	*	*
Other language/s at school and grade in Leaving Certificate	French: Awarded a grade A in higher level paper	French: Awarded a grade A in higher level paper	French: Awarded a grade B in higher level paper Latin: Awarded a grade C in higher level paper	German: Awarded a grade A in higher level paper French: Awarded a grade C in higher level paper
Current languages other than English	German: fluent (CEFR: C2) French: CEFR: C1 (teaches French at Gymnasium)	German: very good (B2)	German: fluent (CEFR: C2)	German: fluent (CEFR: C2)

**Unquantifiable but discussed in section 5*

5. Discussion

This study has served as an important confirmation of the Savings Paradigm on which, apart from a small number of studies, little research has been conducted. Whilst vast amounts of Irish linguistic knowledge appeared to have attrited in the 27 to 32 years of incubation for the participants in this study during which they, apart from one, had no active engagement or contact with the language, evidence of lexical information that was still intact was found on re-exposure to selected items in the form of relearning. This suggests that the issue is not one of loss per se but of difficulty in accessing information. On subsequent testing, participants scored significantly better in recall and recognition tests of words previously known but forgotten during incubation compared to newly learned words in the guise of pseudowords which they encountered for the first time in the testing sessions. It was also explored whether scores on the pretest could predict scores on subsequent tests after relearning, although this was only a tentative observation since each participant was tested on their own individual set and number of words as dictated by performance in the pretest. It was, nonetheless, observed that those two participants who scored lowest in the pretest gained ground in relearning, clearly benefitting from the effects of re-exposure.

The divergent range of scores that emerged across participants in the pretest despite certain similarities in their learning histories and length of incubation is notable but not surprising. In the case of each individual, the factors typically put forward in attrition research interact to differing degrees (for an overview, see Table 7). For example, Cathy, who started learning Irish later than the other three participants, had, therefore, a shorter length of learning, also achieving a lower grade than the other two participants who took the higher-level Leaving Certificate exam. On the other hand, the fact that she only started learning in 5th grade in primary school (age 10) but proceeded, nonetheless, to study the higher-level curriculum suggests high motivation on her part. Claiming that this was instrumental in nature, it was strong enough to propel her forward in pursuing the academically more demanding level.

Indeed, proficiency at onset of attrition seems to be a significant indicator of attrition levels. Interestingly, higher proficiency is also not completely independent of motivation and whilst motivation is dynamic and fluid, it emerged in the interviews that the two strongest cases in terms of initial proficiency also showed a greater interest in learning Irish at school due to a stronger identification with the cultural and historical value of the language.

Sociolinguistic factors seem to play a decisive role in understanding attrition of minority languages that have been learned in an instruction setting. Variables such as status of the language, content of curriculum, approaches to teaching, learner attitudes and motivation and context and frequency of language use are interrelated and aid in predicting degrees of long-term engagement with the language, which can have significant psycholinguistic repercussions with respect to storage of that language in the linguistic system and corresponding activation thresholds (Geary 2022).

5.1. The significance of the language learning experience

In fact, Pan & Berko-Gleason (1986: 193) highlight the importance of examining not just language loss itself but also critically inspecting the pedagogical approaches that had been employed in the teaching of that language previously to see if particular approaches hasten and induce more loss than others. Language environment was also among the influential

factors isolated by Weltens & Grendel (1993: 148) in accounting for variation in results on lexical attrition. Murtagh (2003) also observed that learning environment played a decisive role not just in proficiency outcome but in levels of knowledge retention of Irish exhibited in testing 18 months after official instruction had ended.

Mehotcheva & Mytara (2019: 359) argue, nonetheless, that context of learning is an area largely underexplored in attrition research and that qualitative analysis has the potential to yield interesting insights into attrition trajectories. In the present study, not only context but also a experience of learning, therefore, constituted a central focus.

Indeed, in the present study, negative attitudes with respect to how the language was taught as opposed to any unfavourable attitudes towards the language itself appeared to feed into motivation and its role in possibly impacting long-term knowledge retention. All participants expressed frustration with respect to how the Irish language was taught, especially in secondary school. They argued that there was too much focus on grammar and drills and on a literary canon that was outdated and antiquated and unappealing to the youth of the day with little opportunity to engage in communicative activities. As also stated in the interviews, standards and expectations were very high in Irish and this might also have led to demotivation among learners. This is in keeping with Dornyei (1994a: 276) who stated that in an education context, students' intrinsic interest can be overridden by extrinsic demands whereby initial engagement with learning and learner enjoyment is transformed due to external pressures.

In a survey published by Li et al. (2017) in which they explored attitudes to learning Irish in the current-day school system, the overriding opinion did not deviate greatly from that reported by the participants in this study. Current-day learners still lament the time invested in reading and literary engagement but paradoxically emphasise the importance of the language with respect to the identity of the nation. The participants in a study by Harris & Murtagh (1999) also experienced Irish lessons as "boring, old-fashioned and repetitious" expressing lower motivation in terms of "commitment to learning Irish" despite recognising the symbolic value of the language (cited in Harris *et al.* 2006: 7), sentiments similar to those expressed by the participants in this study.

