WHEN DO DIALECTS BECOME LANGUAGES?
A COGNITIVE PERSPECTIVE

A thesis submitted for the degree of Doctor of Philosophy (PhD)

by

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Contents

ABSTRACT

Several definitions exist that offer to identify the boundaries between languages and dialects, yet these distinctions are inconsistent and are often as political as they are linguistic (Chambers & Trudgill, 1998). A different perspective is offered in this thesis, by investigating how closely related linguistic varieties are represented in the brain and whether they engender similar cognitive effects as is often reported for bilingual speakers of recognised independent languages, based on the principles of Green's (1998) model of bilingual language control.

Study 1 investigated whether bidialectal speakers exhibit similar benefits in non-linguistic inhibitory control as a result of the maintenance and use of two dialects, as has been proposed for bilinguals who regularly employ inhibitory control mechanisms, in order to suppress one language while speaking the other. The results revealed virtually identical performance across all monolingual, bidialectal and bilingual participant groups, thereby not just failing to find a cognitive control advantage in bidialectal speakers over monodialectals/monolinguals, but also in bilinguals; adding to a growing body of evidence which challenges this bilingual advantage in non-linguistic inhibitory control. **Study 2** investigated the cognitive representation of dialects using an adaptation of a Language Switching Paradigm to determine if the effort required to switch between dialects is similar to the effort required to switch between languages. The results closely replicated what is typically shown for bilinguals: Bidialectal speakers exhibited a symmetrical switch cost like balanced bilinguals while monodialectal speakers, who were taught to use the dialect words before the experiment, showed the asymmetrical switch cost typically displayed by second language learners. These findings augment Green's (1998) model by suggesting that words from different dialects are also tagged in the mental lexicon, just like words from different languages, and as a consequence, it takes cognitive effort to switch between these mental settings. **Study 3** explored an additional explanation for language switching costs by investigating whether changes in articulatory settings when switching between different linguistic varieties could - at least in part – be responsible for these previously reported switching costs. Using a paradigm which required participants to switch between using different articulatory settings, e.g. glottal stops/aspirated /t/ and whispers/normal phonation, the results also demonstrated the presence of switch costs, suggesting that switching between linguistic varieties has a motor task-switching component which is independent of representations in the mental lexicon. Finally, **Study 4** investigated how much exposure is needed to be able to distinguish between different varieties using two novel language categorisation tasks which compared German vs Russian cognates, and Standard Scottish English vs Dundonian Scots cognates. The results showed that even a small amount of exposure (i.e. a couple of days' worth) is required to enable listeners to distinguish between different languages, dialects or accents based on general phonetic and phonological characteristics, suggesting that the general sound template of a language variety can be represented before exact lexical representations have been formed.

Overall, these results show that bidialectal use of typologically closely related linguistic varieties employs similar cognitive mechanisms as bilingual language use. This thesis is the first to explore the cognitive representations and mechanisms that underpin the use of typologically closely related varieties. It offers a few novel insights and serves as the starting point for a research agenda that can yield a more fine-grained understanding of the cognitive mechanisms that may operate when speakers use closely related varieties. In doing so, it urges caution when making assumptions about differences in the mechanisms used by individuals commonly categorised as monolinguals, to avoid potentially confounding any comparisons made with bilinguals.

Chapter 1: General Introduction – When Do Dialects Become Languages?

When Do Dialects Become Languages?

The phrase "a language is a dialect with an army and a navy" - first popularised by the linguist Max Weinrich – highlights the often murky political territory that surrounds the classifications of certain language varieties. Language is an integral part of what makes us human and the varieties of language and the differences between them shape the identity of people, nations and cultures (Gleason 2001; Harley, 2008). A less political classification of varieties into languages or dialects is often determined by the degree of mutual intelligibility between interlocutors: if speakers of two separate language varieties can understand each other at a functional level without either having to learn the others' variety, then they are considered to be speaking dialects of the same language; if they cannot understand each other, then they are speaking two separate languages (Lewis, 2009; Trudgill, 2000; Wardhaugh, 1999). This may seem like a reasonable distinction; however, when applied to languages and dialects throughout the world, it is not one which can withstand scrutiny.

The boundaries between languages (and dialects) cannot be fully determined in terms of their structural differences or mutual comprehensibility when, for example, speakers of different Scandinavian languages, like Norwegian and Danish, are able to understand each other to a great extent, whereas Cantonese and Mandarin, both considered dialects of Chinese, are not mutually intelligible at all (Siegel, 2010). Similarly, a problem faced when categorising languages and dialects is that varieties may exist on a continuum with increasing amounts of linguistic distance, such that neighbouring varieties have a large amount of lexical overlap, but varieties which lie further apart on the continuum cease to be mutually intelligible. Chambers and Trudgill (1998) outline this with regards to geographical proximity, providing the example of a rural traveller journeying from village to village in a straight line encountering noticeable linguistic differences along the way[1]. Some differences may be smaller, some are larger, but importantly the effects are cumulative so that varieties at the outer edges of the continuum are not mutually intelligible (although they might not necessarily be considered different languages) yet are linked by a chain of mutual intelligibility as outlined in Figure 1.1.

Several dialect continua of mutual intelligibility exist in Europe; for example, the West Romance dialect continuum contains the standard languages of French, Italian, Spanish and Portuguese (which are not all mutually intelligible) whereas dialects of these languages form a chain which stretches from the coast of Portugal to the centre of Belgium (Chambers & Trudgill, 1998). The prominence of certain standard varieties is also one factor which can lead to the concept of asymmetric intelligibility. Standard languages can often be understood by speakers of regional varieties whereas these regional varieties are not understood by speakers of the standard (e.g. Geordie English speakers may understand Standard English Received Pronunciation perfectly, whereas the same may not be true in reverse); however, this can also hold true for autonomous languages, for example, Swedish and Danish, where Danish speakers can understand Swedish more clearly than Swedish speakers understand Danish (see: Impe, Geeraerts, & Speelman, 2008; Moberg, Gooskens, Nerbonne, & Vaillette, 2006).

[1] This concept has been quantified by Nerbonne and Heeringa (2001) showing that (logarithmic) geographical distance accounts for around 81% of the variability in phonology of dialects in the Netherlands.

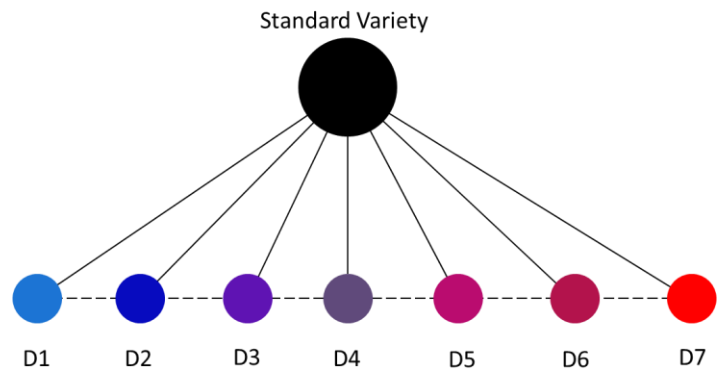

Figure 1.1. Figure outlining an illustration of Chamber and Trudgill's (1998) dialect continuum. Each dialect is intelligible with its neighbouring varieties, as well as having asymmetric intelligibility with the Standard Variety. However, dialects at opposite ends of the continuum are separated by a large amount of linguistic difference and are no longer mutually intelligible.

Even aside from the debate as to which specific language varieties are considered dialects or languages, the term "dialect" itself is one which is often given different definitions. "Dialect" and "accent" are sometimes used interchangeably (see: Chambers & Trudgill, 1998), although Trudgill (2000) points out that the term "dialect" refers to language styles which differ in terms of vocabulary, grammar and pronunciation, whereas "accent" refers exclusively to differences in pronunciation. Siegel (2010) provides a similar sociolinguistic definition with the added provision that dialects tend to be associated with particular geographical regions (e.g. Cockney English; Bavarian German) or social groups (e.g. African American English), can be considered unstandardised or uncodified, and are often not used in formal writing or taught in schools[2]; whereas languages are those varieties which are codified in dictionaries, are used in published expository writing and are formally used in education. Siegel (2010) makes another important distinction when trying to define the

[2] Although again, this is not universal with, for example, Norwegian's Bokmål and Nynorsk dialects both formally used in education (see: Vangsnes, Söderlund, & Blekesaune, 2015).

term “dialect” – namely, whether two varieties are considered belonging to the same language depends not on the technical decision made by linguists, but is based upon the common perceptions of the speakers of these varieties. This is an important distinction that will be addressed again in **Chapter 2**, in relation to the attitudes and perceptions that speakers of specific language varieties in Scotland hold with regards to their native varieties.

Thus, it appears that the definitions of what constitutes a language and what constitutes a dialect are inconsistent and no universally accepted definition exists. Chambers and Trudgill (1998) state that the factors which dictate the classification of varieties into languages (or dialects) are as political, geographical, historical, sociological, and cultural as they are linguistic. However, missing from this list is an entirely different domain which might offer an insight into the qualitative differences (or indeed the similarities) between dialects and languages: the perspective offered by studying human cognition.

The Cognitive Perspective

While linguistic and sociolinguistic definitions of dialect and language have been inconsistent; cognitive psychology can provide evidence of how different languages are mentally represented. Over the past few decades, a wealth of research has explored the cognitive processes involved in maintaining more than one language, and examined the differences between the monolingual and bilingual (or multilingual[3]) brain. The earliest

[3] While there are several studies in this field which include multilinguals (e.g. Costa & Santesteban, 2004; de Bruin, Roelofs, Dijkstra, & FitzPatrick, 2014) the majority of research is focussed on bilinguals rather than multilinguals. This is a problem which De Bot (2004) acknowledges as a limitation in a field which restricts

research in this area tended to be conducted from the perspective that bilingualism was detrimental, especially for children in the education system (see: Bialystok & Craik, 2010; Bialystok, Craik, Green, & Gollan, 2009). This notion started to change, however, from around the 1960s onwards, with Peal and Lambert (1962) showing that, when bilinguals and monolinguals were matched on a series of variables (such as age, language proficiency and socioeconomic status (SES)) and tested on measures that were sensitive towards the languages being used by the participants, bilinguals were able to outperform their monolingual peers on a variety of different measures of intelligence. With this evidence that bilingualism was an *additive* experience and not one which was necessarily detrimental to the individual, this research area grew considerably; although, as will be discussed at various points in this thesis, some supposed benefits of bilingualism have been strongly contested in recent years (Bialystok, 2015; Paap, Johnson, & Sawi, 2015). A considerable amount of research has been conducted to investigate how language is stored in the monolingual brain, upon which several models of bilingual language representation have been built. These models can potentially offer an insight into the differences between dialects and languages, and determine whether there are observable cognitive differences between monolinguals, bidialectals and bilinguals.

Language Representation

Most models of bilingual language representation have their foundations in the models proposed for monolingual language representation. Models of language representation and lexical access in monolinguals commonly show at least three distinct levels involved in

itself to the study of two languages and assumes the same findings must hold true for multilingual language representation.

speech production (for comprehensive descriptions see: Levelt, 1989; Levelt, 1993; and Levelt, Roeloffs & Meyer, 1999) although there are debates as to the exact number of stages of processing, whether there is any interaction between different levels of representation and the extent of interference from non-target words during lexical access. Costa, Colomé and Caramazza (2000) provide a description of these steps in relation to the relatively simple process of picture naming: the first level, the conceptual level, is where a picture is recognised and its semantic representation is activated (e.g. *dog*). At this level, it is assumed that not only is the target representation activated, but other related representations are also activated (e.g. *cat,* as they have similar semantic representations as four-legged animals which are kept as pets). Next, at the lexical level, the target lexical node (word) corresponding to the semantic representation is selected (i.e. the label "dog" has to be selected from amongst others such as "cat" or "fox")[4].

Finally, at the phonological level the individual phonological components (e.g. /d/, /ɒ/, and /g/) are selected for production, before activating the articulatory mechanisms involved in speech. There are two different viewpoints, however, as to whether the spread of activation of non-target items (e.g. "cat" in the previous scenario) extends to the phonological level. According to the serial view of lexical access (Levelt, 1989), only the semantic and lexical levels are activated whereas cascaded activation models (e.g. Caramazza, 1997) posit that phonological segments are also activated in the non-target lexical nodes (such that "dog" would also activate the phonological components: /k/, /a/, /t/). Also debated in different models is whether there exists a single lexical level, or whether this is split into multiple levels. In bilinguals, the presence of two lexicons adds an

[4] This target lexical node is the one with the greatest amount of activation and although this *usually* corresponds to the concept the speakers wants to convey, sometimes a semantic error can occur (e.g. "cat" receives more activation and thus is selected over "dog").

additional dimension: does activation spread from the semantic system to both languages without any restriction, and if so, how does the bilingual speaker select from competing lexical nodes (e.g. English “dog” and German “Hund”) which may both be highly activated?

Bilingual Language Representation

Despite the potential problems that unrestricted activation of both languages could cause in everyday communication, bilinguals experience relatively few cross-language intrusions, both in spontaneous speech and in laboratory settings (Gollan, Sandoval, & Salmon, 2011). Several early studies (e.g. Penfield & Roberts, as cited in Green, 1998) attempted to explain how a bilingual speaker controls their languages by suggesting the concept of a mental “switch” (see also: Costa, Colomé & Caramazza, 2000). In essence, this switch would turn off (and back on) the flow of activation from the semantic system entirely, preventing the activation of lexical nodes not categorised as being part of the target language meaning, as a result, a bilingual speaker would only ever have one lexicon activated at a given time. However, this concept failed to account for a bilingual’s ability to translate between languages, and how effortlessly some bilinguals can intentionally codeswitch or mix languages within a sentence; nor did it explain the presence of cross-language intrusions. McNamara and Kushnir (1972) proposed a solution to this problem by introducing the notion of separate switches for input and output although, while this concept was an appealing and intuitive one, it did not remain unchallenged theoretically or empirically (Green, 1998).

More recent models, however, propose that the activation from the semantic system does in fact activate lexical nodes from both languages and there are several studies which have shown that a bilingual's two lexicons are always active during comprehension even when in a monolingual setting (e.g. Crinion, et. al, 2006; Kaushanskaya & Marian, 2007; Marian, Spivey & Hirsch, 2003; Poarch & Van Hell, 2012). Spivey and Marian (1999) showed that when Russian-English bilinguals participated in a study which was conducted entirely in a monolingual setting (i.e. either in English or in Russian) their other language remained active and available, and provided some interference during speech production. In their study, Spivey and Marian (1999) used a visual world paradigm (see: Huettig, Rommers & Meyer, 2011, for a comprehensive review) in which participants were positioned in front of a whiteboard divided into nine squares, with four objects present in the corner squares and a fixation cross present in the middle square. Some of the objects were (unbeknownst to the participants) deliberately presented in pairs as they were items which contained interlingual distractors between the languages (e.g. marker and stamp, where "marka" is the Russian word for stamp; and shark and balloon, where "sharik" is the Russian word for balloon). Participants eye movements were recorded while they were given instructions such as "put the marker below the cross". The results showed that, for example, a participant would first of all look at the stamp ("marka") around the 200ms mark of the production of "marker" before looking at the marker, picking it up, and placing it under the cross. While the participant may not have been aware of the focus of their attention, Spivey and Marian (1999) concluded that this demonstrated the parallel activation of both languages, even in a context that only required the use of one.

As opposed to speech *comprehension*, which is an automatic process dictated by the type of speech produced by others, a bilingual has a relatively greater amount of conscious control over their speech *production* as they determine which variety they intend to speak in (see: Costa, Colomé, & Caramazza, 2000 for a comprehensive review of theories of speech production). Several models have been proposed to explain these processes (see: Kroll & Stewart's (1994) Revised Hierarchical Model; and the BIA/BIA+ models (e.g. Dijkstra & Van Heuven, 2002; Dijkstra, Van Heuven, & Grainger, 1998;)) however, the most prominent model used to explain how a bilingual successfully manages their two lexicons is outlined by Green (1998) in his Inhibitory Control Model[5].

<u>The Inhibitory Control Model</u>

Green's (1998) Inhibitory Control (IC) Model is one of the most influential models of bilingual language representation to have been proposed in the past couple of decades. The principles underlying this model have been invoked to explain one of the most widely disseminated, and recently most contested, bilingual advantages: that of the bilingual advantage in non-linguistic inhibitory control (see evidence from: Bialystok, 2009; Bialystok & Craik, 2010; Bialystok, Craik, Klein & Viswanathan, 2004; Schroeder & Marian, 2012; but opposing viewpoints from de Bruin, Bak & Della Sala, 2015; Paap, Johnson, & Sawi, 2015;). The principal components assumptions and predictions of Green's (1998) model are as follows:

[5] Most of the work in the experimental chapters of this thesis was inspired by the principles of the Inhibitory Control Model; therefore this model is given prime focus in this Introductory Chapter. Other models will be referred to in the experimental chapters and discussion sections as appropriate. Green's (1998) model builds upon the principles of Kroll and Stewart's (1994) model, thus, in terms of explaining differences between monolinguals and bilinguals it may supersede Kroll & Stewart's (1994) model. To empirically test the BIA/BIA+ models, experiments utilising orthographic presentations are often used rendering this model unsuitable for testing dialect language representation since many dialects (including those contained within this thesis) primarily exist in an oral form, with any orthographical representation likely to be unstandardised.

Mechanisms of the Inhibitory Control Model:

The main components of Green's (1998) model are outlined in Figure 1.2.

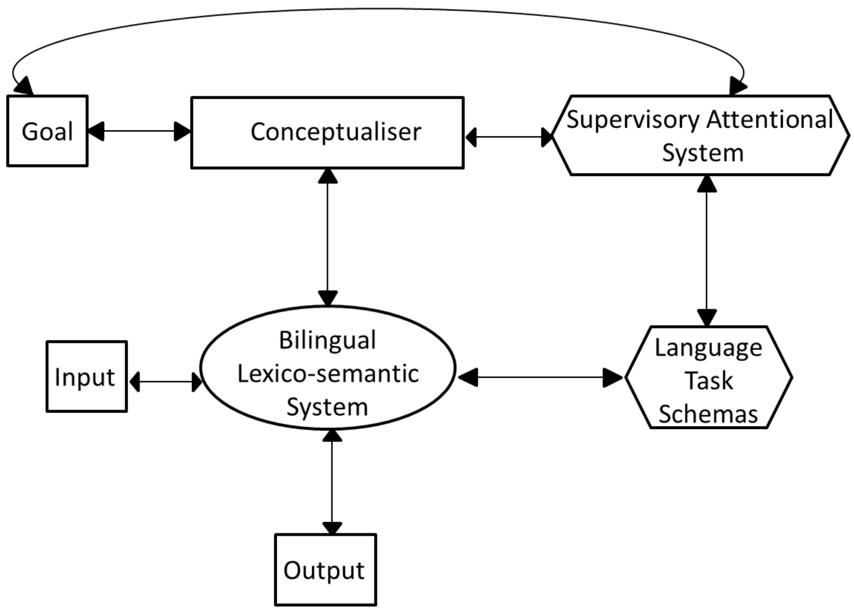

Figure 1.2: An illustration of Green's (1998) Inhibitory Control model, displaying the components involved in regulating the bilingual lexico-semantic system.

The principle components consist of:

1) The Conceptualiser:

   This component is where conceptual representations reside. When a bilingual's goal is to express a target concept, the lexical items residing in the Bilingual Lexico-semantic System which correspond with these concepts are activated and are competing to be selected for output.

2) The Supervisory Attentional System (SAS):

   The SAS is a system which is proposed to be external to the linguistic domain, controlling multiple processes involved in many different aspects of attention. The SAS is involved with the construction and modification of schemas and monitors their performance with respect to the individual's goal. With regards to bilingual language control, when the bilingual's goal is to produce output in a target variety, this system is used to employ language task schemas which inhibit the selection of items from the non-target language.

3) Language Task Schemas (LTS):

   Language Task Schemas are activated by the SAS and regulate the output from the lexico-semantic system. This is achieved by altering the activation of representations within the lexico-semantic system, and by inhibiting the production of output of items with incorrect tags. The LTS remains active until either: its goal is achieved and therefore it inhibits its own activity; until another language task schema is employed, inhibiting the previous LTS; or until the SAS changes the intended goal entirely.

4) The Bilingual Lexico-semantic System:

   This is where lexical items are stored and is similar to the lemma and lexeme levels proposed by Levelt, Roelofs and Meyer (1999). Green (1998) proposes that information about which language an item belongs to is stored at the lemma level and takes the form of a "language tag". Depending on the specific language task schema employed by the SAS, these lemmas are either suppressed or remain activated in order to be selected for production.

Predictions of the Inhibitory Control Model:

The main assumptions and predictions of Green's (1998) Inhibitory Control model are:

1) A bilingual's lexicons are always active and are competing to control output.

2) Therefore, in order to successfully produce an utterance in the desired language, a level of control (residing in the SAS) responds to this goal by utilising the use of language task schemas to ultimately control which language is selected for output.

3) Word selection happens at the lemma level[6] (i.e. lemmas contain information about which language an item is tagged as belonging to) and these language task schemas inhibit the activation all the items associated with a given language tag.

4) Finally, this control at the lemma level is inhibitory and reactive.

To elaborate on this further, Green's (1998) proposals suggest that a bilingual's languages share conceptual representations and both lexical representations of an item are competing

[6] This is keeping in line with Levelt, Roelofs & Meyer's (1999) description that lemmas are packages of syntactic information, with one for each lexical representation.

for output. These items are individually tagged in the Bilingual Lexico-Semantic System as belonging to the L1 or L2; for example, “dog” is tagged as English, “Hund” as German. When the bilingual wants to communicate using the L1 (i.e. English) they have to employ the use of a (specific) language task schema in order suppress the language tags associated with the L2 (i.e. German). This inhibits the activation of all the items which are tagged as belonging to that variety, hence selection of the L1 lexical item can take place and it is then produced for output.

This model suggests that the degree of inhibition required is proportional to the strength of representation of that variety (i.e. the more proficient a bilingual is in one language, the more highly activated that language will be and thus the more effort will be required to suppress it). For example, an English-German bilingual whose dominant language is English, and thus whose English lexicon will be more highly activated, will require a greater level of inhibitory control in order to employ the language task schema involved in inhibiting all items containing an L1 tag. This suggests that the amount of inhibition required to suppress either variety is not equal for bilinguals who are not equally proficient in both languages (i.e. unbalanced bilinguals) and empirical evidence for this model has been demonstrated by Meuter and Allport (1999) amongst others.

Evidence for Green’s (1998) Inhibitory Control Model

Using a language switching paradigm, Meuter and Allport (1999) asked participants to name digits in either their dominant L1 or their weaker L2, depending on the colour cue associated with the digit. Meuter and Allport (1999) found that there was a switching cost associated with switching between languages: trials which involved a switch from one language to the other took longer than trials which required a participant to continue using the same language as was used in the preceding trial. Moreover, these switching costs were asymmetrical, with the cost associated for switching to the more dominant L1 being larger than for switching to the weaker L2[7]. These findings are in line with Green's (1998) model, which not only suggests that the amount of inhibition required to suppress a variety is relative to the strength of its representation, but that switch cost asymmetry is reflective of task set inertia, as it takes longer to *overcome* the stronger inhibition required to block out the dominant language on previous trials which manifests as longer reaction times when switching back to the more dominant (and thus the previously more suppressed) L1. The level of inhibition required to switch between languages and the frequency at which bilinguals have to engage these mechanisms has been proposed to lead to certain cognitive advantages for bilinguals over monolinguals who do not need to engage these same processes.

Cognitive advantages and disadvantages of bilingualism

One of the most influential findings of the past decade or so, regarding the differences between bilinguals and monolinguals, is that of the bilingual advantage in non-linguistic inhibitory control. Based upon the principles outlined in Green's (1998) Inhibitory Control Model, this theory assumes that the bilinguals' constant activation of inhibitory control mechanisms (in order to suppress one of their language varieties while producing the other) employs domain-general executive functions which are highly practiced and the benefits of

[7] In other words, switching out of the dominant language to the weaker language was less costly than switching back *into* the dominant language.

this practice transfer to non-linguistic domains[8] (see: Bialystok, Craik, Green, & Gollan, 2009). This effect is most prominently found in young children (Bialystok, Barac, Blaye, & Poulin-Dubois, 2010; Martin-Rhee & Bialystok, 2008) and older adults (Bialystok, Craik, Klein & Viswanathan, 2004; Salvatierra & Rosselli, 2011; Schroeder & Marian, 2012), presumably because these functions are either not yet fully developed, or are in a state of decline, thus differences are more detectable at these stages than in younger adults who are at the peak of their cognitive capabilities. This association with greater cognitive flexibility later in life has even been proposed to delay the onset of dementia in bilinguals, relative to their monolingual counterparts (Bialystok, Craik, & Freedman, 2007).

Not all advantages for bilinguals are related exclusively to inhibitory control however. Goetz (2003) showed a bilingual advantage in Theory of Mind (ToM) for 3 and 4 year old children after they outperformed their monolingual peers on a battery of ToM tasks including the False Belief task; indicating that they are able to put themselves into the mind set of others and represent the knowledge, beliefs, and intentions of another person more successfully than age-matched monolingual children. This finding has been attributed to the bilingual children's greater sociolinguistic awareness, i.e. that they are aware that an interlocutor's knowledge of language can be different to their own and that they need to match their language to that of their interlocutor in order to successfully communicate with them. Another explanation given for the bilinguals' performance is their greater metalinguistic awareness[9], which has also been shown by Bialystok (1988). This study tested bilingual and monolingual children's ability to understand the arbitrariness of language, i.e.

[8] Similar transfer has been suggested for video game players (Bialystok, 2006) and musicians (Moreno et al., 2011).

[9] A link is also made between the bilinguals' performance in ToM tasks and the possibility of them having greater levels of inhibitory control compared with monolinguals.

that the labels we use to express concepts are separate to the concepts themselves, and to measure their ability to ignore distracting semantic information to respond as to whether a sentence was grammatically correct or not. The results showed that bilingual children were better than monolingual children at identifying sentences, such as “apples grow on noses”, as being grammatically correct despite the nonsensical meaning contained within them. This ability is again explained by the bilingual child’s constant activation of the mechanisms which allow them to switch between their two languages. In this instance, the experience of maintaining two competing lexicons, is said to afford bilingual children greater skill at suppressing distracting (but irrelevant) information (i.e. ignoring semantic information and focussing on grammatical information), although its consequences remain within the linguistic domain as opposed to far transfer to general domains (Bialystok, 1988).

There are, however, some negative consequences of bilingualism. Bilinguals tend to take longer to acquire, and have smaller vocabularies in each of their languages than monolinguals (Bialystok, 2009a). This is often more problematic with regards to children, as vocabulary size is used as a central measure of a child’s progress in both verbal and literate language development, causing bilinguals to perform more poorly than comparable monolinguals on language proficiency measures (Bialystok & Feng, 2009). The maintenance of two vocabularies instead of one has also shown to lead to some bilingual disadvantages in adults. Gollan and Acenas (2004) have shown that bilinguals experience more tip-of-the-tongue states (TOTs) i.e. a failure in word retrieval which is characterised by the feeling of imminent recall, than monolinguals; a finding which they attribute to a bilingual having less ability to activate representations which are specific to each language due to the weaker links that are formed as a result of less overall use of each language. Monolinguals also tend to outperform bilinguals on verbal fluency tasks (see: Gollan, Fennema-Notestine, Montoya, & Jernigan, 2007), and are faster at picture naming (Roberts, Garcia, Desrochers, & Hernandez, 2002) and lexical decision tasks (Ransdell & Fischler, 1987) than bilinguals. These negative consequences are far likely outweighed, however, by the opportunities that bilingualism affords for communication, travel and trade (Bialystok, Craik, Green, & Gollan, 2009) and the distinct cultures than bilingualism can allow an individual to identify with (Schroeder, Lam & Marian, 2015).

But what about dialects?

Despite the intention to explore whether the cognitive perspective can offer a definition of the differences between dialects and languages, the reference to dialects has thus far been minimal. The study of dialects and bidialectal language (variety) representation is an area which has received very little attention and has been vastly underrepresented in the literature. One rare example, a study by Woutersen, Cox, Weltens and De Bot (1994), aimed to investigate whether speakers of varieties with small typological distance between them are comparable to the types of bilinguals identified by Weinreich (1953, as cited in Woutersen et al., 1994). In this study, the authors tested teenage speakers of Maastricht Dutch and Standard Dutch on a repetition priming task which presented participants with Maastricht words and their Standard Dutch translation equivalents to determine whether interlingual priming occurred. The results showed that those who had Maastricht as their L1 behaved like "coordinate" bilinguals (i.e. like balanced bilinguals with equally dominant varieties) and showed no interlingual priming, whereas the L2 Maastricht speakers behaved like “subordinative” bilinguals (i.e. unbalanced bilinguals, for whom one variety (Standard Dutch) is the dominant variety) and displayed more interlingual repetition priming from L1 to L2, than from L2 to L1. This study provided early evidence that dialect speakers have separate lexical representations for dialect words. Although the findings of this research suggest that bidialectal speakers of Maastricht[10] and Standard Dutch behave cognitively like the bilinguals identified by Weinreich (1953, as cited in Woutersen et al., 1994), the authors acknowledge that the limitations of their analysis do not allow for the generalisability of their findings to other dialects. Woutersen et al. (1994) also fail to report whether their participants had any significant exposure and proficiency in other languages (i.e. the neighbouring languages of German and French; or English, which is ubiquitous throughout the Western world’s media) which may have some impact upon their cognitive representations of language.

Typological, or linguistic, distance between language varieties is not a factor which features in the most prominent pieces of research in the field of bilingual language representation and control and most language pairings are between recognised, autonomous, independent languages whose speakers are undoubtedly considered bilingual. For example, Meuter and Allport’s (1999) seminal study which showed asymmetrical switching costs in bilinguals contained a group of bilinguals with different language pairings - all participants had English as either their L1 or L2, whereas participants’ other language was either French, German, Italian, Portuguese or Spanish. While the status of these varieties as languages that are substantially different from English is not in question,

[10] The authors deliberately chose the Maastricht dialect, out of all the other regional dialects of Dutch, as it has the greatest typological distance from Standard Dutch and therefore might have been closer to the bilingual end of the *Continuum of Increasingly Diverging Language Varieties* which will be introduced and outlined in Figure 1.3.

presumably the effect of these different pairings is considered to ultimately be the same and thus a homogenous bilingual group containing speakers of the same two languages was not required by Meuter and Allport (1999) in order to demonstrate their findings. Similarly, several accounts which have purported to show a bilingual advantage in non-linguistic inhibitory control have contained bilingual groups with a multitude of language pairings. The participants in Bialystok, Craik and Luk's (2008) study comprised speakers of 24 different language pairings (including English and either: Albanian, Arabic, Cantonese, Croatian, Filipino, French, German, Greek, Hebrew, Indonesian, Korean, Latvian, Macedonian, Mandarin, Persian, Polish, Portuguese, Punjabi, Spanish, Somali, Tamil, Thai, Ukrainian or Yugoslavian[11]), Schroeder and Marian's (2012) study contained 13 language pairings (English and either: Bengali, French, German, Gujurati, Haitian Creole, Hebrew, Mandarin, Polish, Romanian, Spanish, Tamil, Visayan or Yiddish) and Gold, Kim, Johnson, Kryscio, & Smith's (2013) study also contained 13 different language pairings (English and either: French, Filipino, German, Greek, Gujurati, Hindi, Igbo, Konkani, Luo, Mandarin, Spanish, Swahili or Turkish) highlighting that the specific combination of languages spoken by bilinguals is not a crucial aspect in determining differences between bilinguals and monolinguals.

What this suggests is that the use of any combination of languages is enough to engender these cognitive effects; however, can we just assume that maintaining any two varieties (no matter how closely related they are) is the equivalent of being bilingual? Even monolinguals maintain different ways of speaking, employing different registers (e.g. formal vs informal; adult vs child-directed speech) depending on the situation and their fellow interlocutor which would require them to inhibit the production of certain types of words

[11] Although referred to as "Yugoslavian" in this paper, the language is question is likely to be Serbo-Croatian.

(i.e. swear words), choose between different phonetic variants (“butter” vs “bu/?/er”) and make different lexical choices (e.g. “mother” vs “mum”; “children” vs “kids”; “exhausted” vs “bushed”). Comparably, bidialectal speakers need to monitor continuously who can or cannot be addressed in their dialects, choose appropriate articulatory settings, and inhibit phonetic and lexical variants pertaining to the variety not currently being used; a similar experience to the bilingual maintaining two languages. As outlined in the previous section, group differences between monolinguals and bilinguals have been observed and a host of cognitive advantages and disadvantages of maintaining two languages have been demonstrated, suggesting that monolinguals and bilinguals *are* fundamentally different on a cognitive level. This raises the question as to where the cut-off point between monolinguals and bilinguals is, and where bidialectals should be placed in that dichotomy.

The Continuum of Increasingly Diverging Language Varieties.

As demonstrated in Figure 1.3, there may exist a continuum of diverging language varieties, where, at some point along the spectrum, bilingualism becomes a qualitatively different entity than monolingualism and observable differences between these two types of speakers start to emerge.

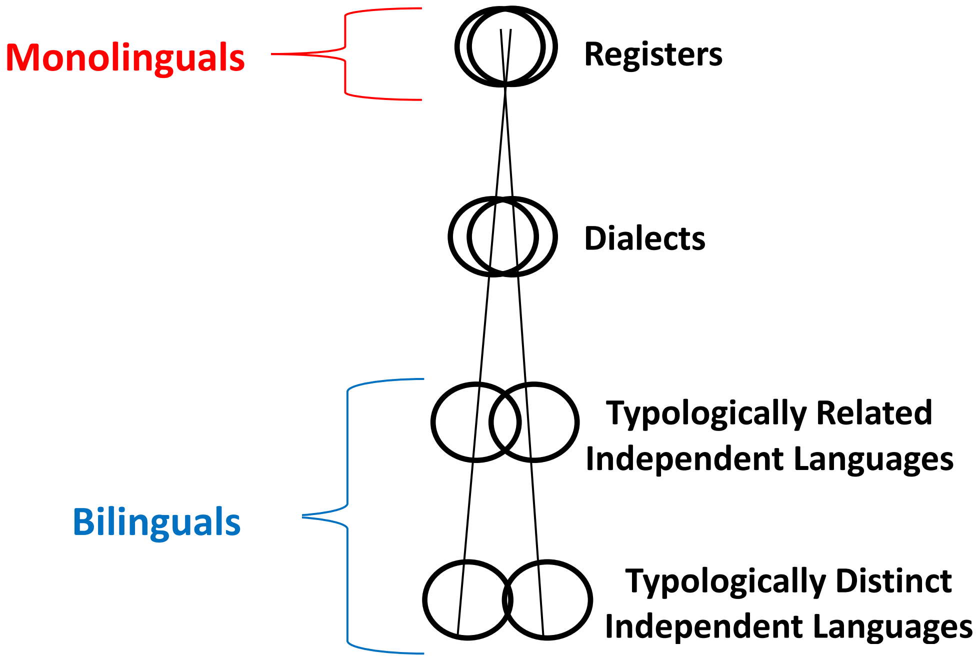

Figure 1.3: An illustration of a *Continuum of Increasingly Diverging Language Varieties* and the points at which monolinguals and bilinguals are traditionally categorised. The area in which two circles overlap represents the potential amount of cognates that two varieties share; the parts which do not overlap represent the amount of potential non-cognate items that are present in the two varieties.

At one end of the continuum there are monolinguals who undoubtedly maintain different registers depending on the social context and/or their fellow speaker, which may also involve changing aspects of their accent. Further down the continuum are dialects, which are often regional varieties used alongside a standard variety (Auer, 2005) but are not recognised as independent languages and thus their speakers are not categorised, nor self-identify, as being bilingual. Further down the continuum there are bilingual speakers of different languages which may have a relatively high amount of typological overlap (e.g. German and Dutch) and at the far end of the spectrum are speakers of languages which are typologically very distinct from each other and thus would contain very little linguistic overlap (e.g. English and Japanese)[12].

Acknowledging Bidialectals

Traditionally, most research has focussed on the differences between monolinguals at one end of the continuum and the bilingual speakers of independent languages, which inhabit the areas towards the end of the spectrum. Despite often treating these groups of speakers as discrete entities it is perhaps unfair, however, to suggest that monolinguals and bilinguals are *always* placed into binary categories.

Within the bilingual literature, several types of bilinguals have been identified and investigated. These include, but are not limited to, comparisons between early and late bilinguals; i.e. those who acquire both languages from birth or childhood, vs those who acquired another language later in life (see: Frenck-Mestre, Anton, Roth, Vaid & Viallet, 2005; Mechelli, et al., 2004; Tao, Marzecová, Taft, Asanowicz, & Wodniecka, 2011); balanced vs unbalanced bilinguals; i.e. those whose are equally proficient in both languages compared with those who have greater proficiency in one language (see: Costa & Santesteban, 2004; Duyck & Braesbert, 2005; Van Assche, Duyck, & Hartsuiker, 2012); second language learners (Mackey & Gass, 2005; Munro & Derwing, 1999); and heritage speakers, i.e. those raised in a bilingual environment where a heritage language is spoken (such as second or third generation immigrants) but for whom input of this language is often only received in the home and full proficiency is never achieved (see: Montrul, 2004;

[12] In the aforementioned studies by Bialystok et al. (2008), Schroeder and Marian (2012) and Gold et al. (2013), both speakers of typologically related languages and typologically distinct languages were categorised into one bilingual group.

Polinsky & Kagan, 2007). Other types of bilinguals also featured in the literature include bimodal bilinguals, who utilise languages in two different modalities i.e. those who use a sign language and a spoken language (see: Emmorey & McCullough, 2009; Kovelman, et al., 2009) and simultaneous interpreters, who are required to have a high degree of proficiency in two languages and for whom a large amount of activation occurs in both languages as language production and comprehension take place at the same (Christoffels, De Groot, & Kroll, 2006; Proverbio, Leoni, & Zani, 2004). Yet, one such group, which has received very little attention in the literature thus far, is the bidialectal group, whose varieties contain a large amount of typological overlap. Despite this range of the different types of bilingualism that can exist, the importance of typological distance between language varieties is often overlooked.

Aside from the aforementioned study by Woutersen et al. (1994) which provides preliminary evidence pointing towards separate linguistic representations for a bidialectal's two varieties, only a handful of other studies (e.g. Cai, Pickering, Yan, & Branigan, 2011; Kraljic, Brennan, & Samuel, 2008; Treiman, 2004) have investigated the cognitive representations that govern language use in bidialectals. Therefore the purpose of this thesis is to provide an investigation into bidialectal language representation which may help determine where on this continuum the cognitive differences between monolinguals and bilinguals start to emerge.

The Aim of this Thesis

The aim of this thesis is to investigate, whether dialect speakers represent their varieties separately like bilinguals, whether their language representation is similar to that of monolinguals, or whether they are different to both groups. This will be predominantly investigated using bidialectal participants who are speakers of Standard (Scottish) English and Dundonian, an urban variety of Scots.

Chapter 2 will outline the sociolinguistic context of Scotland, and will explore the typological relationship between its varieties and the attitudes which surround their usage in the present day.

Chapter 3 is the first empirical chapter of the thesis and will investigate whether bidialectals' use of two closely related varieties results in a similar non-linguistic inhibitory control advantage as is observed for bilinguals over monolinguals. In doing so, this study takes into account potential confounds associated with bilingualism and bidialectalism; such as socioeconomic status and immigrant status, to try and ensure that monolingual, bidialectal and bilingual groups are as carefully controlled as possible.

Chapter 4 investigates whether a switching cost is found when switching between two dialects and will determine whether the pattern of these costs differs across three different dialect groups: active bidialectals, who routinely produce both dialects; passive bidialectals who are proficient in both dialects but who routinely just use the standard variety; and monodialectals, a group with only recent and limited exposure to a second dialect.

Chapter 5 will investigate the role of switching between different articulatory settings to determine whether a switching cost is solely associated with inhibition of lexical representations or whether articulatory preparation may account for some of the cost in switching between different dialects or languages.

Chapter 6 will provide a preliminary investigation into how well language users are able to identify different linguistic varieties and how much exposure is needed to do so, a simple question which to date has not been investigated empirically.

Chapter 7 will provide a general discussion of the empirical work conducted in the thesis and will address the theoretical and methodological issues this work has raised. This chapter will also identify future avenues of research within this subject area which have been inspired by the work conducted in the thesis.

Chapter 2: Scotland's Language Varieties

The Languages of Scotland

As outlined in **Chapter 1**, there are many situations in the world where the distinction between a language and a dialect is unclear. This is true of Scotland, which makes it an ideal location to address the research question concerning the cognitive representation of dialects, or closely related language varieties, due to the language varieties present in this environment and their varying degrees of linguistic overlap with each other. There are three indigenous varieties in Scotland: Standard (Scottish) English, Gaelic and Scots; all of which are used in various combinations by the participants in the experimental chapters of this thesis. Standard Scottish English and Gaelic are undeniably considered separate languages, and speakers of both varieties would undisputedly be categorised as, and consider themselves, bilingual. There is no general consensus as to the status of Scots, however, with it being classed as anything from “bad English” or slang (making it more akin to a register), to being considered a regional dialect of English, to its recognition as a full independent Germanic variety which is referred to by some, including the Scottish Government, as “the Scots Language” (see: Unger, 2010). The following section outlines some of the history, features, surrounding attitudes and usage patterns of these three varieties with the intention to paint a picture of the current political and sociolinguistic environment in which they inhabit.

Standard Scottish English

The standard variety of English in Scotland is known as Standard Scottish English (often abbreviated to SSE) and is the variety used in formal situations such as education and broadcasting - it being the main literary language of Scotland, as well as being used widely in spoken form. SSE is often considered to simply be (standard) English spoken with a Scottish accent (Millar, 2006; Stuart-Smith, 2004). There are some minor lexical differences between Standard Anglo and Scottish English, however, which are similar to the types of differences that exist between Standard British English and other regional standards, such as Standard American English (e.g. holiday/vacation; nappy/diaper). Examples of lexical differences between SSE and Standard Anglo English (SAE) include the widespread use of the word “outwith”, meaning “outside of“ (i.e. the opposite of “within”); “wee” to mean “small/little” (e.g. “my wee brother”), and some commonly-used loan words from Scots which are often used where there is no direct English equivalent (e.g. “dreich”, to mean miserable, dreary, wet weather: “it’s a dreich day”; or “glaikit” (stupid, foolish or thoughtless)).

Standard Scottish English arose during the 17th and 18th centuries as a compromise between the London-centric Standard English and localised Scots-norms (Johnston Jr., 2007), thus Standard Scottish English (particularly in spoken form) is heavily influenced by Scots phonation and grammar. One such acceptable grammatical difference between Anglo and Scottish English is the rendering of the contraction of “I am not” as “I amn’t” instead of (or used interchangeably alongside) “I’m not”; another is the usage of the definite article where Anglo English would use the indefinite: e.g. “he’s in the huff” instead of “he’s in a huff”.

Detailed accounts of the number of phonetic differences between Standard Scottish and Anglo accented English are given by Stuart-Smith (2004) and Johnson Jr. (2007) of which there are too many to detail in this section. Most differences would likely be part of the natural variability in indexical features which occur amongst individual speakers, and which listeners do not have much difficulty processing, although the occasional contrast may be very noticeable. In some cases, the same phonemes are used in the Standard Scottish English pronunciations of words whereas in Anglo English these would be discrete entities (for example, in SSE the phoneme /ɐ̠/ appears in both "cat" and path", whereas in Anglo English two different phonemes are used: /cat/ and /pɑːth/) and vice versa (where SSE uses different phonemes in /sɔrt/ and /torn/, Anglo English uses just one (/oː/) in words like "sort" and "torn"). Indeed, one noticeable example of this phenomenon occurred when a famous British retailer ran an advertising campaign with the slogan "Good With Food": the vowels in the two target words being rendered differently between Standard Scottish and Anglo English (Standard Anglo English contains two different targets: /gʊd/ and /fuːd/, compared with SSE's single target: /gu:d/ and /fu:d/). It was, perhaps unsurprisingly, a Scottish actor who provided the voiceover to the commercial in order to allow the target words to rhyme.

It is not just vowel sounds which differ between these two standard varieties. Johnson Jr. (2007) outlines that Scottish English speakers do not have any difficulty producing the phoneme /x/ (the hard "ch" sound), which exists in both Gaelic and Scots (as well as several other Germanic varieties) but is usually replaced by /k/ by Anglo-English speakers in words like "loch" (lake), the aforementioned "dreich" or the various Scottish place names (e.g. Auchtermuchty, the Trossachs) and surnames (e.g. McCulloch, Donachie) which are Scots in origin. In Standard Scottish English, like in many other regional varieties of English, /t/ is often replaced with the glottal stop (/ʔ/) in words where this phoneme is in the medial or terminal position, such as “butter”, “bat” and “market” (see: Gordeeva & Scobbie, 2013). This feature is known as t-glottalisation and is becoming increasingly more common in rural environments as well as urban ones (Johnson Jr., 2007; Stuart-Smith, 2004). However, unlike several other regional accents of English, Standard Scottish English accents are rhotic, so the /r/ in words like “barn” is produced whereas this would be omitted in Standard Anglo English (i.e. SSE: /bɐ̟rn/ vs SAE: /bɑː(ɹ)n/). In some areas of Scotland, most noticeably the Highlands and Western Isles, the phonology of Scottish Standard English contains influences from Gaelic due to the close geographical proximity of these varieties within those regions, such as /ʒ/ in place of /s/ in some words (e.g. “firsht” instead of “first”) (Stuart-Smith, 2004). Such language contact is unsurprising given that Gaelic has been spoken in such areas for hundreds of years and for many people in these regions, it is their native language.