Indeed, the two participants in the present study who voiced the greatest discontent and criticism of how Irish was taught at school were those who demonstrated lower levels of proficiency as indicated by their Leaving Certificate results and who also exhibited lower levels of retention in the pretest (see Table 7). These were also the participants who claimed that they were predominantly driven by instrumental motivation in learning Irish. This is in line with findings from other surveys and studies conducted on attitudes and motivations in learning Irish in which it was reported that instrumental motivation constitutes the main driving force among learners of Irish in school (Darmody & Daly 2015; Murtagh 2007; Li et al. 2017).

5.2 Minority languages and cultural identity

Most of the literature on motivation, however, is dominated by the teaching of L2 English and other modern foreign languages. Motivations in learning Irish are unique to its status as a minority language with no exclusively monolingual L1 speakers of Irish and only a relatively small number of Irish speaking communities on the island.

Indeed, it emerged in the responses of the participants in this study, that motivation driven by an identification with the language and an appreciation of its cultural significance might be a predictor of long-term retention. This was expressed by the two candidates who had achieved higher grades in the Leaving Certificate and who demonstrated greater levels of knowledge retention in the pretest. This identification may be critical when it comes to learning a minority language because in internalizing the cultural value of the language, learners might commit more to the learning process and in doing so be prompted to engage more regularly with the language, thereby not only leading to higher proficiency levels in the short-term but also fortifying its storage in long-term memory.

In their study of adults learning Irish as an L2/FL, Flynn & Harris (2016) also found that cultural identity and an appreciation of heritage emerged as key motivators among these learners who had undertaken the language course by choice. Flynn & Harris refer to this as a socio-cultural motivating factor which is based on "the learner's cultural background, linguistic heritage and personal identity", a factor they argue warrants greater attention and one

that is hardly reported on in the literature on L2 learning motivation (2016: 381).

The question arises why participants in the present study differed with respect to the degree to which they internalised this identification, considering that all followed the same Irish curriculum and all appeared interested in language learning in general. In examining the profiles of the participants, the geographical location where they grew up and attended school might be a decisive factor along with their experiences in the Irish language classroom. While Cathy and Brendan grew up on the island's east coast, Enda and Ellen lived in the south-west region where traditionally more Irish was spoken and present in everyday life. This may have led to a more heightened sense of the importance of the language and possibly a more positive attitude toward the language in general despite the lack of enthusiasm experienced at times in the school context. Harris *et al.* (2006: 5) also refer to research that found a relation between region/location where school was attended and proficiency attained in Irish. It was found that pupils from the south-west of the island reached the highest levels of Irish language proficiency overall with learners in Dublin and surrounding areas demonstrating lower proficiency levels (where Cathy and Brendan attended school).

5.3. The individual nature of attrition: a dynamic interplay of influencing factors

As the above has demonstrated and as stated by Larson-Hall (2019: 388), problems in lexical item retrieval cannot be explained according to one simple account. Mehotcheva & Mytara (2019: 352) argue that a number of variables interrelate to varying degrees over time in determining severity of attrition. They refer to De Bot (2007) who pointed to the individual nature of the process with much variability in retention levels even across individuals who learned and attrited under similar conditions, as was also the case in this study.

Mehotcheva & Mytara (2019: 352), therefore, in keeping with De Bot's proposal, suggest adopting a dynamic systems perspective, according to which the process of attrition is understood as resulting from the interplay of a number of different variables within an overall fluctuating system. The

present study also considers variables as operating in such clusters rather than as encapsulated, isolated entities, whereby the relative influence of each variable can change over time. This changing constellation and the varying strength of different factors as well as their mutual influence within a cluster, is distinctly unique to each learner and attriter, thereby complicating the exploration of attrition.

6. Conclusion

It is argued in this paper that if linguistic information has the chance to become properly consolidated in memory, then whilst difficulties in access arise due to long periods of disuse and inactivation of this knowledge, whereby simultaneously competing languages become more readily available for selection, this knowledge remains available nonetheless and through re-exposure and the right cues can become accessible again.

Understanding language loss has important implications for the L2/FL education domain and pedagogy. Therefore, an important consideration in language learning in the first place is how best to support the entrenchment of linguistic information in memory, highlighting the necessity of examining learning processes and educational approaches to teaching languages, and in particular, as in the case of this paper, minority languages. In exploring possibilities to stave off attrition, the learning context and the social status of the individual language consequently warrant careful exploration. It is important in education that efforts are made to motivate pupils and awaken in them a positive connection to the language to increase chances of a continued interest in maintaining and even developing knowledge of the language after official instruction has ceased. N

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