Gaelic

Scottish Gaelic, a member of the Goidelic branch of Celtic languages (alongside Irish and Manx) in the Indo-European family tree, is the oldest surviving indigenous language of Scotland. According to the last census (Scottish Census, 2011), Gaelic is spoken by around 58,000 speakers, predominantly in the Highlands and Hebridean islands of Scotland, although there are sizeable Gaelic speaking communities in urban environments such as Glasgow. This number is considerably lower than the 254,415 speakers reported in the 1891 census (MacKinnon, 2007), fuelling concerns that the language is in danger of becoming extinct, particularly because adult Gaelic monolinguals no longer exist (MacKinnon, 2007).

At one time a language spoken throughout most of Scotland, by the 11th century Gaelic was in a state of decline, losing its place at court and amongst the aristocracy to Norman French and geographically conceding to Scots in the Lowlands and Norn (an extinct language brought to Scotland by Norse settlers) in the Northern Highlands and Islands (MacKinnon, 2007). Gradually confined after this period (mostly) to areas of the Highlands and Western Islands of Scotland, Gaelic suffered considerably during the "Highland Clearances" in the nineteenth century, which saw families forcibly displaced from their crofts to make way for large scale sheep farming. This saw the large scale migration of speakers to the industrial lowland cities of Scotland or to emigrate overseas.

By the early 20th century, Gaelic was losing its literary tradition due to the legacy of the Education Act (1872) which, in the process of formalising and centralising Scottish education, had excluded Gaelic entirely from the curriculum. This saw a number of native Gaelic speakers being unable to read and write the language, and despite surviving as a strong oral tradition, this was a common trend throughout the 20th century with many native speakers having greater literacy skills in English (see: Gerhand, Deregowski, & McAllister, 1995). Unquestionably a distinct language from English, Gaelic uses the verb-subject-object word order, unlike English and Scot's subject-verb-object order. Language contact between varieties has led to several Gaelic words, such as "ceilidh" and "cairn" entering the English language and loanwords from English entering Gaelic. MacKinnon (2007) outlines the differences in structure and grammar between Gaelic and English, with one example being the Gaelic for “he loved her” - “bha gaol aige oirre” – when transliterated to English approximating as “(there) was love at-him for-her”.

Gaelic has been recognised under Part III of the European Charter for Regional or Minority Languages (see: Miller, 2006), effectively making it a recognised minority language by the UK and European Governments, and one which requires practical measures put in place by government to promote the use of the language across a number of different societal institutions. As a result of the relatively small number of speakers in the present day, several initiatives have been put in place to preserve the language and there are now many schools across Scotland (including in areas which, in recent history, Gaelic did not have a significant presence) which provide Gaelic-medium education in all areas of the curriculum. In 2008, a Gaelic-medium broadcasting channel, BBC Alba, was launched fulfilling some of the requirements of the charter although most programs are provided with English subtitles. In recent years, several campaigners have highlighted the need for the same treatment to be applied to Scots, which, although is also recognised by the European Charter for Regional or Minority Languages, falls under Part II of the charter. This means that the requirements by government and the provisions employed to protect the language are less stringent and concrete than those instructed for Gaelic; with Millar (2006) attributing Scots’ inclusion in Part II, rather than in III, to the *dialectalised* nature of Scots in relation to its close relative, Standard Scottish English.

Scots

Despite the fact that in Scotland there are more reported speakers of Scots than Gaelic (around 1,500,000 compared with Gaelic's 58,000 according to the Scottish Census, 2011), Scots inhabits a curious position, with there being no consensus as to whether it is a dialect (of English) or a language in its own right. Despite several authorities, including the Scottish Government (2010), promoting Scots as a language, in some situations the same type of speech might even be classed as slang and, when used in schools, would be instantly corrected by teachers (see: Costa, 2015).

<u>The Historical Perspective</u>

Most literature concerning the definition of Scots will inevitably delve into an account of the *history* of Scots and this section proves no different: while some of this information may be extraneous to the core purpose of this thesis, it is important to give some context to the often tumultuous history of this variety to inform a view of its current status and the attitudes that surround it in the present day. It is certainly true that, historically, Scots was recognised as a legitimate language variety in its own right, related to, but separate from English (Johnston Jr, 2007). Scots and English, which had a common ancestor in Old English (see: Stuart-Smith, 2004, for a history of the emergence of these two tongues), co-existed side by side and began the earliest forms of standardisation around the same time. Miller (2006) describes Scots in the sixteenth century as being a language that was used "at all levels of the royal administration" and was also the basis of a large body of literature of considerable quality and diversity. According to Johnston Jr. (2007), Scots had the potential to become as independent from English as Portuguese is from Spanish, or as Dutch is from German, had it not been for the political and religious upheavals of the seventeenth and eighteenth centuries which saw the status of Scots decline considerably for a variety of reasons, while being gradually supplanted by Standard Scottish English.

The Fall of Scots and the Rise of English

In 1603, the crowns of Scotland and England were united when King James VI of Scotland ascended the English throne after the death of Elizabeth I. This led to the new James I of England relocating his court from Edinburgh to London, which began a general trend towards the usage of English rather than Scots amongst the aristocracy, subsequently influencing trends and tastes in poetry and music. In the same period the Bible was fully translated into English, but not Scots, effectively making English the language of worship in both England and Scotland (or as Kay, 2012, describes it: "from then on, God spoke English"). The downward trend in the popularity and prestige of Scots was further bolstered by the Acts of Union in 1707, which saw Scotland become part of the emergent Great Britain. In this new union, Standard English took precedence over matters of parliament, and although Scotland maintained autonomy over matters concerning the church, and the education and legal systems (which remain separate to this day), Scots was gradually replaced by Standard Scottish English within these institutions. The failed Jacobite rebellion of 1745, which aimed to restore the exiled Stuart dynasty to the throne, saw Scots further demonised by its association with Scottish nationalism, which was largely rejected by the upper classes. By the eighteenth century, literary Scots had declined considerably, and although spoken Scots remained in wide usage, it had become the low variety in a diglossic situation with Standard Scottish English occupying the role of the high, prestigious variety. From this period onwards, Scots had largely become the speech of the working class, especially in the urban environments of the main cities, while SSE was the language of communication used by the professional and educated classes.

Modern Scots

Modern Scots is classified into four main regional groups which cover the breadth of the country, with their sub-categories containing a mixture of urban and rural vernaculars. Urban varieties of Scots include Glaswegian, spoken in the city of Glasgow, and Dundonian, spoken in the city of Dundee, with rural varieties including Doric, spoken around Aberdeenshire, and Shetlandic in the Shetland Islands. Until relatively recently, it was difficult to estimate the number of Scots speakers due to the lack of recognition of the different varieties, and the (mainly political) incentive to conduct a large scale survey; however, a recent report commissioned by the Scottish Government (2010) placed the figure at around 85% of the population speaking Scots to some degree, whereas the recent Scottish Census (2011), which included a question on Scots for the first time[13], reported that only around 30% of the population speak Scots (potential reasons for this discrepancy will be discussed later in this chapter).

Johnston Jr. (2007) describes varieties in the Germanic language group of having consonants which remain relatively stable over time, whereas it is their vowels which are more likely to undergo change and account for the phonological distinction that occurs between the different languages which occupy this group. This is true of many words which

[13] Gaelic has been included in the Census since 1881.

are cognates between Scots and English, such as "hoose" ("house"), or "auld" ("old") which feature in most or all varieties of Scots. Some varieties have vowel sounds which are considered fairly unique and characteristic of a particular variety, such as Dundonian, with its distinctive /ɛ̠/ sound often replacing the phonemes /ae̯/ and /ɐ̠/, so that "eyes" in Dundonian is "ezz"; "pie" is "peh"; "farmer" is "fehrmer" and so forth[14].

Unlike most other varieties of Modern Scots which (at least with regards to cognate words) tend to have the same consonants as Standard Scottish English, some rural varieties, such as Doric, have undergone a degree of consonantal shift. A distinctive feature of Doric is characterised by the phoneme /f/ often taking the place of /hw/ in words like "who", "what", "which" and "where", giving rise to the Doric 'shoe-shop' shibboleth "fit fit fits fit fit?" ("which foot fits which foot?"). Shetlandic Scots features *th*-stopping with /d/ and /t/ replacing /ð/ and /θ/ (see: Smith & Durham, 2004), a feature which does not appear in any mainland variety of Scots[15]; further giving the perception that rural varieties are more definable as something qualitatively different (i.e. as Scots), whereas urban varieties are just a (bad) form of English.

Despite its association as non-standard, informal or slang English (Costa, 2015; Johnston Jr, 2007; Kay, 2012; Stuart-Smith, 2004), Scots has a shared etymology with several other Germanic varieties although this is often largely unknown by its speakers. The Scots word

[14] This characteristic is often considered to be an identifying feature of a Dundonian *accent,* despite the fact that not all native Dundonians would make this shift. This highlights the interchangeability of terms like *accent* and *dialect* amongst the general population (see: Chambers & Trudgill, 1998; Trudgill, 2000) further adding to the confusion of what actually constitutes Scots.
[15] Although *th*-fronting is common in some East Coast dialects (see: Clark & Trousdale, 2009).

"bairn" (meaning "child"), which features in most northern and eastern dialects of Scots[16] is a cognate with the Swedish word "barn" and given that they are separated only by the North Sea, it is not surprising that other Scandinavian languages, such as Norwegian, also share cognates with East Coast varieties of Scots: for example, kvinne/quine ("girl"), gråte/greet ("cry") and kirke/kirk ("church")[17]. Despite being considered "corrupt", "slovenly" or "bad" English, it should be noted that some Scots words are preservations of cognates between Scots and English which have fallen out of usage in Modern English. Such examples include the word "ken", which is either used as a verb (e.g. "to know") or a noun (meaning "knowledge"). The latter only exists in Standard Anglo English as a fossil word in the phrase "beyond one's ken" (i.e. when something is beyond one's knowledge) but as a verb it has remained intact in Scots and is a cornerstone of many dialects including Shetlandic and Dundonian (e.g. "Eh dinna ken" ("I don't know")). Another word used in and around the Dundee area is "fleg" which means "fright(en)", and is a preserved cognate of a Middle English word which meant "to flay"[18]. Again, these types of words are often considered "slang" and their linguistic heritage is likely unknown not only by the speakers who use them, but by those who decry their use.

As a possible result of the majority of "formal" discourse being conducted in SSE, with Scots in recent history having had very little presence in such matters (although more emphasis has been given to Scots in Education Scotland's new "Curriculum for Excellence"; see: Costa, 2015), a problem faced by Scots varieties is what Smith and Durham (2012)

[16] Although "wean" (from "wee" and "ain" ('one')) is more commonplace in Glaswegian and surrounding West Coast varieties.

[17] One perhaps rather surprising missing cognate is the Norwegian word for "hospital" ("sykhus") - identical in pronunciation to the Dundonian words for "sick" and "house" (/sik/ and /huːs/), yet this is not a compound which features in this variety.

[18] Possibly sharing some etymological base with the concept of "jumping out of one's skin" when given a sudden fright.

highlight as "dialect-levelling" – where regional forms used by older speakers are being rejected by young speakers whose language is becoming more standardised. Williams and Kerswill (1999) describe this process as one in which distinctive features within regional varieties start to disappear and new features emerge which are adopted by speakers over a large geographical radius, reducing the differences between varieties overall. Although Smith and Durham's (2012) study is concerned specifically with Shetlandic, this process is also true of other Scots varieties such as Dundonian, where words like "nicht" ("night"), "echt"[19] ("eight"), "fecht" ("fight") and "cundie" ("roadside drain") are unlikely to be used in the present day by young or middle aged speakers, but would likely have been part of the vernacular of their grandparents.

In his highly informative account detailing the experience of observing Scots being taught in a classroom in Scotland, Costa (2015) describes a related problem faced by Scots; namely, that Scots language dictionaries often only include words that differ entirely from Standard English (i.e. non-cognates) or those which differ in pronunciation and/or spelling (i.e. cognates). This leads to the perception that common forms of words which are identical across Scots and English are assigned as being *de facto* English words, which in turn creates the perception that, if Scots is to be considered a language in its own right, then it is an incomplete one and must concede to English to remain functional. This has led some linguists to refer to Scots as a semi-language or *Halbsprache*[20] (Aitken, 1990; Gorlach, 1996; as cited in Costa, 2015), further fuelling the common held belief that Scots is a dialect of English rather than a language in its own right.

[19] Another example of Germanic cognates, this time with German "Nacht" and "acht".
[20] An appropriate label, using current terminology, might be to describe Scots as the "L1.5".

To emphasise this, take the example of a phrase that could be uttered by a Standard Scottish English speaker:

> "Bring through some more chairs; the two wee girls from next door don't have a place to sit",

and its translation into Dundonian Scots (**Red Text** indicates Cognates**,** **Green Text** indicates Non-Cognates, with the remainder of the items identical between SSE and Dundonian):

> "Bring **ben** some **mair** chairs; the **twa** wee **lassies** **fae** next door **dinna hae**[21] a place to sit",

and it is not surprising to see that for many, the notion of Modern Scots (especially urban varieties like Dundonian) being considered a distinct language from Standard Scottish English is an absurd one.

The Status of Modern Scots: Language or Dialect?

As previously mentioned, in a Scottish Government report (Scottish Government, 2010) which sampled 1020 adults representative of the Scottish adult population, 85% of respondents reported speaking Scots to some degree. This differs considerably from the figure of 30% of the population (around 1,500,000 speakers) reported in the recent census (Scottish Census, 2011)[22]. The reason for such a discrepancy is likely to arise from the lack of awareness amongst the general population as to what Scots actually is. In the Scottish Government (2010) report, respondents were played a short recording containing different

[21] Although for some speakers "have" is used but the /ɐ̯/ tends towards /ɪ/.
[22] The Scottish Government (2010) report shows 43% of the population *speaking* Scots "fairly often/a lot"; whereas the Scottish Census (2011) has just 37% being able to, at the very minimum, *understand* Scots.

examples of Scots (with examples of urban as well as rural varieties from across Scotland) before giving their responses. The 2011 census (Scottish Census, 2011) was the first to contain a question related to Scots and although a companion website[23] was launched to help the public provide an informed response, it is possible that not every individual who completed the census consulted this website before responding to the target question.

The attitudes towards Scots that exist in the general environment are also likely to have an influence on how people identify with the variety. In the first chapter of his book, *The Mither Tongue,* Kay (2012) gives an account of some of the descriptions of Scots he has personally encountered. While some are no doubt positive e.g. "the guid Scots Tongue", "the National Language", there are many which are not ("a slovenly based dialect", "uncouth gutturals", "coarse slang") and his account is not an isolated one especially with regards to Urban Scots (see: Costa, 2015; Stuart-Smith, 2004). Rural varieties, such as Doric spoken in the North East of Scotland, or Shetlandic spoken in the Shetland Islands are often treated with higher prestige and are spoken across all social strata, unlike their urban counterparts which are more likely to have the status of being improper, corrupt English and are predominantly considered to be spoken by those of lower socio-economic status (Costa, 2015; Johnston Jr, 2007; Stuart-Smith, 2004).

In Dundee, for example, the variety linguists would call Dundonian Scots is more commonly referred to amongst locals as either simply a "Dundonian accent", the "Dundonian/Dundee dialect" (as a dialect of *English* rather than Scots), or "oary" – a Dundonian word which when used as an adjective approximates to English as meaning

[23] www.ayecan.com

something akin to common, uncouth or vulgar[24], and is particularly used in reference to the items which are cognates with Standard Scottish English[25]. Thus, even in Scotland, speakers of Urban Scots varieties may consider their own variety as "oary" or "slang" with the negative connotations and lack of legitimacy which such attitudes entail, but might, for example, recognise as "Scots" the archaic style used by poets such as Robert Burns. Similarly, Urban Scots speakers, while considering their own variety to be a low status variety of English, may also consider the modern rural varieties such as Doric, as being "Scots" – an entity which has some shared components with their "slang" yet is not something they themselves speak (See: Macafee, 1994, as cited in Stuart-Smith, 2004).

Even when given a distinction as to what is categorised as Scots, there is no general consensus as to whether it is a register, a dialect or a language. In the Scottish Government (2010) report, 64% of respondents stated that they "don't really think of Scots as a language – it's more just a way of speaking". Although this report highlights some positive attitudes towards Scots, with respondents recognising its importance as an expression of national cultural identity, 31% of respondents stated that children in Scotland should not be encouraged to speak Scots, and 29% stated that it should not be taught in schools. With the results of this survey in mind, it is perhaps no surprise that Scots remains a politically hot topic in the present day, dividing opinion on its importance, relevance and legitimacy. It was part of the Scottish National Party's (SNP) pre-election manifesto that a census question related to Scots be included in the 2011 census, and more recently the SNP-led Scottish Government unveiled a Scots Language Policy document outlining a list of measures which aim to promote the use of the variety, to raise its status and legitimise its use in all types of

[24] A synonym with "slang", albeit perhaps a more emotionally charged one.
[25] Words like /hoose/, / ezz/, /peh/ etc.

discourse in Scotland. Whatever the current or historical socio-political factors which surround the use of Scots and fuel the debate as to whether it is a language in its own right or not, such classifications are perhaps irrelevant when it comes to the cognitive representation of closely related language varieties as will be investigated in the experimental chapters of this thesis.

A note on the definitions used throughout this thesis

For the purposes of this thesis, Scots (or its specific regional varieties, e.g. Dundonian) and English (whether referring to Standard English generally, or to SSE/SAE) will be categorised as dialects when used in relation to each other. This term is used to denote that these varieties overlap considerably, but is not used to infer that one variety is a dialect of the other (i.e. that Scots is a regional variety of English). This term is used to keep the relationship between these varieties distinct from the term "language", which will be used when describing recognised, independent varieties, such as Gaelic and English. Occasionally, as already evident throughout Chapters 1 and 2, the term "language varieties" will be used when referring to languages and dialects collectively.

Likewise, throughout the experimental chapters of this thesis the term "bidialectal" is used to describe users of language varieties which are not undisputedly recognised as distinct, separate languages, whereas the term "bilingual" is reserved for speakers of recognised, autonomous languages (which are either typologically related or distinct as shown in Figure 1.3). This is in line with the terms used in other studies conducted in Scotland with

Scots/SSE speakers (e.g. Smith & Durham, 2012; Smith, Durham & Fortune, 2007) and with Gaelic/SSE speakers (e.g. de Bruin, Bak, & Della Sala, 2015; Gerhand, Deregowski, & McAllister, 1995; Lachlan, Parisi, & Fadda, 2013).

Most of the active bidialectals who feature throughout the experimental chapters are speakers of both Standard Scottish English and Dundonian Scots, who, while not necessarily using the term “bidialectal” (and certainly never self-identifying as “bilingual”) to describe themselves, are conscious of having two different ways of talking which they can switch between depending on the situation and their fellow interlocutors. As a possible result of the large stigmatisation that surrounds the use of some varieties of Scots, some chapters also include passive bidialectals – those who have full knowledge and awareness of two varieties, but predominantly just use one: Standard Scottish English.

Chapter 3: Is there a Bidialectal Advantage in Non-linguistic Inhibitory Control?

The work contained within this chapter has been disseminated as follows:

Kirk. N. W., Fiala, L., Scott-Brown, K.C., & Kempe, V. (2014) No reduced Simon cost in elderly bilinguals and bidialectals*. Journal of Cognitive Psychology 26*(6), 640-648.

Kirk, N.W., Scott-Brown, K. C., & Kempe, V. (2013). Do older Gaelic-English bilinguals show an advantage in inhibitory control? In M. Knauff, M., Pauen, N., Sebanz, & I. Wachsmuth (Eds.) *Proceedings of the 35th Annual Conference of the Cognitive Science Society (pp. 782-787*). Austin TX: Cognitive Science Society.

Kirk, N. W., Scott-Brown, K.C., & Kempe. V. (2013). Do older Gaelic-English bilinguals show an advantage in inhibitory control? *Paper presented at the 35th Annual Conference of the Cognitive Science Society*. Berlin Germany.

Kirk, N. W., Scott-Brown, K. C., & Kempe. V. (2013). Do elderly bidialectal speakers enjoy an advantage in inhibitory control? Poster presentation at *Bilingualism and Cognitive Control Workshop*, Krakow, Poland.

INTRODUCTION

When the idea for this current research project was originally conceived, one particular finding relating to the differences between the monolingual and bilingual brain had risen to prominence. Not only had this finding captured the attention of neuroscientists and psycholinguistics alike, having inspired "a global research effort of unprecedented magnitude" (Hartsuiker, 2015), it had even made its way firmly into public knowledge and discourse[26]. This essence of this somewhat tantalising finding was that bilinguals, as a result of the constant "mental juggling" undertaken in maintaining more than one language, display greater general cognitive flexibility than monolinguals (see: Kroll, 2009). Built upon the principles of Green's (1998) Inhibitory Control model, this theory specifically states that the habitual employment of the attentional-control mechanisms which allow a bilingual to successfully switch between their languages without intrusions from the non-target language (i.e. the employment of language task schemas that inhibit the activation of lexical items which are tagged as belonging to the non-target language) also exercises domain *general* executive functions (see: Hilchey & Klein, 2011; Kroll & Bialystok, 2009). Subsequently, bilinguals are afforded an advantage over monolinguals in attentional tasks which extend beyond the linguistic domain. Extensive evidence for this bilingual advantage in non-linguistic inhibitory control has been demonstrated, particularly from the lab of Ellen Bialystok in Ontario, Canada (see: Bialystok, 1999; Bialystok, 2001; Bialystok, Craik, Klein, &

[26] The New York Times was just one media outlet which published a feature on this topic (see: http://www.nytimes.com/2011/05/31/science/31conversation.html?_r=0).

Viswanathan, 2004; Bialystok, Craik, & Luk, 2008; Bialystok, Craik, & Ryan, 2006; Emmorey, Luk, Pyers, & Bialystok, 2008, etc.)[27].

Bilingual Advantage in Children

Some of the first studies showing the bilingual advantage in non-linguistic inhibitory control were primarily conducted with children, often using measures of inhibition such as the *dimensional change card sort task* (see: Bialystok, 1999; Bialystok & Martin, 2004). In this task, the participants are asked to sort a series of cards based on a particular dimension, for example, putting all red coloured shapes in one pile, and blue coloured shapes in another. The instructions are then changed so that the cards have to be sorted by a different dimension such as shape (e.g. squares in one pile, circles in another). This is a task which is difficult for very young children to perform successfully as, according to Bialystok (1999), they have not yet developed the ability to consciously represent the new rules or the ability to reflect upon them; however, Bialystok (1999) discovered that bilingual children were able to perform this task at a younger age than monolingual children which she interpreted as being a result of the bilingual children's more developed executive control systems. Other, more complex, versions of these tasks exist, such as the *Multiple Classification Card Sorting Task* and the *Wisconsin Card Sorting Task;* however, more recent studies, including those conducted with younger and older adults, use entirely different tasks to measure levels of inhibitory control.

[27] A substantial amount of evidence has been published in recent years refuting the bilingual advantage; however, the majority of this was unpublished at the point the present project began. This introduction section will therefore focus on the literature that was available at the time the idea for the project was conceived, whereas the discussion will cover the more recent evidence which challenges this theory.

Measures of Inhibitory Control: the Simon Task

Several studies have instead opted to use computerised tasks, such as the Simon Task, in order to measure inhibitory control across the lifespan; from childhood into adulthood and beyond, into old age (e.g. Bialystok, Craik, Klein, & Viswanathan, 2004; Bialystok, Martin, & Viswanathan, 2005). In the Simon Task (see: Simon, 1969), participants have to respond to the colour of an object and are assigned a colour cue to a specific keyboard response (e.g. the left key for red; the right key for blue). These keys are aligned with the on-screen location where an item may appear (i.e. an object can appear at either the left or right side of the screen). Participants are then presented with a series of coloured squares appearing at either the left or right hand side of the screen, but are asked to respond to the *colour* of the square and not its *location*. The positioning of the square is therefore a potently distracting, yet task-irrelevant, dimension which the participants have to inhibit in order to correctly choose the key associated with the target colour; and thus the ability to overcome this distracting information is an indicator of the employment of inhibitory control.

Simon (1969) found that “congruent” trials i.e. those in which the coloured square appeared in the same location as the response key for that colour (for example a red square appeared at the left hand side of the screen and the target was left key = red) had faster reaction times than trials in which the location and response were “incongruent” (i.e. the blue square appeared on the left hand side of the screen, but the response key for blue was situated on the right). This difference in reaction times between congruent and incongruent trials is known as the Simon Cost, with a lower cost associated with better levels of inhibitory control. Several studies have thus found lower Simon Costs for bilinguals than monolinguals, indicating an inhibitory control advantage associated with the maintenance of two language systems. Most commonly these differences are observed in young children and older adults as, within such populations, these cognitive systems are either developing or are in a state of decline; whereas differences are harder to detect in young adults who are at the peak of their cognitive functioning (Bialystok, Martin, & Viswanathan, 2005).

Bilingual Advantage in Older Adults

One of the first studies to demonstrate the bilingual advantage in non-linguistic inhibitory control in older adults was conducted by Bialystok et al. (2004). In Experiment 1 of this study, 40 participants comprising two age groups (younger (mean age = 43.0) vs older adults (mean age = 71.9)) which were further categorised into two language groups (monolinguals vs bilinguals; ultimately yielding 10 participants per group), were tested on a series of measures including the Simon Task. The participants were matched for age and socioeconomic status, although the English speaking monolinguals were tested in Canada and the Tamil-English bilinguals were tested in India. The results of this study showed a clear bilingual advantage in inhibitory control across both age groups. In the younger group, the mean Simon Cost for bilinguals (40ms) was significantly lower than for monolinguals (535ms), and this was also observed in the older bilinguals (784ms) who displayed significantly greater levels of inhibitory control than monolinguals (mean Simon Cost = 1713ms). Two further experiments replicated these findings across more complex versions of the Simon Task (which contained more trials and multiple conditions), with monolinguals and bilinguals drawn from similar populations; although experiment 3 included English-French bilinguals who were tested in Canada alongside their monolingual counterparts.

This bilingual advantage for older adults has also been demonstrated using the Simon Task by Salvatierra and Rosselli (2010) and Schroeder and Marian (2012); with other studies purporting that the cognitive benefits of bilingualism can even act as a buffer against the onset of symptoms of dementia. One such study, by Bialystok, Craik and Freidman (2007) showed that, of a sample of 184 patients who were referred to a memory clinic due to cognitive complaints and had subsequently developed dementia, those who were bilingual typically presented symptoms of dementia four years later than monolinguals. These findings were widely disseminated in the public domain and a more recent study by Alladi, et al. (2013), which showed a similar positive effect of bilingualism in slowing the progress of dementia was also widely reported in the media, with the researchers themselves quoted as suggesting that "bilingualism might have a stronger influence on dementia than any currently available drugs"[28]. As a result of these often sensationalised findings, the proverbial stakes were raised, and although the finding that bilinguals display greater levels of non-linguistic inhibitory control than monolinguals was initially widely accepted, it did not remain completely unchallenged.

Confounds Associated with Bilingualism

Morton and Harper (2007; 2009) were perhaps the first prominent opponents of the bilingual advantage in non-linguistic inhibitory control having questioned whether bilingualism was confounded with other demographic variables such as ethnicity and socioeconomic status which could instead account for these cognitive differences between bilinguals and monolinguals. In their study, Morton and Harper (2007) compared the

[28] See: http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-24836837

performances of English monolingual and English-French bilingual children who were carefully matched for socioeconomic status (all children were from middle-class families whose parents were well educated) and ethnicity (all participants were Canadian born Caucasians; whose parents were also predominately Canadian born). The results of this study showed that performance on the Simon Task (modelled after Experiment 1 of Bialystok et al., 2004) did not differ across the bilingual and monolingual groups, with no significant differences in their overall reactions times, nor any difference in their Simon Costs. When data from both participant groups were combined, there was a significant negative correlation between socioeconomic status and Simon Cost (in terms of number of errors rather than differences in reaction times); indicating that higher socioeconomic status, and not bilingualism, was responsible for greater levels of inhibitory control. These allegations were rebuffed in a response by Bialystok (2009b) who claimed that SES, although not specifically measured, was carefully controlled for in all her studies[29] by sampling participants from the same homogenous middle class schools and neighbourhoods. Morton and Harper (2009) disagreed with this, stating that a large number of Canadian immigrants earn less money, but are more educated than their non-immigrant counterparts, again arguing that this is a confound that exists between traditionally sampled monolingual and bilingual groups.

This criticism of Bialystok's work by Morton and Harper (2007; 2009) opened the door to the number of possible other confounds which are associated with bilingualism and are not always controlled for. Alongside differences in socioeconomic status, bilinguals may differ from monolinguals on a variety of other dimensions including the aforementioned differences in ethnicity, as well as culture and cultural practices that vary as a result of

[29] Although as mentioned previously, this was not the case for the groups reported in Bialystok et al. (2004).

monolingual and bilingual participant groups being drawn from disparate backgrounds. Some studies have tested monolinguals and bilinguals who reside in different parts of the world entirely: Bialystok et al.'s (2004) study, although claiming to have controlled for confounds such as SES, predominantly compared English speaking monolinguals in Canada with Tamil-English bilinguals in India. Therefore not only is there the possibility that, between these countries, there are different criteria as to what constitutes being "middle class", but these bilingual participants are also ethnically and culturally different from their monolingual Canadian counterparts.

Other studies which have compared the performances of bilinguals and monolinguals have been conducted with groups of participants which currently reside in the same geographical location; however, the bilingual participants are often from an immigrant background which again opens up the possibility to confounding variables associated with their bilingualism. Such studies include Bialystok et al. (2008), where 20 out of the 24 bilingual participants were immigrants compared with the non-immigrant English speaking monolingual group. Likewise, although Salvatierra and Rosselli (2010) and Schroeder and Marian (2012) do not explicitly report immigrant status, the age of acquisition of English of their bilinguals suggest that they too were predominantly first or second generation immigrants who again differed in ethnic and cultural background from the monolinguals. Conversely, Kousaie and Phillips (2012) showed that when immigrant status was controlled for, the bilingual advantage in non-linguistic inhibitory control did not appear in older adults, suggesting that other factors which differ between immigrant and non-immigrant populations may be responsible for these cognitive effects. These confounds that arise when comparing monolingual and bilingual groups from vastly different backgrounds are reminiscent of the argument proposed by Henrich, Heine and Norenzayan (2011) who suggest that the WEIRD (Western Educated Industrial Rich and Democratic) people with whom psychology research is predominantly conducted are not representative of the entire world population. While their argument is focussed on the fact that findings obtained from WEIRD samples are not generalisable to humans across the world, this highlights the notion that bilingual status is not the only thing that can differ between bilingual and monolingual groups which are not drawn from the same geographical, socioeconomic, ethnic and cultural background.

Confounds of Culture and Ethnicity

Not only can different cultural practices, such as culture-specific parenting attitudes or educational and leisure activities which promote the training of executive functions by promoting exposure to activities that require executive control potentially lead to cognitive differences (see: Sabbagh, Xu, Carlson, Moses, & Lee, 2006), but genetic effects may also contribute to ethnic differences in executive functioning. There are several population-genetic studies which show that the prevalence of the 7-repeat allele of the dopamine receptor gene (DRD4) is lower in East and South-East Asia compared to North America (Chang, Kidd, Livak, Pakstis, & Kidd, 1996). This allele has been associated with attention-deficit hyperactivity disorder (ADHD; Faraone, Doyle, Mick, & Biederman, 2001), which can subsequently manifest in poorer executive functioning (Schachar, Tannock, Marriott, & Logan, 1995); although the relationship between DRD4 and ADHD itself seems to be subject to cross-cultural variation as culture may affect the 782 phenotypic realisation of this genotype (Nikolaidis & Gray, 2010). On the other hand, Chen, Burton, Greenberger and

Dmitrieva (1999) have shown a link between the long alleles of DRD4 and population migration patterns, indicative of migration selecting for traits like novelty seeking and openness. The personality trait of openness, in turn, has been associated with better performance in some aspects of executive functioning (Williams, Suchy, & Rau, 2009). This may imply the possibility of a reverse causal relationship between bilingualism and executive processing: individuals with superior executive abilities could be more likely to be bilingual because of a potentially greater propensity to make life choices leading to migration or, when placed in a bilingual environment, greater success in maintaining use of more than one language. Not only do bilinguals potentially differ from monolinguals depending on their ethnic, cultural and socioeconomic backgrounds, but the languages spoken by bilinguals from different parts of the world are also highly diverse, and accordingly, different pairs of languages can have varying degrees of typological distance from each other which may impact the level of cognitive control involved in maintaining and switching between them.

Cognitive effects between different language pairings

Some of the aforementioned studies have included bilingual groups which are not homogenous in terms of the languages spoken by the participants. Schroeder and Marian's (2012) study, for example, contained bilinguals who (alongside English) spoke one of 13 different languages and Bialystok et al.'s (2008) participants spoke English and one of 24 different languages (including languages which are typologically related to English, such as German, and others, such as Mandarin, which are not). The bilingual advantage in non-linguistic inhibitory control has been found in studies which tested Chinese-English

(Bialystok, 1999), French-English (Bialystok et al., 2005), Spanish-English (Salvatierra & Rosselli, 2010) and Tamil-English (Bialytok et al., 2004) bilinguals; as well as in several studies which contained bilinguals who spoke a mixture of language pairs (e.g. Bialystok et al., 2004; Bialystok & Senman, 2004; Schroeder & Marian, 2012). This calls into question whether certain language pairings are more likely to give rise to different cognitive effects or indeed whether typological distance between languages is important at all. Subsequently, this leads to the question as to whether dialect speakers would be afforded the same cognitive advantages as bilinguals as a result of the cognitive control required in using two closely related language varieties; although again, careful consideration would have to be given to ensure that any comparison between monolinguals, bidialectals and bilinguals is not confounded by other background variables.

A Meta-Analysis of the Bilingual Advantage

A meta-analysis conducted by Adesope, Lavin, Thompson, and Ungerleider (2010), aimed to address many of the confounds associated with bilingualism, to determine whether bilingualism was indeed responsible for the cognitive differences between monolinguals and bilinguals that had been reported in 63 previous studies. In this paper, Adesope et al. (2010) pooled the results from several different studies which had found bilingual advantages over a number of different tasks, using participants of different age groups; in studies whose bilinguals used different language combinations and which had been conducted in many different parts of the world. The main findings of this meta-analysis were that the bilingual advantages found in previous studies (including in non-linguistic inhibitory control) were robust: they existed across all bilingual groups irrespective of socioeconomic status; and general cognitive benefits for bilinguals could be found with any language pairing. Different effect sizes emerged depending on the age groups of the participants involved, with significantly higher effect sizes emerging in studies conducted with adults than in those conducted with children, suggesting that this effect was more pronounced in older adults.

Perhaps inspired by the reports of non-replicable findings raised by Morton and Harper (2007; 2009) and also to ensure the results of their own meta-analysis were not invalidated, Adesope et al. (2010) acknowledged that a *publication bias* may exist with regards to the bilingual advantage. In essence, this means that only novel, positive findings are published in peer-reviewed journals, and studies which find a negative or null result do not get published leading to a "file-drawer" problem (see: Rosenthal, 1979) where such results are inaccessible to other researchers. However, their statistical analyses indicated that 453 additional studies containing null results would be required in order for the results of the meta-analysis to be nullified; which they conclude as indicating that the bilingual advantage was a robust finding across the studies they measured.

A Bidialectal Advantage in Non-Linguistic Inhibitory Control

The results of Adesope et al.'s (2010) meta-analysis indicate that the bilingual advantage should appear for any combination of languages spoken. This leaves the pathway open to empirically test whether dialects are cognitively represented like separate languages and to investigate whether bidialectals behave cognitively like bilinguals by determining whether a bidialectal advantage in non-linguistic inhibitory control also exists. If bidialectals display this advantage, then it can be assumed that their language varieties are represented in a similar way to bilinguals and the same cognitive mechanisms are employed in maintaining and switching between them. Keeping in mind the confounds that were identified in previous studies; it is important to ensure that monolinguals, bidialectals and bilinguals are as closely matched as possible on a number of different background variables to ensure that any differences which may emerge between them can be confidently attributed to the variable that is being investigated (i.e. their language usage) and is not due to the presence of any confounds.

The Aim of this Study

The aim of the present study is thus two-fold. First of all it will investigate whether a bidialectal advantage in non-linguistic inhibitory control exists and whether this is of a similar magnitude to that found in bilingual speakers who maintain two typologically distinct languages. This will be investigated by means of a partial replication of Experiment 1 in Bialystok et al.'s (2004) comparing performance on the Simon Task between older adult bidialectals, monolinguals and bilinguals. To determine whether the active use of two dialects is required for these potential cognitive effects to emerge, or whether passive exposure (with full comprehension) of a second dialect would also engender such effects, two bidialectal groups will be included: active bidialectals who regularly use Standard Scottish English and Dundonian; and passive bidialectals who predominantly use Standard Scottish English but have full comprehension and regular exposure to Dundonian. Subsequently, an additional monodialectal/monolingual group, consisting of Standard (Anglo) English speakers, will be tested who do not have this same exposure or knowledge of a second dialect. These groups will be compared to a bilingual group drawn from the same country, and whose participants all speak the same two languages (Standard Scottish English and Gaelic).

Secondly, it will contribute to the debate surrounding the potential confounds which may exist in some studies purporting to show a bilingual advantage in non-linguistic inhibitory control by ensuring these confounds are carefully controlled for. This will be achieved by comparing the performance of monolingual, bidialectal and bilingual groups drawn from similar cultural, socioeconomic, and geographical backgrounds within the UK; and will ensure these language groups are also controlled for age, and verbal and non-verbal intelligence. However, because previous studies have potentially been confounded by the difference in immigration status between monolingual and bilingual participants, an additional bilingual group will be included consisting of participants who have immigrated to the UK, who speak English and one of several different Asian languages to determine whether the bilingual advantage in non-linguistic inhibitory control only appears in this group.

It is predicted that there will be an effect of language group on levels of non-linguistic inhibitory control, as measured by the Simon Cost; however, where these differences lie depends on the potential origin of the bilingual advantage. If confounds associated with immigrant status (or comparisons made between people residing in different parts of the world) are responsible for the bilingual advantage in non-linguistic inhibitory control reported in previous studies (e.g. Bialystok et al., 2004; Schroeder & Marian, 2012), then we should see significantly greater levels of inhibitory control in the Asian-Language-English bilingual group only. If bilingualism in general is responsible for these effects, then the Gaelic-English bilinguals should also display better greater inhibitory control than the remaining groups. If active use of two dialects also engenders an advantage in non-linguistic inhibitory control, then, alongside the bilinguals, this group should also outperform the passive bidialectal and monodialectal groups. If passive bidialectalism also leads to an advantage, then all bilingual and bidialectal groups should significantly differ from the monodialectal group.

METHOD

Participants

Eighty older adults (*M* = 70.88 years, *SD* = 7.52 years, range = 60-89 years) participated in this study[30]. Sixteen (6 males) were "active" bidialectal speakers of Standard Scottish English and Dundonian Scots, sixteen (5 males) were "passive" bidialectal speakers of Standard Scottish English but also had full comprehension and regular exposure to (but did not use) Dundonian Scots, sixteen (6 males) were Gaelic-Standard Scottish English bilinguals[31], sixteen (10 males) were Asian language – Standard English speakers and sixteen (6 males) were monodialectal speakers of Standard Anglo English[32]. This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A(i)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

The active and passive bidialectals were recruited from the Dundee area, the Gaelic-English bilinguals were recruited from the Isle of Lewis and Glasgow, the monodialectals were recruited from Birmingham and Dundee/Angus/Aberdeenshire (as visitors or recent re-locators to these regions from England) and the Asian language (consisting of speakers of either: Bengali, Gujarati, Hindi, Malay, Punjabi or Udru) – English bilinguals were recruited in London and Dundee, with their average age of arrival into the UK (*M* = 26.6 years, *SD* = 4.8

[30] Some of the bidialectal participants were previously reported in Kirk (2010) and are re-analysed here for comparison purposes. The Asian Language-English bilinguals were tested in collaboration with an undergraduate student and have also been reported in Fiala (2014).
[31] Some Gaelic-SSE bilinguals also reported dialect usage, but for the purposes of this experiment have been categorised according to their bilingual status.
[32] Although England also has a number of distinctive regional dialects, the participants in this group did not self-report using or having high levels of proficiency with such varieties.

years, range = 14.0–35.0 years) being similar to the 21.5 years reported for the bilinguals in Salvatierra and Rosselli (2010).

Bilingual and bidialectal participants were included if they used Standard English between 30-70% of the time. In addition to the 80 participants (16 per language group) included in the final analysis, a number of other participants were tested but excluded for the following reasons: Three participants reported predominantly using Dundonian Scots and, as it proved impossible to recruit further monodialectal speakers of this type, were excluded from the study. Nine bilinguals reported percentages of English use outwith the 30–70% range. Two participants were excluded for having extremely low English proficiency as measured in the Vocabulary subscale of the WASI. Five participants were excluded for having an age of arrival in the UK greater than 40. Four participants failed to perform the Simon task correctly, and data for one participant were not recorded due to equipment malfunction.

Materials

Background Questionnaires

A background questionnaire (Appendix B (i)), which inquired about the participants' educational background, the age at which they left school and the occupations they had held throughout their working lives in order to measure socio-economic status, was administered. This questionnaire also enquired about their daily usage of (their relevant standard variety of) English and of other foreign languages; Scottish participants were also asked about their use of varieties of Scots in different situations.

Bilinguals and bidialectals additionally received modified versions of the LEAP-Q (Marian, Blumenfeld & Kauschanskaya, 2007), a questionnaire designed to determine bilingual language status through proficiency self-ratings that has been validated using behavioral measures of language proficiency. The LEAP-Q was adapted for use with dialect speakers by asking to what extent participants were fluent in one or two varieties, e.g. SSE and Dundonian Scots, and the age at which they became fluent.

Wechsler Abbreviated Scale of Intelligence (WASI)

Two subscales of the WASI were used to determine participants' verbal and non-verbal IQ. The Vocabulary subscale tested participants' verbal reasoning ability and ability to give definitions of words. These ranged from the likes of 'bird' and 'calendar', to more difficult words towards the end of the test such as 'ruminate' and 'panacea'. The Matrix Reasoning subscale contained visuo-spatial patterns designed to measure abstract non-verbal reasoning ability with participants being presented with 5 options to choose the correct response from. Participants' raw scores for each subscale were converted to t-scores (which are normalised for each age range) and then combined to form an overall score (from which an IQ score can also be determined).

Simon Task

The same procedure as Experiment 1 in Bialystok et al. (2004) was used. Participants were presented with red and blue squares, half of which appeared on the left side of the screen, and half on the right. Participants were asked to press the '1' key on the left or the '0' key on the right of the keyboard depending on the colour of the square. Colour assignment to key location was counterbalanced across participants. The response keys were marked with white stickers on the keyboard. In congruent trials, the response key associated with the colour of the square was located on the same side as the square. In incongruent trials, the response key was located on the opposite side requiring participants to inhibit the (dominant) spatial cue (see: Figure 3.1). The Simon Effect occurs as a result of the need to overcome the distracting spatial cue which manifests in longer reaction times for incongruent trials. The reaction time difference between congruent and incongruent trials is known as the Simon Cost and is considered to be a measure of inhibitory control, with a lower Simon Cost signalling a higher level of inhibitory control.

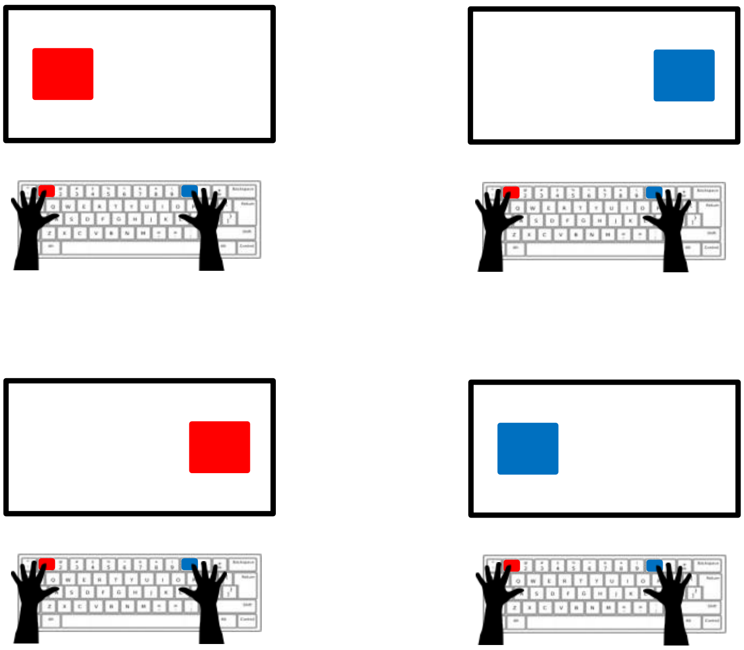

Figure 3.1: Representation of the types of trial that appear in the Simon Task, in which participants are asked to respond to the colour of a square (and ignore its location). The top row demonstrates “congruent” trials: those in which the coloured square appears in the same location as the response key for that colour. The bottom row demonstrates “incongruent” trials in which the location of the square appears in the opposite location of the response key for that colour. N.B. Although the 1 and 0 keys were stickered, they were not visibly colour coded; the participants had to memorise which colour was assigned to which key.

The Simon Task was presented using Eprime v.1 on Windows XP. On-screen instructions were given, outlining the nature of the task. At the beginning of each trial, participants saw a fixation cross in the middle of the screen for 800ms, followed by an interval of 250ms. A red or blue square then appeared either to the left or the right of the screen. The squares were visible for 1000ms if there was no response. Timing began with the onset of the stimulus, and was terminated with the response. The next trial started after a 500ms interval.

Participants were given 4 congruent and 4 incongruent practice trials with feedback before moving on to the 28 critical trials (7 each of congruent red, congruent blue, incongruent red, incongruent blue) presented without feedback (as in Experiment 1 of Bialystok, et al., 2004). Order of the 14 congruent and 14 incongruent trials was randomised.

Procedure

Participants were first given the Background Questionnaire followed by the LEAP-Q, if appropriate. The Vocabulary and Matrix Reasoning subscales of the WASI were then administered to the participant (but were scored at a later time). The Simon Task was administered after the WASI, with the participants given the option of a break between these two tasks.

RESULTS

Results for the linguistic, cognitive and demographic variables in the five participant groups are given in Table 3.1.

Table 3.1: Means and standard deviations (in parentheses) for linguistic, demographic and cognitive measures. Asterisks denote significant differences between groups based on appropriate statistical test (explanations in text) with * p < .05 and *** p < .001.

	monolinguals			**Bilinguals**	
	Active bidialectals	Passive bidialectals	Monodialectals	Gaelic – English	Asian – English
Age	72.4 (8.2)	69.7 (7.7)	69.5 (8.6)	69.8 (5.5)	72.6 (7.3)
Vocabulary WASI	55.6 (6.7)	57.1 (8.4)	60.3 (9.6)	57.9 (9.0)	53.6 (14.2)
Matrix WASI	59.1 (7.7)	59.5 (10.3)	61.0 (10.5)	59.5 (5.7)	56.2 (6.9)
Skill Level* (1 - 4)	2.4 (0.9)	2.9 (0.9)	3.1 (1.2)	3.4 (0.8)	2.7 (1.1)
% use of English* **	52.6 (9.7)	94.6 (7.3)	100.0 (0.0)	44.3 (15.4)	52.8 (15.0)

Age of Participants

Although participants were all aged over 60, it was important to ensure that the groups did not differ overall in terms of age, due to the cognitive decline that is associated with aging. A one-way between subjects ANOVA confirmed that there were no significant differences in age between the five language groups: $F(4, 75) = .66$, $p = .624$.

Percent Language Use

Bilingual and bidialectal participants were included in their respective language groups if their English usage was between 30-70% of the time, as measured in the background questionnaires and LEAP-Q.

A one way between subjects ANOVA revealed a significant effect of language group on self-reported % usage of Standard (Scottish/Anglo) English, $F(4, 75) = 90.96$, $p < .001$. Post-hoc tests using Tamhane's T2 for unequal variances revealed significant differences between the Active Bidialectals and both the Passive Bidialectals ($p < .001$) and Monodialectals ($p < .001$), between the Gaelic-English Bilinguals and both the Passive Bidialectals ($p < .001$) and Monodialectals ($p < .001$), and between the Asian-English Bilinguals and both the Passive Bidialectals ($p < .001$) and Monodialectals ($p < .001$). There were no other significant differences.

Socio-economic Status (SES): Due to the fact that the majority of participants for this study were retirees, participant income was not used as a measure of SES. Instead, the 2010 Standard Occupation Classification (UK National Office of Statistics) was used to categorise the amount of formal qualifications or work-based training estimated to be necessary to perform operational tasks within one of four skill levels. These skill levels ranged from 1 (occupations requiring general education, e.g. factory worker, cleaner) to 4 (professional/managerial occupations requiring degree-level education, e.g. doctor, teacher).

A Kruskal-Wallis test revealed a significant effect of language group on skill level (*H*(4) = 9.61 2, *p* = .047). A post-hoc test using a Bonferroni-corrected Mann-Whitney test showed a marginally significant difference between the Active Bidialectals and Gaelic-English Bilinguals (U = 51, *p* = .05). There were no other significant differences.

Weschler Abbreviated Scale of Intelligence (WASI)

WASI scores were missing for one passive bidialectal participant who was unable to complete the test due to time constraints. One way ANOVAs comparing performances separately on the Vocabulary subscale (*F*(4, 74) = 1.05, *p* = .389) and Matrix subscale (*F*(4, 74) = .71, *p* = .591) revealed no significant differences between the language groups. An additional one way ANOVA comparing language groups on overall WASI score also showed no significant difference (*F*(4,74) = 1.48, *p* = .216).

Simon Task

Results for congruent and incongruent reaction times, percentage of errors and Simon Costs in the five participant groups are presented in Table 3.2.

Table 3.2: Means and standard deviations (in parentheses) for reaction times, error rates and Simon Costs as measured using the Simon Task.

	monolinguals			**bilinguals**	
	Active bidialectals	Passive bidialectals	Monodialectals	Gaelic – English	Asian – English
Congruent RTs	614.9 (173.6)	576.1 (66.3)	608.3 (78.6)	594.2 (125.8)	714.1 (202.1)
Incongruent RTs	696.5 (190.4)	674.6 (97.6)	693.7 (125.5)	684.5 (157.1)	809 (207.71)
Congruent Proportion Correct Responses	.991 (.02)	1 (.00)	.991 (.02)	.991 (.02)	.969 (.05)
Incongruent Proportion Correct Responses	.960 (.06)	.969 (.05)	.969 (.06)	.960 (.05)	.920 (.09)
Simon Cost	81.6 (51.7)	98.49 (66.5)	85.4 (85.4)	90.3 (104.0)	94.9 (55.0)

<u>Error Rates/Proportion of Correct Responses</u>

A total of 2.7% of errors were made by participants. Error rates were used to calculate the proportions of correct responses, which were submitted to a 5 (Language Group: active bidialectal, passive bidialectal, monodialectal, Gaelic-English bilingual, Asian Language-English bilingual) x 2 (Trial Type: congruent, incongruent) ANOVA. This revealed a significant effect of Trial Type ($F(1, 75) = 18.16$, $p < .001$, partial $\eta^2 = .2$) with a lower proportion of correct responses in incongruent trials ($M = .955$, $SD = .064$) than in congruent trials ($M = .988$, $SD = .025$), as well as a significant effect of Language Group ($F(4, 75) = 2.88$, $p < .05$, partial $\eta^2 = .13$). Post hoc Tukey tests revealed that Asian-Language bilinguals ($M = .944$, *SD*

= .058) had a significantly lower proportion of correct responses than Passive bidialectals (*M* = .984, *SD* = .025), $p = .027$, $d = .89$; but no other significant differences were found between groups. No significant interaction between Language Group and Trial Type was found ($p = .865$).

Reaction Times

Of the remaining correct trials, those which had reaction times greater than 2.5 standard deviations above the mean (constituting 2.6% of trials) were excluded from further analysis. The remaining reaction times were submitted to a 5 (Language Group: active bidialectal, passive bidialectal, monodialectal, Gaelic-English bilingual, Asian Language-English bilingual) x 2 (Trial Type: congruent, incongruent) ANOVA which revealed a significant main effect of Trial Type ($F(1, 75) = 115.09$, $p < .001$, partial $\eta^2 = .61$) with congruent trials (*M* = 621.54ms, *SD* = 144.5) being on average 92.47ms faster than incongruent trials (*M* = 713.92ms, *SD* = 164.37), indicating that a Simon Effect (and thus, the Simon Cost) was present. The effect of Language Group on global RTs fell short of significance ($p = .074$). There was no significant interaction between Language Group and Trial Type ($p = .969$) indicating that the Simon Cost (and therefore levels of inhibitory control) did not differ between the groups.

Additional Simon Task Reaction Time Analyses

Previous studies which have used the Simon Task to demonstrate a bilingual advantage in inhibitory control have been inconsistent in their treatment of reaction time data. In Bialystok et al.'s (2004) seminal study, the treatment of reaction times was not reported and thus presumably no outliers were removed. To achieve comparability with that study, the ANOVA was re-run without the exclusion of any outliers. This analysis revealed a significant main effect of Trial Type ($F(1, 75) = 10.53$, $p < .01$, partial $\eta^2 = .12$) with congruent trials being faster than incongruent trials. Again, no significant effect of Language Group was found ($p = .127$) nor was there an interaction between Language Group and Trial Type ($p = .861$).

Schroeder and Marian's (2012) study, which also reported a bilingual advantage in inhibitory control, had a more stringent treatment of reaction times: removing trials below 200ms, above 1600ms and/or above 2.5 standard deviations above the participant mean as well as removing "recovery" trials (those which immediately followed an incorrect trial). Again, to achieve comparability with that study, the data from the present study were treated with the same exclusion criteria and the same ANOVA was re-run. This analysis revealed a significant effect of trial type ($F(1, 75) = 96.6$, $p < .001$, partial $\eta^2 = .56$), with congruent trials being faster than incongruent trials, but again the effect of Language Group fell short of significance ($p = .068$), nor was there a significant interaction between Language Group and Trial Type ($p = .988$).

DISCUSSION

The results of this experiment showed no differences in the Simon Cost between any of the five language groups, indicating that a bidialectal advantage in inhibitory control for the active and passive Dundonian-Standard Scottish English bidialectals was not present, nor was the bilingual advantage replicated in either the Gaelic-English bilinguals or the Asian Language-English bilinguals. In fact, the Asian Language-English bilinguals showed a trend towards slower reactions times overall; a finding that goes in the opposite direction of what a bilingual advantage would predict (see: Hilchey & Klein, 2011). Furthermore, despite using the same version of the Simon Task used in Experiment 1 of Bialystok et al. (2004), participants in the current study vastly outperformed those in that study, in terms of both reaction times (e.g. around 700ms in the present study compared with 3000ms in Bialystok et al., 2004) and accuracy (around 97% in the present study compared with 70% in Bialystok et al., 2004). One obvious explanation for these longer reaction times is the lack of removal of outliers in Bialystok et al.'s (2004) study, thus trials with artificially long reaction times remained in the final analysis[33]. With regards to accuracy, at least one participant in the current study was removed from the analyses as a result of continuously swapping the mapping of colour cue to response key throughout the task, leading to extremely low accuracy levels. Given the small sample size (n = 10) in Experiment 1 of Bialystok et al. (2004), a similar systematic error committed by even one individual may have had

[33] To illustrate further, a trial in which a participant was distracted by an outside source (such as a mobile phone ringing), which caused them to take several thousand milliseconds to return their attention to the task and answer correctly, should be removed as the length of the trial is not fully reflective of the individual's ability to perform the task.

considerable impact on the overall accuracy levels of the entire group overall[34]. However, additional analyses which were consistent with the treatment of outliers as reported in both Bialystok et al. (2004) and Schroeder and Marian (2012) did not yield a significant interaction between language group and trial type. The results of this study were published as Kirk, Fiala, Scott-Brown and Kempe (2014) and join a growing body of literature which has also failed to replicate the bilingual advantage in non-linguistic inhibitory control (see: Paap & Greenberg, 2013; Paap, Johnson, & Sawi, 2015).

Several other recent studies have been conducted comparing monolingual and bilingual groups which were matched on immigrant, cultural and socioeconomic status: de Bruin, Bak, and Della Sala (2015) also found no bilingual advantage for older Gaelic-English bilinguals; and Gathercole et al. (2014) did not find an advantage in Welsh-English bilingual children, teenagers, or younger and older adults. Similarly, Duñabeitia et al. (2015) failed to find the bilingual advantage in a large scale study which compared 252 bilingual and 252 monolingual children who were matched on a series of background measures including immigrant status, cultural background and socioeconomic status; as did a similar large scale study by Antón et al. (2014) which was also conducted with Spanish-Basque bilingual (N = 180) and Spanish monolingual children (N = 180). Likewise, there are several recent studies which show no link between bilingualism and delayed onset of dementia (e.g. Lawton, Gasquoine, & Weimer, 2015; Zahodne, Schofield, Farrell, Stern, & Manly, 2014). These recent studies suggest that other factors associated with bilingualism may be responsible for this advantage in non-linguistic inhibitory control, and thus controlling for these confounds results in no advantage being found for bilinguals.

[34] Similarly, if an individual swaps the mapping of colour cue to response key, despite being consistent in their responses (and responding "correctly" based on the new assignment), all subsequent trials would be registered as being incorrect.

Other recent studies have been published, however, which still provide evidence to support the hypothesis of a bilingual advantage in non-linguistic inhibitory control. Gold et al. (2013) have shown an advantage in older adults for a mixed-language immigrant-based bilingual group, similar to the advantage displayed by comparable bilinguals in Bialystok et al. (2008) and Schroeder and Marian (2012). Similarly, Wiseheart, Viswanathan, and Bialystok (2015) report a bilingual advantage for global switch costs in younger adults using a task switching paradigm, although around half the bilinguals were immigrants who spoke a mixture of different languages. Not all recent studies showing a bilingual advantage have been potentially confounded with immigrant status, however. A recent study by Woumans, Santens, Sieben, Versijpt, Stevens, and Duyck (2015) has again demonstrated a significant delay in the onset of Alzheimer's disease for non-immigrant bilinguals residing in Europe, of a similar magnitude (4.5 years) to that shown by Bialystok, et al. (2007) and Alladi et al. (2013). Relatedly, Verreyt, Woumans, Vandelanotte, Szmalec, and Duyck (2015) found balanced (Dutch-English) switching bilinguals displayed significantly greater levels of non-linguistic inhibitory control than balanced non-switching bilinguals and unbalanced bilinguals. The authors suggest (in line with previous findings reported by Prior & Gollan, 2011; and in relation to Green & Abutalebi's, 2013, adaptive control hypothesis) that the interactional context in which a bilingual uses their languages (which in turn determines how frequently they have to switch between languages), is responsible for the bilingual advantage: i.e. it is the frequency of *switching* between languages, as opposed to having a high level of *proficiency* in two languages, which engenders this cognitive advantage.

Despite this mixed evidence to suggest whether the advantage in non-linguistic inhibitory control for bilinguals actually exists, if bilingualism is indeed confounded with differences between ethnicity, immigration, cultural or socioeconomic status then the Asian Language-English bilinguals in the present study should potentially have displayed smaller Simon Costs than the other groups. This suggests that methodological differences could account for the failure to replicate this finding. Indeed, one limitation of the present study is that the version of the Simon Task (despite being identical to that used in Experiment 1 in Bialystok et al., 2004) may not have been sensitive enough to detect any differences in non-linguistic inhibitory control between the five language groups, either due to the reduced complexity of the task or the small number of trials overall (see: Paap & Greenberg, 2013). Gathercole et al. (2014) found no bilingual advantage in a non-immigrant based bilingual group using a version of the Simon task which was similar to the present study except it contained double the number of trials (48 vs 24), although this again may not have been a sensitive enough measure. De Bruin, Bak, and Della Sala's (2015) recent study, however, also compared Gaelic-English bilinguals and Standard English monolinguals[35] by using a more complex version of the Simon Task which contained two conditions (a high vs low number of switches between congruent and incongruent trials), each containing two blocks with 96 trials in each block. No significant differences were found in performance on the Simon Task between their bilingual and monolingual groups. Relatedly, Paap and Greenberg (2013) did not show a bilingual advantage across fourteen different tasks which purport to measure the same aspects of executive functioning (such as the Simon and Flanker tasks), nor did they demonstrate convergent validity between these tasks. The question still arises

[35] Although the authors do not specifically report this, it can be assumed that their monolinguals were speakers of Standard Scottish English, as they were recruited from the Isle of Skye. The authors also did not report their monolingual participants' use and knowledge of Scots.

then as to why some researchers find the bilingual advantage while others do not, especially given the results of the meta-analysis conducted by Adesopet et al. (2010) which indicated that the bilingual advantage was a robust finding.

Recent Meta-Analyses Investigating the Bilingual Advantage

Despite the meta-analysis published by Adesope et al. (2010) which suggested that a "file-drawer" problem was not apparent and the bilingual advantage was also unlikely to be subject to a publication bias, a recent meta-analysis by de Bruin, Treccani, and Della Sala (2015) investigated whether this was in fact the case. Having identified 104 conference abstracts from 52 different conferences (related to bilingualism, psycholinguistics, cognitive neuroscience, psychology, and psychiatry) between 1999 and 2012, the authors determined how many were ultimately published as journal articles. De Bruin et al. (2015) classified the conference abstracts into four different categories: those which reported a clear bilingual advantage (38% of the total number of abstracts included); those which had mixed results but on the whole supported the bilingual advantage (13%); those with mixed results which partly challenged the bilingual advantage (32%); and those which clearly showed no bilingual advantage (16%). The results of their meta-analysis showed that 68% of conference abstracts which supported the bilingual advantage were published, which was significantly higher than the number of abstracts which showed no (or a negative) effect of bilingualism (29%). Mixed results in favour of the bilingual advantage were also more likely to be published than mixed results which challenged the bilingual advantage. De Bruin et al. (2015) also reported that studies with null or negative results were not likely to be rejected for publication as a result of having small sample sizes. Similarly, Paap, et al. (2015) report that null results are found in studies with small, medium and large sample sizes, whereas (with the exception of Costa, Hernández, & Sebastián-Gallés, 2008) the bilingual advantage is not found in studies with large sample sizes, which is not the expected pattern should bilingualism truly be responsible for enhancing executive functions.

The results of the meta-analysis conducted by de Bruin et al. (2015) were disputed by Bialystok, Kroll, Green, MacWhinney, and Craik (2015) who claimed that the methods employed by the authors were flawed. Bialystok et al. (2015) state that conference abstracts are not representative of studies which are sent to journals: they are often preliminary reports containing small sample sizes, which are trialling new methods and are "rarely" peer-reviewed. The authors suggest that the only way to determine whether a publication bias truly exists is by comparing the acceptance rates of journal submissions that report a positive effect with those that do not. Another meta-analysis by Donnelly, Brooks and Homer (2015) aimed to investigate the robustness of the bilingual advantage (conducted with published studies only) and indicated that the bilingual advantage was reliable but the effect sizes of the included studies were significantly moderated by research group. In other words, specific research groups were more likely to publish studies showcasing a bilingual advantage with a larger effect. Alongside the sociolinguistic and methodological explanations offered by Donnelly, et al. (2015) to explain why this may have been a factor, the presence of a significant effect of research group may also fuel the prospect of a publication bias, if, for example, certain established research groups are more likely to have their positive results published due to their reputation within the field (see: Klein, 2015) or because they are more successful at receiving grant funding which allows them to conduct this work on a larger, or more frequent, scale than other researchers.

Where next for the bilingual advantage?

While the bilingual advantage in non-linguistic inhibitory control was once held as being an established and reliable finding, the subsequent failures to replicate have led to a substantial shift towards questioning whether this advantage really exists. One of the most direct opponents is Ken Paap who, in the title of a recent article (Paap, Johnson, & Sawi, 2015), stated that “bilingual advantages in executive functioning either do not exist or are restricted to very specific and undetermined circumstances”. In this paper, the arguments against the bilingual advantage are laid out in full: failures to replicate are caused by either a failure to match monolinguals and bilinguals on a variety of background measures; or by methodological issues such as using measures which do not actually test the mechanisms which are proposed to be exercised by bilingual language control. In addition, Paap et al. (2015) outline the effect of confirmation and publication biases which hinder the publication of results which fail to find a positive effect of bilingualism. A host of researchers have provided commentaries which contribute to this debate: while some (e.g. Bak, 2015; Woumans & Duyck, 2015) are still in favour of a bilingual advantage, others suggest that more focus needs to be given on refining the methodologies used to measure these cognitive mechanisms (Gade, 2015; Valian, 2015), that bilingualism should not be treated as a dichotomous variable (Kousaie & Taler, 2015), and that more effort be spent formulating more precise theories of language control, skill generalisation and cognitive control (Hartsuiker, 2015).

What do these findings tell us about bidialectal language representation?

In essence, as a result of the issues which now surround the difficulty in replicating the bilingual advantage in non-linguistic inhibitory control, very little has been revealed about bidialectal language representation and the cognitive effects of maintaining more than one dialect. Despite the inclusion of two bidialectal groups alongside two bilingual groups, and their comparison to a monolingual/monodialectal group, the lack of observable differences between any of the language groups indicates that this was not a valid measure to determine the differences or similarities between bidialectal and bilingual language representation.

While the debate continues on as to whether regular use of two languages confers an advantage to general, non-linguistic domains, the principles of Green's (1998) Inhibitory Control model may still offer some explanation as to the similarities between bidialectal and bilingual language representation with regards to the effects of language-specific inhibitory control. As will be outlined in the next chapter, several studies (e.g. Costa & Santesteban, 2004; Meuter & Allport, 1999;) have shown that the strength of a bilingual's language representation can be observed using language switching paradigms which indicate the cost involved in switching between languages. If dialects are represented in a similar fashion to separate languages, then a cost should also be observed for bidialectals when having to switch between varieties.

Chapter 4: Are Dialects Cognitively Represented as Separate Varieties? Evidence from a Dialect Switching Paradigm.

The work contained within this chapter has been disseminated as follows:

Kempe, V., Kirk, N. W., & Brooks, P. J. (2015). Revisiting theoretical and causal explanations for the bilingual advantage in executive functioning. *Cortex, 73*, 342-344.

Kirk, N. W., Kempe, V., Scott-Brown, K., Philipp, A., & Declerck, M. (2015) Demands on executive functioning can differ among monolinguals. Paper presented at the *19th Conference of the European Society for Cognitive Psychology (ESCOP), Paphos, Cyprus.*

Kirk, N. W., Declerck, M., Scott-Brown, K. C., Kempe, V. & Philipp, A. (2014). Cognitive cost of switching between Standard and Dialect varieties. Poster presented at *AMLaP XX, Edinburgh, Scotland.*

INTRODUCTION

As was investigated in **Chapter 3**, the assumption that mechanisms of inhibitory control are routinely employed in bilingual lexical selection is central to the proposal that bilingualism may lead to a general advantage in executive functioning (Bialystok, Craik, Green & Gollan, 2009; but see Paap, Johnson, & Saawi, 2014). This proposal suggests that this advantage exists for bilinguals either because bilingual lexical access requires more frequent deployment of domain-general executive control processes compared to monolinguals (de Bruin, Roelofs, Dijkstra & FitzPatrick, 2014), or because bilinguals transfer inhibitory control abilities from the linguistic to the non-linguistic domain (Bialystok et al., 2009). While the debate continues as to whether such an advantage in non-linguistic inhibitory control exists for bilinguals (see: Bialystok, 2015; Paap, Johnson, & Sawi, 2015), several studies have investigated the role of inhibitory control *within* the linguistic domain in order to determine the processes involved in using two languages. Investigating inhibitory control within the linguistic domain may also offer some insight into the cognitive mechanisms employed by bidialectals.

Green's (1998) Inhibitory Control (IC) model proposes that a bilingual's two languages are always active and are competing for selection. Therefore in order to select an item for production from the target language, the bilingual needs to inhibit the activation of all items in the non-target language. As outlined in **Chapter 1**, this is achieved by the employment of language task schemas which inhibit the production of items that are tagged as belonging to the non-target language. The presence of this inhibition is presumed to lead to a delay in switching between languages. Another main presumption of Green's (1998) IC model is that inhibition is *reactive*; that is, the more activated a lexical item is, the greater the level of inhibition that will be required to suppress its selection for production. Not only does this mean that there is a delay in overcoming this suppression in order to switch between languages, but it will take longer to switch back into a language that previously required a large amount of inhibition to suppress - such as the dominant L1 of an unbalanced bilingual, compared with a less dominant variety that was less activated in the first place.

A seminal study by Meuter and Allport (1999) investigated the cost involved in switching between languages. Using a cued language switching paradigm (for reviews on the validity of these paradigms see: Bobb & Wodniecka, 2013; Declerck & Philipp, 2015), the researchers instructed bilingual participants (who spoke English alongside either: French, German, Italian, Portuguese or Spanish) to name digits which were surrounded by a coloured border indicating which language to name the digit in. From trial to trial, participants would either be cued to continue naming a digit in the same language as in the previous trial (e.g. English) or could be required to switch language from one trial to the next (e.g. from English to French). Meuter and Allport (1999) observed a cost involved with switching: participants took longer to name digits in the "switch" trials, compared with the "non-switch" (also known as "repetition") trials which required them to remain within a language. Similar switch costs have been found by Christoffels, Firk, and Schiller (2007), Philipp, Gade, & Koch (2007), and Verhoef, Roelofs, & Chwilla (2009) using similar paradigms, and are even found in tasks in which the participants were not cued to switch, but could voluntarily switch between languages (e.g. Gollan & Ferreira, 2009; Gollan, Kleinman, & Wierenga, 2015). More importantly, in their study, Meuter and Allport (1999) observed that the cost in switching between languages was not symmetrical – participants displayed greater switching costs for their L1; in essence it was less costly for them to switch to their weaker language, than it was for them to switch into their dominant language. This finding provided evidence to support the proposal outlined in Green's (1998) IC model which suggests that in order to name an item in a target language, a corresponding language task schema is employed which inhibits the activation of all the items tagged as belonging to the non-target language. Subsequently, when cued to switch languages, a different language task schema is employed which needs to overcome the inhibition triggered by the previous language task schema, in order to allow a lexical item to be selected from the new target language. The presence of asymmetrical switching costs, therefore, is evidence that the amount of inhibition which is required to suppress the activation of lexical items in a particular language is proportional to how strongly represented and dominant that language is, and the persisting effect of this inhibition, which carries over into the subsequent trial, is directly related to how strongly inhibited it was in order to allow the selection of a lexical item from the target variety.

Further evidence suggesting that bilinguals employ inhibition when switching between languages was provided by Costa and Santesteban (2004) who replicated the asymmetry in switch costs for unbalanced Catalan-Spanish and Korean-Spanish bilinguals: both had greater switch costs for their L1 than their L2. To determine whether inhibition was only necessary for unbalanced bilinguals who had high proficiency in one language only, Costa and Santesteban (2004) used the language switching paradigm with balanced Catalan-Spanish bilinguals who were highly proficient in both their languages. The results of this experiment showed that the switch cost was symmetrical: switching from L1 to L2 was as costly as L2 to L1. One explanation for this could be that due to the equal proficiency in both languages, an equal amount of inhibition is applied when switching between either of the two languages (Declerck & Philipp, 2015a; Declerck, Thoma, Koch, & Philipp, 2015); however, Costa and Santesteban (2004) also demonstrated that when balanced bilinguals switched between their L1 and an additional, weaker, L3, symmetrical switch costs were also present. This finding challenged the idea that inhibition is required at all, as symmetrical switch costs in this instance would not comply with the logic of reactive inhibition considering the L1 is much more dominant, and therefore more highly activated, than the weaker L3. Thus, Costa and Santesteban (2004) instead proposed that, once a bilingual was highly proficient in at least two languages, then a different mechanism was employed - it was not the employment of *inhibition*, but rather it was increased *activation* that allowed a highly proficient bilingual to switch between languages. This process involves, based on the speaker's intention, the employment of language cues, which indicate the target language that is required for production, and that subsequently, the representations in the target variety become more activated. This is referred to by Costa and Santestban (2004) as a *language-specific selection mechanism,* as opposed to the mechanism outlined by Green (1998) which would be *language non-specific*.

Further research from Costa, Santesteban and Ivanova (2006) in which highly proficient bilinguals switched between a weaker L3 and L4 demonstrated, however, that asymmetrical switch costs were in fact present in this group. This suggested that inhibition was employed when switching between languages, even when a high level of proficiency had been gained in two languages, leading Costa et al. (2006) to conclude that their previously identified *language-specific selection mechanism* did not fully account for bilingual language control, and conceded that in some (unspecified) conditions, highly proficient bilinguals also need to resort to inhibitory control to perform lexical selection. Costa et al. (2006) also determined that, whichever mechanisms were ultimately utilised by highly proficient bilinguals to switch between languages, they were not dependent on the age that the L2 was acquired, having found similar results for late Spanish-English bilinguals as for early Catalan-Spanish bilinguals, nor were they dependent on the linguistic similarity between the two languages, having found comparable results for bilingual speakers of the typologically related languages of Spanish and Catalan as for speakers of the "very dissimilar" Spanish and Basque languages. This latter finding suggests that bidialectals could also potentially operate similar mechanisms when switching between dialects.

Other accounts (e.g. Finkbeiner, Almeida, Janssen, & Caramazza, 2006) also propose that inhibition is not required for a bilingual to switch between languages, and thus the presence of asymmetric switch costs in unbalanced bilinguals does not constitute evidence for the presence of reactive inhibition as outlined in Green's (1998) IC model. Finkbeiner et al. (2006) suggest that the signature effects of language suppression (i.e. switch costs) are an artefact of the use of bivalent stimuli in language switching tasks and that asymmetrical switch costs can arise because of the initial speed words are retrieved[36]. Finkbeiner et al. (2006) propose that lexical entries in the more dominant language, albeit activated faster, trigger a "double-checking procedure" to ensure correct production in order to prevent errors, as switch trials are supposed to be difficult and thus fast responses are less likely to be given in this difficult situation. Since L1 trials are more dominant, they are generally also easier and thus faster. While this interpretation does not seem to be accepted by many

[36] This raises the question as to what other artefacts of language switching could also be manifested within switch cost and will be investigated further in **Chapter 5**.

other researchers (see: Declerck & Philipp, 2015a) several other accounts have reviewed the validity of the switching paradigm as a measure in explaining the processes involved in bilingual language control (e.g. Bobb & Wodniecka, 2013; Declerk & Philipp, 2015a) and have not discounted entirely the role of inhibition in this process. Indeed, a recent study by Declerck, et al. (2015) investigating n-2 language repetition costs using speakers of German, Turkish and English again provides evidence for persistent inhibition, rather than persistent activation, in bilingual language control. If switching costs are evidence of inhibition of language schemas and dialects are represented as two separate varieties, then switch costs should also be present in bidialectal speakers when switching between their two varieties.

Typological Distance in the Language Switching Paradigm

Unlike the vast majority of studies investigating the bilingual advantage in non-linguistic inhibitory control which commonly did not consider typological distance as a factor in determining how and when the bilingual advantage might emerge, several studies utilising language switching paradigms have investigated the similarity between languages to determine whether this has an impact on bilingual language representation. One way to investigate typological distance between languages is by considering the number of cognates between two varieties. While some studies have specifically chosen bilinguals with different language combinations to eliminate systematic effects which may arise as a result of the presence of cognate items (e.g. Finkbeiner et al., 2006; Meuter & Allport, 1999), other studies (e.g. Declerck & Philipp, 2015b) have investigated the representation of cognates items to determine how cognate status of a word affects lexical access.

Cognate Facilitation Effect

Several studies have investigated the role of cognates in bilingual language representation (e.g., Caramazza & Sebastian-Galles, 2000; Van Assche, Duyck, Hartsuiker, & Diependaele, 2009; Verhoef, Roelofs, & Chwilla, 2009) providing evidence for cascaded activation models of lexical access. These studies have demonstrated facilitatory effects for interlingual cognates suggesting that the non-target language is active and can speed up lexical access in the target language, due to cascaded processing of lexical entries where activation accrued on the lemma level (e.g. Levelt, 1989; Levelt, Roelofs & Meyer, 1999; Roelofs, 1992) is continuously propagated to the level of phonological representations (Costa, et al., 2000; Caramazza, 1997). As a result, items with cognate names are named faster than those with non-cognate names because phonological forms of cognates may receive activation from both languages, whereas non-cognates only receive activation from the target language (Christoffels, et al., 2007). This cognate facilitation has also been found for speakers with different proficiency levels, not only in the L2 but even for a dominant L1 (see: Christoffels, De Groot, & Kroll, 2006; Christoffels, De Groot, & Waldrop, 2003). There are differences, however, as to the extent of the impact cognate words can have on language switching costs. Some studies have found higher switch costs for cognates than non-cognates when both appear within the same block (e.g. Christoffels, et al., 2007; Filippi, Karaminis, & Thomas, 2014) whereas others have found smaller switch costs for cognates than non-cognates when they appear in separate blocks (e.g. Declerck, Koch, & Philipp, 2012).

As outlined in **Chapter 1** and illustrated by the *Continuum of Increasingly Diverging Language Varieties* (Fig 1.3), dialects share many more cognate items than do both typologically related and typologically distinct languages. Given that Scots is considered a *halfsprache* (see: J. Costa, 2015), which must concede to English to remain functional, this would suggest that a considerable amount of items between the two varieties are identical (as demonstrated in **Chapter 2**), with other items taking the form of cognates (e.g. house/hoose) and non-cognates (e.g. children/bairns). A cognate facilitation effect therefore may exist between these dialects as has been demonstrated in studies conducted with typologically related independent languages, which potentially could be manifested as a difference in switch costs between cognate and non-cognate items. In some Scots dialects, including urban varieties such as Dundonian, lexical items which are cognates with the standard variety are often considered of lower status than items which are non-cognates (see: J. Costa, 2015; Johnston Jr., 2007); this in turn may have an impact on their use by bidialectal speakers and again could manifest in different switch costs between cognate and non-cognate items.

The Aim of this Study

By using a language switching paradigm adapted for use with dialects, this study will investigate whether a cost appears for switching between dialects, and if so, whether the pattern of these switching costs is similar to those displayed by bilinguals. Ultimately, whatever the nature of the switching cost, whether it be due to inhibition of the non-target language (e.g. Meuter & Allport, 1999), increased activation of the target language (e.g. Costa & Santesteban, 2004) or a collection of processes which combine both persisting inhibition and persisting activation (e.g. Declerck & Philipp, 2015a; Philipp et al., 2007), observing switch costs in bidialectals when cued to switch between dialects may give an indicator as to whether dialects are represented in a similar way to separate languages.

In this *Dialect Switching Task,* participants will be cued to name items in either Standard English or Dundonian Scots and will belong to one of three dialect groups. Active bidialectals, who regularly use both Standard (Scottish) English and Dundonian, and may be considered the dialect equivalent of highly proficient balanced bilinguals (see: Costa and Santesteban, 2004), will be compared with passive bidialectals who have high levels of knowledge and exposure to both dialects but who do not regularly produce Dundonian, primarily because of its low status (see: J. Costa, 2015; Stuart-Smith, 2004). However, because it is unclear whether long-term passive exposure to Dundonian can result in comparably strong representations of the two linguistic varieties, an additional group of (English) monodialectals, i.e. speakers of Standard (Anglo) English who have had only limited recent exposure to Dundonian, will also participate.

As dialects typically contain many more cognates than do separate languages (and in some varieties are considered of lower status than non-cognate items, see: Kay, 2012), items will be separated into cognate and non-cognate blocks to determine whether there is any effect of cognate status on the speed of lexical retrieval. If both varieties are active in bidialectal language processing, facilitatory effects for interdialectal cognates should be observed, which would suggest that the non-target variety is activated and can influence processing of the target variety, supporting a *language non-specific selection mechanism* (see: Green, 1998).

As a result of the three dialect groups having different levels of experience in producing Dundonian, in an additional component, a further group of participants will independently rate the authenticity of the production of Dundonian words by the participants in the *Dialect Switching Task.* It is predicted that due to the monodialectals speaking Standard Anglo-English, they will be rated as less authentic than the Scottish bidialectal groups; however it is unclear whether active and passive bidialectals, despite being native Dundonians, will be rated as being quantitatively different from each other as a result of each groups' prior experiences of producing Dundonian.

METHOD

Participants

Dialect Switching Experiment

Forty-eight adults (*M* = 30.31 years, *SD* = 10.98 years, range = 18 – 54 years) participated in the dialect switching experiment. 16 (9 males) were active bidialectal speakers, who spoke both Standard Scottish English and Dundonian Scots on a daily basis, 16 (3 males) were passive bidialectal speakers, who predominantly spoke Standard Scottish English but were regularly exposed to Dundonian Scots and had high self-reported levels of comprehension of it, and 16 (12 males) were "monodialectal" speakers of Standard (Anglo) English and had less exposure to, and knowledge of Dundonian Scots[37]. The active and passive bidialectals were native Dundonians whereas the monodialectal participants were either visitors, or had recently moved to Dundee from various parts of England to work or study. Scottish participants were paid £5 and English participants £10 (this difference was due to compensating the English participants for their greater time commitment which arose as a result of having to participate in the training component which the Scottish participants did not have to do).

Five additional participants were tested but were excluded from the analyses for the following reasons: two were over the age of 60, one Scottish participant was from an area of Scotland which was outwith the dialect region from which the stimuli were drawn, one English participant reported over 30% usage of a regional English dialect and one participant

[37] Each group contained sixteen participants as this number was consistent with previous studies (e.g. Declerck & Philipp, 2014; Finkbeiner, et al., 2006; Meuter & Allport, 1999).

was discarded due to having unusually long reaction times (more than 3 standard deviations above the mean for all participants). This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A (ii)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Dialect Ratings Experiment

In order to determine whether there were differences in (native-like) dialect production between the dialect groups, an additional 8 participants (3 males, 23-59 years) who were speakers of both Standard Scottish English and Dundonian took part in an experiment where they rated the productions of the participants from the main dialect switching experiment for native-like production authenticity. Participants in this experiment were paid £10. This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A (iii)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Materials

Dialect Usage Questionnaire

A dialect usage questionnaire was administered which enquired about the participants' general and dialect/language background information (Appendix B (ii)). The questionnaire gave a brief outline of the differences between Standard (Scottish) English and Dundonian

Scots and provided some examples of each. Participants provided information about their geographical and language background, their education and job history. No participants reported having a high level of proficiency in a second language.

Participants were asked to rate where they fell on a scale of usage (between 100% Standard (Scottish/Anglo) English and 100% Dundonian (or other dialect)). Classification of Scottish participants into active and passive bidialectals was performed according to responses to this question: Bidialectals who reported using the dialect at least 30% of time were categorised as active users (similar to the active bidialectals in **Chapter 3**), those who used the dialect less than 30% of the time were classed as passive bidialectals. Participants were also asked to rate their ability to understand a Dundonian speaker between 1 (can't understand) and 7 (completely understand).

Dialect Training Task (English Monodialectal Participants Only)

Having only recently visited or lived in Dundee for a relatively short period of time, English participants were given a separate, additional, training task to familiarise themselves with the items that would be used throughout the main dialect switching task. This training task was programmed using E-prime version 1 and was presented on a PC running Windows 7.

In the dialect training task participants were first of all shown the eighteen items that were to be used throughout the main switching experiment, with their Standard English labels written underneath. They were then shown the items again and asked to name them in Dundonian if possible. Participants were then given a training block where they were presented with each item 4 times (in random order), with the Dundonian label written underneath the picture while simultaneously hearing a native speaker pronounce the word in Dundonian. Participants were free to repeat this training block as many times as they wished until the felt fully familiar with the items. Before commencing to the main dialect switching experiment, they were again shown the list of items (twice) in random order and asked to name them in Dundonian. If a participant failed to achieve 100% accuracy when naming the items, they were invited to run through the training block again before restarting the production test. Once all items had been named correctly in the production test, the participant proceeded to the main experiment.

Dialect Switching Task

A dialect switching task was programmed using E-prime version 1 and was run on Windows 7. The dialect switching task contained written instructions detailing the purpose of the task. Participants were first of all shown the eighteen items which were to be used throughout the main experiment then were given a practice block which contained all 36 Item X Variety combinations (18 Standard English items, 18 Dundonian Scots items). As the practice was not being recorded and thus similar numbers of switch and non-switch trials were not crucial, these trials were allocated randomly by the E-prime script.

For the main task, each participant was presented with 4 blocks each containing 72 items. Two blocks contained cognate items only (e.g. house/hoose) and the other 2 blocks contained non-cognate items only (e.g. children/bairns). The blocks were presented in a counterbalanced ABAB or BABA order (i.e. participants were never given 2 of the same type of block in a row).

The sequence lists were created randomly but then manipulated in order to ensure an even number of switch vs non-switch trials. Two sequence lists were used: one which began with two non-switch trials and one which began with a non-switch trial followed by a switch trial which were counterbalanced across subjects and blocks. There were a similar number of switch vs non-switch trials (50.7% vs 49.3%) in each block and the lists were constructed so that each item was featured in an equal number of switch and non-switch trials. During each trial, the target picture was presented simultaneously with the coloured border, and remained on the screen until participants had started their verbal response. The next trial started automatically, 1250ms after onset of the participants' response. Participants began each block by pressing the space bar and thus could take a break between finishing one and starting the next.

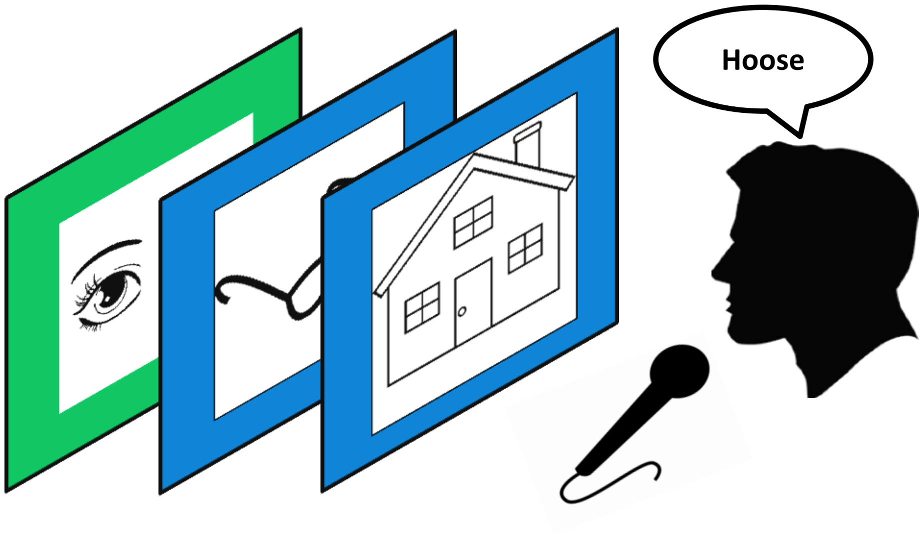

Figure 4.1: Representation of a selection of cognate block trials in the Dialect Switching Task for a participant given the cue of blue = Dundonian, green = Standard English. The next trial in the sequence is cued for naming in the same linguistic variety, hence it is a "non-switch" trial. This is then followed by a "switch" trial.

Dialect Switching Task Stimuli

Eighteen words and their corresponding pictures were used in the experiment (see: Table 4.1). Half of the items were Standard English words which were cognates in Dundonian (e.g. house/hoose), the other half were non-cognates (e.g. boy/laddie), and the items were matched for number of syllables across both varieties. The corresponding pictures were black and white drawings obtained from the Snodgrass and Vanderwart (1980) picture set or various internet sources. There were no significant differences in syllable length and phoneme length between cognates (mean syllable length: 1.8; mean phoneme length: 5.4) and non-cognates (mean syllable length: 1.6; mean phoneme length: 4.7; all *p*'s > .32). Word frequency data were not available for the Dundonian items; the word frequency of Standard English cognates (mean CELEX log-WF: 1.47) and non-cognates (mean CELEX log-WF: 1.38) was not significantly different (*p* = .85).

Table 4.1: Table outlining the list of Standard English and Dundonian items used in the Dialect Switching Task. Items are categorised by which block they belonged to: cognate or non-cognate.

Cognate Items		Non-Cognate Items	
Standard (Anglo/Scottish) English	**Dundonian Scots**	**Standard (Anglo/Scottish) English**	**Dundonian Scots**
Eyes	Ezz	Armpit	Oxter
Farmer	Fermer	Boy	Laddie
Garden	Gairden	Children	Bairns
Glasses	Glesses	Ears	Lugs
Heart	Hert	Girl	Lassie
House	Hoose	Hill	Brae
Mouse	Moose	Potato	Tattie
Sausages	Sassages	Slippers	Baffies
Screwdriver	Screwdrevver	Turnips	Neeps

Dialect Switching Task Procedure

Participants were first of all asked to complete the dialect background questionnaire before proceeding to the Dialect Switching Task. The English monodialectal participants were given the Dialect Training Task first (see materials section for procedure for this task) before moving to the main switching task.

Participants were shown all 18 pictures which were to be used in the main experiment (9 cognate items and 9 non-cognate items) and asked whether they were familiar with any of the Dundonian names for the pictures. Participants were asked to pronounce both versions of each word (for example, “screwdriver” and “screwdrevver”; “turnips” and “neeps”) and to let the experimenter know whether any of the words were unfamiliar to them or if any of the pictures were unclear. They were also reminded that this was a *dialect* switching task, and not one which required *accent* switching, therefore the English monodialectals, for example, could produce words like “bairn” in their non-rhotic English accents without having to mimic the rhoticity of a Scottish accent.

Participants were then given instructions for the experiment: half were asked to name the items using the Standard (Anglo/Scottish) English pronunciation if the picture was surrounded by a blue border and in Dundonian if the border was green (the other half had the assignment: Standard English = green, Dundonian = blue). Participants were instructed to, if possible, omit any extraneous vocalisations (e.g. “um…”) as the microphone would record this as their response and potentially move to the next trial while they continued to vocalise their target response. Participants were also instructed not to be overly concerned with correcting themselves if they made a mistake as often there would not be enough time for two utterances of the word before the next trial began.

Naming latencies were measured (using a microphone connected to a serial-response box) from the onset of picture presentation until the participants' response triggered the voice key. Participants completed the practice block (36 trials), before moving on to the four main experimental blocks (each containing 72 trials). Participants' responses were recorded using a SONY ICD-UX533 recording device and were coded for accuracy and error type at a later time. A sample of these recordings was used in the dialect ratings task.

Dialect Ratings Task

A selection of three audio-taped Dundonian naming responses from fifteen participants per dialect group (135 responses in total; audio files for 3 participants (one per group) were unusable due to software problems), obtained in the dialect-switching experiment, was rated by eight new participants who were proficient speakers and users of both SSE and Dundonian. This task was presented using Eprime version 1 run on Windows 7.

Audio responses were rated with respect to authenticity of native Dundonian pronunciation using a slider on a line presented on the screen with “not good” marked on the left hand side at the 450 pixel position, and “very good” marked on the right-hand side at the 1250 pixel position. Participants were not aware of the dialect background of each speaker.

Design

Dialect Switching Experiment

This experiment employed a mixed design: the independent variables were the between-subject variable Dialect Group (active bidialectals, passive bidialectals and monodialectals), and the within-subject variables of Linguistic Variety (Dundonian vs Standard (Anglo/Scottish) English), Cognate Status (cognate vs non-cognate), and Trial Type (switch vs non-switch). The dependent variables were error rates and naming latencies.

Dialect Ratings Task

This experiment employed a within subjects design with the independent variable being Dialect Group of Speaker (active bidialectal, passive bidialectal or monodialectal). The dependent variable was authenticity score as determined by the pixel position on a scale of "not authentic" (450 pixel position) to "very authentic" (1250 pixel position).

RESULTS

Section A: Background Variables

Percentage Standard (Anglo/Scottish) English Usage

The English monodialectal participants had the highest percentage of Standard English usage (M = 96.87, SD =7.04), followed by the passive bidialectals (M = 87.13, SD = 9.22), with the lowest amount used by the active bidialectals (M = 46.88, SD = 17.97).

A one-way between subjects ANOVA revealed a significant effect of Dialect Group on Percentage of Standard (Anglo/Scottish) English Usage ($F(2, 45) = 73.72$, $p < .001$, partial $\eta^2 = .8$). Post hoc Tukey tests revealed the difference between active bidialectals and passive bidialectals was significant ($p < .001$, $d = 3$) as was the difference between active bidialectals and English monodialectals ($p < .001$, $d = 4$). There was no significant difference between the passive bidialectals and the English monodialectals ($p = .077$)

Proportion of Life Spent Living in Dundee

The background questionnaire enquired about the participants' age and the number of years they had spent living in Dundee, from which the proportion of their life spent living in Dundee was calculated. Active bidialectals had the largest proportion of life spent living in Dundee (*M* = .95, *SD* = .10), followed by passive bidialectals (*M* = .88, *SD*= .21) with the

English monodialectals having spent a smaller proportion of their lives in Dundee (*M* = .11, *SD* = .15).

A one-way between subjects ANOVA revealed a significant effect of Dialect Group on proportion of life spent living in Dundee ($F(2, 45) = 130.76$, $p < .001$; partial $\eta^2 = .85$). Post hoc Tukey tests revealed the difference between active bidialectals and English monodialectals was significant ($p < .001$, $d = 6.12$) as was the difference between passive bidialectals and English monodialectals ($p < .001$, $d = 4.27$). There was no significant difference between the active and passive bidialectals ($p = .323$)

Self-rated comprehension of Dundonian

In the background questionnaire, participants were asked to give a self-rating on a scale from 1 – "Can't Understand" to 7 – "Completely Understand" as to how well they could understand a Dundonian speaker. Active bidialectals had the highest self-rated comprehension (*M* = 6.69, *SD* = .48), followed by passive bidialectals (*M* = 6.31, *SD* = .87), with the English monodialectals having the lowest self-rated comprehension (*M* = 4.63, *SD* = 1.63).

A Kruskal-Wallis test revealed a significant difference in self-rated Dundonian comprehension between Dialect Groups ($H(2) = 16.96$, $p < .001$). Post-hoc tests using Bonferroni-corrected Mann-Whitney tests showed a significant difference between the active bidialectals and English monodialectals (*U* = 18.43, *p* < .001) and between passive bidialectals and English monodialectals (*U* = 18.44, *p* = .009). No significant difference was found between the active and passive bidialectals (*p* = .962).

Number of Identified Dundonian Items

At the beginning of the dialect switching experiment participants were asked to give the Dundonian labels of the 18 items used in the main experiment. This provided an objective measure of Dundonian knowledge alongside the subjective self-rating of Dundonian comprehension and a Pearson's product-moment correlation coefficient showed a significant positive linear relationship between these two variables (*r* = .654, *N* = 48, *p* < .001). Active bidialectals identified the greatest number of Dundonian items (*M* = 18, *SD* = 0), closely followed by the passive bidialectals (*M* = 17.87, *SD* = .34), with the English monodialectals identifying the fewest number of Dundonian items (*M* = 5.19, *SD* = 2.81).

A one-way between subjects ANOVA revealed a significant effect of Dialect Group on Number of Dundonian items identified (F (2, 45) = 324.64, p < .001, partial η^2 = .9). Post hoc Tukey tests revealed the difference between active bidialectals and English monodialectals was significant (p < .001, d = 9) as was the difference between passive bidialectals and English monodialectals (*p* < .001, *d* = 8). No significant difference was found between the active and passive bidialectals (p = .975).

Authentic Native-Dundonian Production

The *Dialect Ratings Task* was used to determine how native-like the participants sounded in their production of Dundonian items as rated by independent speakers measured using x-axis pixel position on a scale of “Not Authentic” (x = 450 pixels.) to “Very Authentic” (x = 1250 pixels). Passive bidialectals were rated as the most authentic (M = 1050.6, SD = 245.3) with active bidialectals (M = 1048.1, SD = 247.8) following closely behind, and English monodialectals were rated the least authentic (M = 646.3, SD = 269.7).

A one-way ANOVA with Dialect Group (of the speaker) as a within-subjects factor revealed a significant effect of Dialect Group on pixel position ($F(2,28) = 64.01$, $p < .001$, partial $\eta^2 = .82$). Follow-up Bonferroni tests revealed significantly less authentically rated Dundonian pronunciation in the English monodialectals compared to the active ($p < .001$, $d = 1.08$) and passive ($p < .001$, $d = 1.1$) bidialectals; again, there was no significant difference between the latter two groups ($p = 1.000$). This suggests that active and passive bidialectals did not differ in authenticity of native-like Dundonian pronunciation despite passive bidialectals reporting limited production of this variety; however, both bidialectal groups differed from the monodialectals who often displayed a noticeable English accent.

Summary of Between Group Differences

The active and passive bidialectals did not differ significantly from each other on any measure except % English Usage. The passive bidialectals and English monodialectals showed no significant difference in % English Usage, but significantly differed from each other in all other measures. The active bidialectals and monodialectals were significantly different from each other on every measure.

Table 4.2: Table displaying means (and standard deviations) of a range of background measures summarising Dialect Group differences and similarities. Matching background colours indicate no significant difference between those groups for that measure; differing colours indicate a significant difference was found between groups on that measure.

	Active	**Passive**	**Monodialectal**
% English Usage	**46.88 (17.97)**	**87.13 (9.22)**	**96.87 (7.04)**
Proportion of Life in Dundee	**.95 (.10)**	**.88 (.21)**	**.11 (.15)**
Self-rated Dundonian Comprehension	**6.69 (.48)**	**6.31 (.87)**	**4.63 (1.63)**
Knowledge of Dundonian Items	**18 (0)**	**17.87 (.34)**	**5.19 (2.81)**
Native-like Dundonian Pronunciation	**1048.1 (247.8)**	**1050.6 (245.3)**	**646.3 (269.7)**

Section B: Dialect Switching Paradigm Results

In line with Raaijmakers (2003), only the by-subjects analyses are reported in this and the proceeding chapters[38].

Error Rates/Proportion of Correct Responses

Trials that were invalidated due to premature triggering of the voice key (0.7%) as well as first trials of a block, which are undefined as to Trial Type (1.3%), were excluded prior to any further analyses. Of the remaining trials, errors, i.e. trials in which participants produced either the wrong word or the correct word in the wrong variety, comprised 3.7% of trials. Error rates were then used to calculate the overall proportions of correct responses as outlined in Table 4.3.

[38] The results for this chapter were confirmed with Mixed Effects Analyses as part of the preparation for publication and are attached in Appendix C (i) for Error Rates and C (ii) for Naming Latencies.

Table 4.3: Means (and standard deviations) of proportion of correct responses for each combination of Dialect Group, Cognate Status, Linguistic Variety and Trial Type.

	Dundonian		Standard English	
	non-switch	switch	non-switch	switch
active bidialectals				
cognate	.962 (.041)	.967 (.035)	.984 (.026)	.969 (.475)
non-cognate	.966 (.040)	.955 (.049)	.961 (.062)	.962 (.051)
passive bidialectals				
cognate	.969 (.049)	.981 (.033)	.987 (.021)	.993 (.021)
non-cognate	.974 (.040)	.960 (.055)	.965 (.039)	.995 (.043)
monodialectals				
cognate	.969 (.055)	.933 (.083)	.969 (.033)	.965 (.051)
non-cognate	.963 (.033)	.945 (.062)	.949 (.064)	.918 (.065)

Proportion of correct responses were submitted to a 3 (Dialect Group: active bidialectal, passive bidialectal, English Monodialectal) by 2 (Cognate Status: cognate, non-cognate) by 2 (Linguistic Variety: Dundonian, Standard (Anglo/Scottish) English) by 2 (Trial Type: non-switch, switch) mixed ANOVA was conducted which showed a main effect of Cognate Status ($F(1, 45) = 11.38$, $p < .01$, partial $\eta^2 = .2$, with a higher mean proportion of correct responses in the cognate blocks (.971) than the non-cognate blocks (.956). A main effect of Trial Type was also found ($F(1, 45) = 7.62$, $p < .01$, partial $\eta^2 = .15$, with a greater mean proportion of correct responses in non-switch trials (.968) than switch trials (.959). A significant two way interaction was found between Cognate Status and Linguistic Variety ($F(1, 45) = 6.31$, $p < .05$, partial $\eta^2 = .12$) indicating that the difference in proportion of correct responses differed across the two types of block (a lower mean proportion of correct responses was found for Dundonian items (.964) than Standard English items (.978) in the cognate blocks, whereas this was reversed in the non-cognate blocks with Dundonian items (.960) having a mean higher proportion of correct responses than Standard English responses (.952)). A significant two way interaction was also found between Trial Type and Dialect Group ($F(2, 45) = 3.40$, $p < .05$, partial $\eta^2 = .13$) with the difference in proportion of correct responses between switch trials and non-switch trials being greater for the English monodialectal participants (.017) than the passive bidialectals (.002) ($p < .05$).

Naming Latencies

For the analyses of naming latencies, recovery trials following an error (3.8%), as well as items with latencies below 150 ms, above 3000 ms or greater than 3 standard deviations above the participant mean (2.1%) were excluded from the correct trials (see: Table 4.4).

Table 4.4: Means (and standard deviations in brackets) for naming latencies across the different combinations of Dialect Group, Cognate Status, Trial Type and Linguistic Variety.

	Dundonian		Standard English	
	non-switch	switch	non-switch	switch
active bidialectals				
cognate	797.3 (204.7)	834.1 (210.4)	792.7 (193.5)	840.1 (183.3)
non-cognate	939.3 (212.1)	1036.6 (268.9)	983.4 (223)	1070.4 (265.9)
passive bidialectals				
cognate	873.6 (157.7)	910.2 (167.6)	834.6 (140.1)	894.8 (175.8)
non-cognate	983.6 (145.2)	1108 (197.9)	1059.8 (163.3)	1147.5 (208.8)
monodialectals				
cognate	929.7 (141.3)	991.9 (191.3)	852.3 (120.2)	991.4 (184.3)
non-cognate	1025 (177.8)	1132.7 (257.9)	1033.9 (157.9)	1183.6 (191.5)

Naming latencies were submitted to a 3 (Dialect Group: active bidialectal, passive bidialectal, English monodialectal) by 2 (Cognate Status: cognate, non-cognate) by 2 (Linguistic Variety: Dundonian, Standard (Anglo/Scottish) English) by 2 (Trial Type: non-switch, switch) ANOVA which revealed significant main effects of Cognate Status ($F(1, 45)$ = 193.29, $p < .001$, partial η^2 = .81) with cognate items (M = 876.9ms, SD = 173.44ms) named on average 164.95ms faster than non-cognate items (M = 1041.85ms, SD = 195.07ms), and Trial Type ($F(1, 45)$ = 88.98, $p < .001$, partial η^2 = .66), with non-switch trials (M = 916.2ms, *SD* = 169.7ms) being named, on average, 81.08ms faster than switch trials (*M* = 997ms, *SD* 208.6ms).

There was a two-way interaction between Cognate Status and Linguistic Variety ($F(1, 45) = 26.99$, $p < .001$, partial $\eta^2 = .38$), indicating that the magnitude of difference in naming latencies between the two linguistic varieties was significantly different between the cognate and non-cognate blocks (Dundonian items were named on average 21.22ms faster than Standard English items in the cognate blocks but were named 39.68ms slower than Standard English items in the non-cognate blocks) and between Cognate Status and Trial Type ($F(1, 45) = 17.74$, $p < .001$, partial $\eta^2 = .28$) indicating that switch costs were on average 34.17ms greater in the non-cognate blocks (99.78ms) than in the cognate blocks (65.60ms).

There was also a significant three-way interaction between Linguistic Variety, Trial Type and Dialect Group ($F(2,45) = 4.03$, $p < .05$, partial $\eta^2 = .15$) indicating that the interaction between Linguistic Variety and Trial Type was significantly different across the Dialect Groups as shown in Figure 4.2.

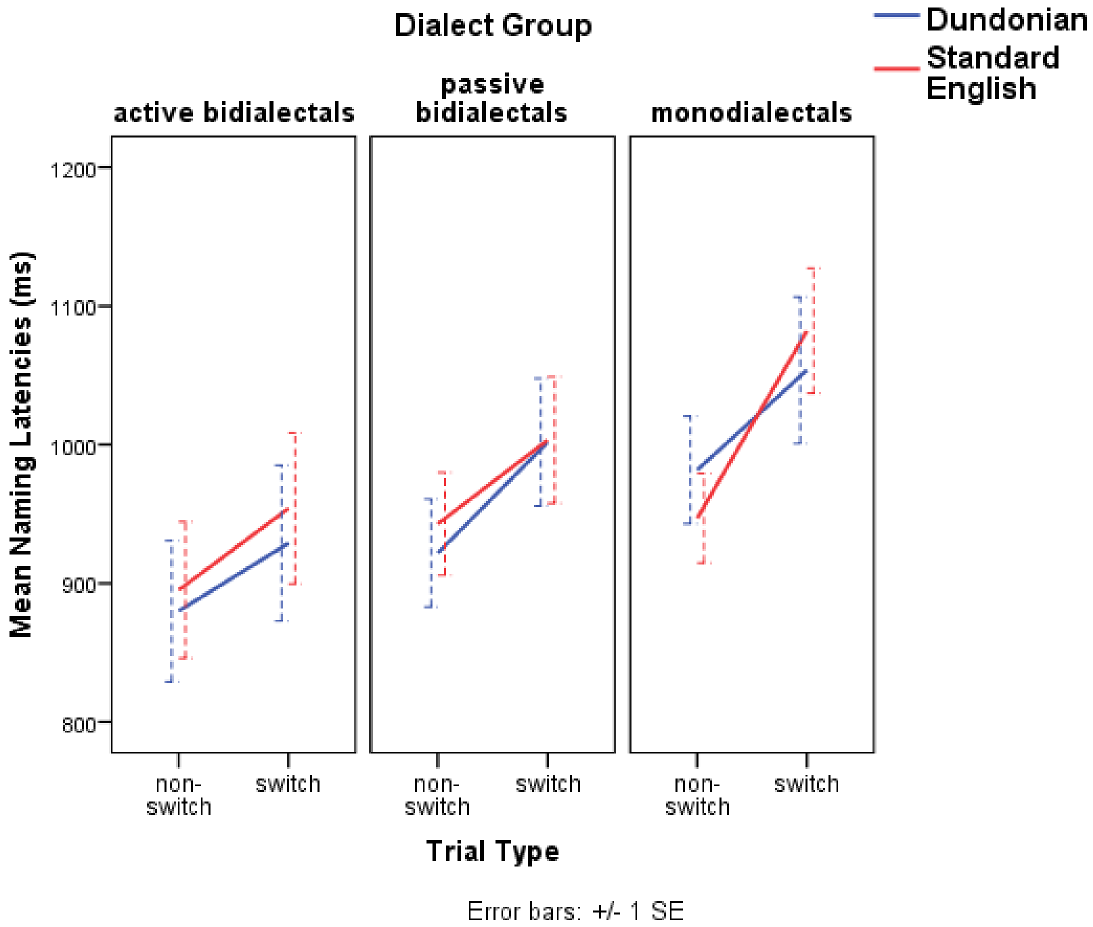

Figure 4.2: Graph displaying interactions between Trial Type and Linguistic Variety across the 3 Dialect Groups (active bidialectal, passive dialectal, English monodialectal).

Separate analyses for the Dialect Groups revealed that this interaction between Linguistic Variety and Trial Type (i.e. the difference in magnitude of switch costs between the two linguistic varieties) was not significant in the active (p = .976) and passive (p = .668) bidialectals but was significant in the English monodialectals ($F(1, 15) = 16.82$, $p < .001$, partial $\eta^2 = .53$) (see Figure 4.3).

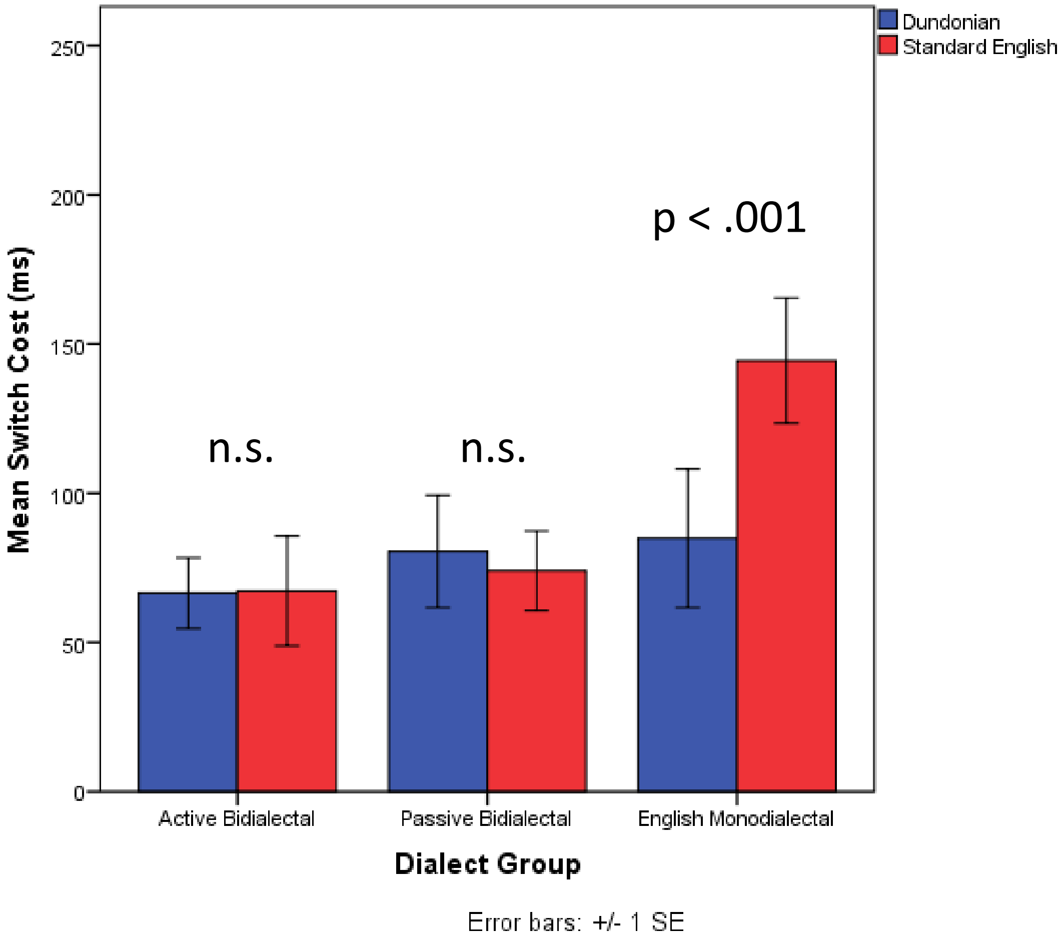

Figure 4.3: Switch Costs (as measured by differences between non-switch and switch trials) for both Linguistic Varieties across the 3 Dialect Groups. Only the English monodialectal group display a significant difference in Switch Costs between the two varieties.

For active bidialectals the absence of a significant Trial Type by Linguistic Variety interaction demonstrates that the switch costs for both varieties were symmetrical (66.51ms for Dundonian, 67.22ms for Standard English), which is also true of the passive bidialectals (80.95ms for Dundonian, 73.98ms for Standard English) indicating that both groups behave like balanced bilinguals from previous research (Costa and Santesteban, 2004). This interaction differed for the English monodialectals who displayed asymmetrical switch costs, with a significantly higher cost for switching to Standard English (144.42.ms), which is essentially their dominant language, than for Dundonian (80.5ms), their weaker variety.

DISCUSSION

The results of this study showed that when active bidialectal speakers of Standard (Scottish) English and Dundonian Scots were asked to switch between dialect and standard varieties, they displayed very similar effects to those found for bilinguals switching between languages: Naming latencies were slower when speakers had to switch between varieties, and these switching costs were symmetrical, similar to what is typically found for balanced bilinguals (Bobb & Wodniecka, 2013; Costa & Santesteban, 2004; Declerck et al., 2015; Declerck & Philipp, 2015a). Relatedly, active bidialectals were numerically slower to name in English than in Dundonian, and although this did not reach significance for this group (p = .068), it displays a similar trend as reported by Costa and Santesteban (2004) who observed that their balanced bilinguals were slower to name in their dominant variety[39]. Although the passive bidialectals reported using significantly less Dundonian than the actives, these two Scottish bidialectal groups did not differ from each other on any other background measure, including their proficiency level and the authenticity of their Dundonian production. Moreover, like for the active bidialectals, switching costs were symmetrical for the passive bidialectals.

These switching costs were asymmetrical, however, for the English monodialectals who had limited familiarity with Dundonian. Similar to what is typically found for unbalanced bilinguals, who display higher switch costs when switching back into the dominant variety (Meuter & Allport, 1999), these monodialectal participants had a greater

[39] Although balanced bilinguals in Costa and Santesteban's (2004) study had high proficiency in both languages, they determined that one language could still be slightly more dominant than the other. This should also hold true of the active bidialectals in the present study – English is likely to be more dominant as its use is ubiquitous, and it is used in literacy whereas Dundonian is not (or at least, rarely) used.

switch cost for Standard English than for their weaker variety (Dundonian). These findings support the principles of Green's (1998) Inhibitory Control model suggesting that Dundonian is represented like a separate language: lexical items are tagged as belonging to either Standard English or Dundonian, an equivalent language task schema is employed in order to suppress the tags of the non-target variety and this level of inhibition is proportional to the current level of activation of the lexical items in each of the varieties. Like in balanced bilinguals, this manifests itself as symmetrical switch costs for individuals who are highly proficient in both varieties as an equal amount of inhibition is applied to each variety (e.g. Declerck et al., 2015), whereas asymmetrical switch costs are present in those who have to apply greater levels of inhibition to suppress their dominant, and thus more highly activated, variety.

Costa and Santesteban (2004) have proposed that highly proficient bilinguals employ a qualitatively different mechanism of language control, and inhibition is only employed by bilinguals who do not have high proficiency in both languages (which manifest as asymmetrical switch costs). Regardless of whether it is solely inhibition (see: Declerck et al., 2015; Green, 1998; Meuter & Allport, 1999), or an increase in activation of the target language (as proposed by Costa & Santestban, 2004) that is responsible for bilingual language control, the results of the present study fit both these accounts and demonstrate that the language control displayed by active and passive bidialectals is similar to highly proficient balanced bilinguals, whereas the language control displayed by monodialectals is similar to that of second language learners or unbalanced bilinguals. This suggests that speakers of varieties with a large degree of typological similarity employ the same language control mechanisms as speakers of typologically more distant languages. Yet how does this explain the performance of passive bidialectals who report high levels of comprehension of both varieties but do not report *speaking* both dialects? The findings of this study have potential implications for the understanding of bilingual lexical representations as they suggest that accessibility of languages may primarily be determined by frequent comprehension, and not necessarily by frequent production (e.g. Green, 1998). Thus an explanation for the performance of the passive bidialectals is in line with models that propose shared representations for comprehension and production (Grainger, Midgley, & Holcomb, 2010). Put in the context of Green's (1998) IC model, the presence of asymmetric switching costs, as well as a cognate facilitation effect in the monodialectals speakers who had only limited recent dialect exposure, suggests that variety-specific tags may be established after fairly brief periods of exposure to a new variety. Exactly how much exposure to a variety is required before these tags are developed is an empirical question which warrants further investigation[40].

The results of this study also show cognate facilitation effects that are similar to those reported in the bilingual picture naming literature (Christoffels et al., 2007; Costa et al., 2000; Declerck, Koch & Philipp, 2012): Cognates were generally named more accurately and faster, especially in Standard English, similar to the larger L1 cognate facilitation effects in mixed language blocks found in bilinguals (Christoffels et al., 2007; Verhoef et al., 2009). Even in balanced bidialectals, naming latencies in Standard English were more susceptible to influences from the phonological representation of the dialect suggesting that cognate facilitation may be more sensitive to subtle differences in linguistic dominance, even if

[40] This will be investigated in **Chapter 6**.

switch costs are not. Moreover, as in the unbalanced bilinguals studied by Declerck et al. (2012) which used a similar methodology (i.e., nine cognates vs non-cognates in each separate block), non-cognates incurred larger switch costs than cognates suggesting that switch trials were more susceptible to cognate facilitation. Thus, in situations where the non-target variety needs to be inhibited interference from non-target phonological representations is strongest. This supports the idea of a cascaded model of lexical access (e.g. Caramazza, 1997) for bidialectals as well as for bilinguals.

What are the implications of these findings?

The results of this chapter show that three different groups of participants, who would all traditionally be categorised as monolingual, performed differently on a dialect version of a language switching task depending on their familiarity with a second dialect. Those with a high level of proficiency in a second dialect produced a pattern of switch costs like balanced bilinguals, even when they did not regularly produce the dialect, whereas those with limited proficiency displayed results that were similar to second language learners (or unbalanced bilinguals). If interpreted within the framework of Green's (1998) IC model, these results provide evidence that dialectal lexical entries may be tagged with respect to linguistic variety membership and that dialects such as Dundonian Scots contain enough items with separate tags to engender the same effects that occur with speakers of independent languages.

Despite the active and passive bidialectals behaving cognitively like balanced bilinguals, according to the Scottish Government (2010) report, 64% of respondents stated that they “don’t really think of Scots as a language – it’s more just a way of speaking”. As a result, such individuals would likely be categorised, and self-identify, as monolinguals. Such categorisations could be problematic when comparing monolinguals with bilinguals and may offer a different explanation as to why some studies do not find evidence for a bilingual advantage in non-linguistic inhibitory control: if bidialectals frequently find themselves in situations requiring them to selectively control lexical access in their different varieties (even if just during comprehension), then executive control processes may be exercised to a similar extent as in bilinguals who have to control lexical access in different languages. Yet, if researchers do not have an awareness of the non-standard language varieties which are present in a given environment, and do not employ the use of sensitive measures which allow participants to self-report their use of non-standard varieties, then bidialectals are likely to be erroneously categorised as monolingual, potentially rendering any monolingual versus bilingual comparison as void (for a published discussion of this idea, see Kempe, Kirk, & Brooks, 2015).

Chapter 5: Are Changes in Articulatory Settings Responsible for Previously Reported Language Switching Costs?

The work contained within this chapter has been disseminated as follows:

Kirk, N.W., Scott-Brown, K.C., & Kempe, V. (2015) Are changes in articulatory settings responsible for the language switching cost? Poster presented at *ICPS, Amsterdam, Netherlands*.

INTRODUCTION

Using a language switching paradigm adapted for use with dialects, the study in the previous chapter demonstrated that active and passive bidialectals displayed a pattern of switch costs similar to balanced bilinguals, whereas the pattern of switch costs displayed by monodialectals (with limited previous exposure to a second dialect) was similar to the performance of unbalanced bilinguals (or second language learners) reported in previous studies (see: Costa & Santesteban, 2004; Meuter & Allport, 1999). The switch costs which are evident in the language switching paradigm are commonly interpreted as being a marker of the employment of inhibition when switching between different linguistic varieties in line with Green's (1998) Inhibitory Control (IC) model (see: Declerck & Philipp, 2015a, for a discussion), although some proposals have suggested that lexical items in the target language are subject to increased activation rather than items in the non-target language being subject to inhibition (e.g. Costa & Santesteban, 2004). Regardless of the exact mechanisms involved in bilingual language control, these different explanations are all posited to define switching costs in terms of lexical access. However, Finkbeiner, Almeida, Janssen, and Caramazza (2006) provide an alternative explanation, proposing that (asymmetric) switch costs are not caused by inhibition of non-target varieties, but are a consequence of the bivalent stimuli used in such paradigms. Although not widely accepted by other researchers (see: Delerck & Philipp, 2015a; Philipp & Koch, 2009), Finkbeiner et al.'s (2006) theory raises the question as to whether other aspects of speech production, outwith the mechanisms used at the lexical level, could contribute to the switching cost frequently observed in such paradigms.

Articulatory Settings

One often overlooked aspect of switching between languages is the change in language-specific articulatory settings which bilinguals have to employ in order to produce native-like pronunciations in a target variety (Wilson & Gick, 2014). Articulatory settings are defined as "the overall arrangement and manoeuvring of the speech organs necessary for the facile accomplishment of natural utterance," (Honikman, 1964) and may represent an optimal configuration of the articulators with which a set of target speech sounds can be produced with minimal effort[41]. This configuration can consist of changes in the position of the upper and lower lips, larynx, pharynx, tongue, velum and jaw positions (Gick, Wilson, Koch & Cook, 2004). While the concept of the existence of such a range of settings has been considered for some time (see: Gick et al., 2004; Mennen, Scobbie, de Leeuw, Schaeffler, & Schaeffler, 2010), it is only in relatively recent years that these have been measurable, using technologies such as X-rays (e.g. Gick et al., 2004), electropalatography (EPG; e.g. Cleland, Mccron, & Scobbie, 2013; Scobbie & Pouplier, 2010), magnetic resonance imaging (MRI; see: Ramanarayanan, et al. 2010) and ultrasound imaging (e.g. Lawson, Stuart-Smith, & Scobbie, 2008; Scobbie, Stuart-Smith, & Lawson, 2012). Gick, et al. (2004) have shown, for example, that the inter-speech postures[42] (ISP) for English and French, as measured by the positions of the aforementioned speech organs, are significantly different from each other in monolingual speakers, providing evidence that a different baseline articulatory posture exists for each language. Furthermore, Wilson and Gick (2014) have shown that bilinguals who are highly proficient in both of their languages use distinct language-specific ISPs,

[41] More effort would be required to successfully articulate speech under adverse speaking conditions such as speaking with a mouthful of food, for example.

[42] Gick et al. (2004) describe ISPs as being the inter-utterance speech resting positions; in other words, the default position which these articulators return to between utterances.

indicating that they have discrete articulatory settings for both of their languages, which they must shift between when switching from one language to the other.

There is evidence to suggest that bilinguals produce less native-like pronunciations when switching between languages (Goldrick, Runnqvist, & Costa, 2014; see also: Amengual, 2012), which is commonly attributed to the partial activation of phonological representations from the (dominant) non-target language which interferes with the production of the target language (see also: Costa, Roelstraete & Hartsuiker, 2006, for further evidence of the feedback between the phonological and lexical levels of production across a bilingual's two languages). However, Simmonds, Wise, and Leech (2011) suggest that non-native speakers may fail to accurately produce L2 speech sounds as a result of problems in phonetic implementation (i.e. articulation), rather than being a result of difficulties with phonological encoding (i.e. the auditory discrimination of speech sounds). This may lead us to suspect that assembling different articulatory settings is effortful (especially for less familiar varieties) and could perhaps be responsible for some of the cost involved in switching between varieties as has been previously demonstrated in various language switching paradigms (e.g. Costa & Santesteban, 2004; Meuter & Allport, 1999).

<u>Different Articulatory Settings in Monolingual Situations</u>

It is not only the process of switching *between* languages which involves the employment of different articulatory settings – different settings are required to produce several different types of speech even when remaining in a monolingual setting. Gick et al. (2004) describe articulatory settings as contributing to the essential 'sound' of a language or dialect (or accent), and that these settings are also used to form the basis of sociolinguistic differences within a variety. Such sociolinguistic features can involve, for example, replacing the phoneme /t/ with /?/ (glottal stop), a process known as t-glottalisation which is often considered a characteristic of less prestigious speech (Trudgill, 2000). Similarly, different articulatory processes are involved in shouting (Schulman, 1989) or whispering (Tsunoda, Ohta, Niimi, Soda, & Hirose, 1997); two types of speech production which employ different articulatory settings from speech spoken at normal volume, but do not involve accessing different lexical representations unlike the requirement involved when switching between dialects or languages.

With this in mind, if it is possible to demonstrate switch costs in a monolingual situation which only requires the switching of articulatory settings and does not require the access of different lexical representations, then perhaps it can be concluded that bilingual language switching (or indeed dialect switching) costs may be partly caused by the time taken to manoeuvre the speech organs into their target setting. Whether or not the preparation of articulatory processes is responsible for any part of the switch costs previously reported in the bilingual literature is an empirical question that has thus far not been addressed.

The Aim of this Study

The aim of the present study is to determine whether switch costs appear when participants are cued to switch between different articulatory settings. Using an adapted language switching paradigm, two experiments will be conducted which require participants to switch between different sets of articulatory settings while remaining within the same language variety. Participants will be randomly assigned to either of the experiments and will not take part in both.

The first experiment will use pictures of objects whose labels contain a target phoneme which can be produced in two different ways and thus requires the use of two different articulators. The paradigm will cue participants to name these pictures using either the phoneme /t/ or replace it with the phoneme /?/, also known as a glottal stop. The interchangeability of these phonemes (a process known as t-glottalisation) is common throughout many varieties of English, including Standard Scottish English (see: Stuart-Smith, 2004). Alongside the shift in articulatory settings required to produce these different phonemes, t-glottalisation also has a sociolinguistic component with the use of /?/ in place of /t/ often considered to be an improper way of speaking (see: Trudgill, 2000). However, to determine whether this sociolinguistic aspect of t-glottalisation may invoke more than just a change of articulatory processes (i.e. whether words produced with a glottal stop also have a separate lexical representation), a second experiment will be conducted which requires the use of different articulatory settings across two different volumes of speech.

Using the same stimuli as in Experiment 1, participants in Experiment 2 will be cued to switch naming pictures either by whispering their response or producing it at normal volume. Whispered speech requires a different set of articulatory processes than speech produced at normal volume (see: Tsunoda, et al., 2007), yet whispered items are unlikely to have a separate lexical representation to those spoken at different volumes,

The same materials will be used as in Experiment 1 to allow for a comparison of naming latencies and to determine whether there are in any differences in the magnitude of any potential switch costs between the two experiments.

METHOD

Experiment 1: Glottal (/?/) vs T (/t/) Switching

Participants

16 (5 male) adults (*M* = 29.38 years, *SD* = 9.34 years, range = 18 – 58 years) participated in Experiment 1[43]. Participants, who were all Scottish natives currently residing in Dundee (but were from different parts of Scotland), were paid £5 for participating in this experiment. This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A (iv)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Materials

Background Questionnaire

A background questionnaire was administered which enquired about the participants' general background and also some dialect/language background information (Appendix B (iii)). Participants provided information about their age, current occupation, highest level of education and birthplace, as well as listing any languages or dialects that they use and the usage patterns of these.

[43] Again, having sixteen participants was consistent with previous studies (e.g. Declerck & Philipp, 2014; Finkbeiner, et al., 2006; Meuter & Allport, 1999).

Glottal vs T Switching Task

A switching task was programmed using E-prime version 2 and was run on Windows 7. The switching task contained written instructions detailing the purpose of the task alongside a spoken set of instructions which were pre-recorded and presented over headphones. The purpose of this recording was to give the participants audible examples of the differences between the /t/ and /?/ phonemes.

Once participants had confirmed that they understood the difference between the /t/ and /?/ phonemes, they were given a practice block which contained all 36 Item X Variety combinations (18 items with /?/, 18 items with /t/). As performance on the practice block was not being recorded and thus a similar number of switch and non-switch trials was not crucial, these trials were allocated randomly by the E-prime script.

Participants were instructed as to which target variety to use for that trial by the colour of the border surrounding the item. The mapping of colour to variety was counterbalanced across participants, with half receiving the target of green = /?/, blue = /t/ and the other half receiving blue = /?/, green = /t/.

For the main task, each participant was presented with 2 blocks each containing 72 items. The same switch/non-switch sequence lists as used in the Dialect Switching Experiment (**Chapter 4**) were used. These lists were created randomly but then manipulated in order to ensure an even number of switch vs non-switch trials. Two sequence lists were used: one which began with two non-switch trials and one which began with a non-switch trial followed by a switch trial, and these lists were counterbalanced across subjects and blocks. There were a similar number of switch vs non-switch trials

(50.7% vs 49.3%) in each block and sub-lists were used within E-prime to ensure that each item was featured in a similar amount of switch and non-switch trials across both target varieties. During each trial, the target picture was presented simultaneously with the coloured border, and remained on the screen until participants had started their verbal response. The next trial started 1250 ms after onset of the participants’ response.

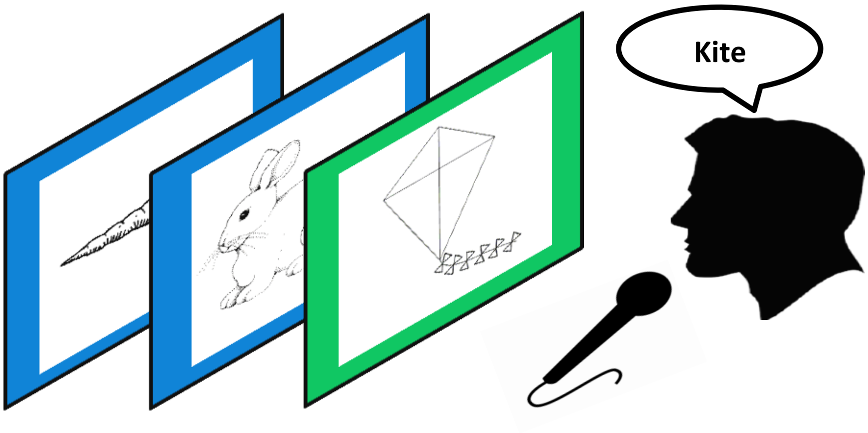

Figure 5.1: Representation of a selection of trials in the "Glottal" Switching Task for a participant given the cue of blue = /?/, green = /t/. The next trial in the sequence is cued for naming using the other articulatory setting, hence it is a "switch" trial. This is then followed by a "non-switch" trial, which requires the participant to remain within the same articulatory setting.

Stimuli

Eighteen words and their corresponding pictures were used in the experiment. All words contained the phoneme /t/ in a position which allowed it to be interchangeable with the phoneme /?/ (a "glottal stop"). Six of the items were mono-syllabic with a /t/ in the terminal position, six were bi-syllabic words with a terminal /t/ and six were bi-syllabic with the /t/ in the medial position. The corresponding pictures were black and white drawings obtained from various internet sources. The stimuli are outlined in Table 5.1.

Table 5.1: List of stimuli used in Glottal vs T switching task.

Mono-syllabic (terminal target phoneme)	**Bi-syllabic (terminal target phoneme)**	**Bi-syllabic (medial target phoneme)**
Bat	Basket	Butter
Hat	Carrot	Button
Kite	Peanut	Kitten
Net	Puppet	Letter
Pot	Rabbit	Lettuce
Rat	Rocket	Lighter

<u>Procedure</u>

Participants were presented with the written and spoken instructions outlining the nature of the task and the phonemes (and subsequently, the articulatory settings) they would be switching between. They were then presented with the eighteen items which were to be used throughout the task and were asked to pronounce each word using both articulatory settings and to let the experimenter know whether any of the words were unfamiliar to them or if any of the images were unclear.

Participants were then given instructions for the experiment: half were asked to name the items by producing the /t/ if the picture was surrounded by a blue border and with a /?/ if the border was green (the other half had the assignment: /t/ = green, /?/ = blue). They were also instructed to, if possible, omit any extraneous vocalisations (e.g. "um…") as the microphone would record this as their response and potentially move to the next trial while they continued to vocalise their target response. Participants were also instructed not to be overly concerned with correcting themselves if they made a mistake as often there would not be enough time for two utterances of the word before the next trial began. Lastly, participants were informed that, due to the random allocation of items to switch and non-switch trials, that certain non-switch trials may be a duplicate of the previous trial (e.g. a picture of a rabbit surrounded by a blue border, with the next trial also depicting a rabbit surrounded by a blue border) and visually may not appear to have advanced to the next trial, thus causing a delayed response. Such “replica” trials were removed from the naming latencies analysis.

Naming latencies were measured (using a microphone connected to a serial-response box) from the onset of picture presentation until the participants’ response triggered the voice key. Participants completed the practice block (36 trials), before moving on to the two main experimental blocks (each containing 72 trials).

<u>Design</u>

This experiment employed a within subjects design, with the independent variables being articulatory setting (/?/ vs /t/) and trial type (switch vs non-switch) and the dependent variables being error rates/proportion of correct responses and naming latencies (ms).

RESULTS

Error Rates/Proportion of Correct Responses

Trials that were invalidated due to premature triggering of the voice key (0.3%) as well as first trials of a block, which are undefined as to Trial Type (1.4%), were excluded prior to any further analyses. Of the remaining trials, errors, i.e. trials in which participants produced either the wrong word or the correct word in the wrong variety, comprised 6.9% of trials. A 2 (Articulatory Setting: /?/, /t/) by 2 (Trial Type: non-switch, switch) within subjects ANOVA revealed a main effect of Articulatory Setting ($F(1, 15) = 4.95$, $p = .042$, partial $\eta^2 = .25$) with a higher proportion of correct responses given for /t/ (.956) than for /?/ (.905). No other significant effects were found.

Table 5.2: Means (and standard deviations) for proportion of correct responses and naming latencies for non-switch and switch trials in the /?/ and /t/ conditions.

	/?/		/t/	
	non-switch	switch	non-switch	switch
Proportion of Correct Responses	.908 (.12)	.902 (.10)	.960 (.04)	.952 (.04)
Naming Latencies (ms)	1009.03 (270.81)	1111.06 (311.75)	911.80 (178.12)	1012.33 (181.9)

Naming Latencies

For the analysis of naming latencies, recovery trials following an error (6%), replica trials (i.e. those trials which were identical to the previous trial and thus didn't visually appear to be a new trial (1.8%)), as well as items with latencies below 150 ms, above 3000 ms or greater than 3 standard deviations above the participant mean were excluded (1.8%) from the correct trials.

The remaining 81.7% (of the overall number) of trials were subjected to a 2 (Articulatory Setting: /?/, /t/) by 2 (Trial Type: non-switch vs switch) within subjects ANOVA. This revealed a significant effect of Trial Type ($F(1, 15) = 17.99$, $p < .001$, partial $\eta^2 = .55$) with switch trials (M = 1061.7ms, SD = 221.1ms) taking on average 101.3ms longer than non-switch trials (M = 960.4ms, SD = 208.8ms), indicating that there was a cost involved with switching between the two articulatory settings. There was no significant effect of Articulatory Setting ($p = .083$), nor was there a significant interaction between Articulatory Setting and Trial Type ($p = .969$) indicating that the costs of switching between the two settings was symmetrical.

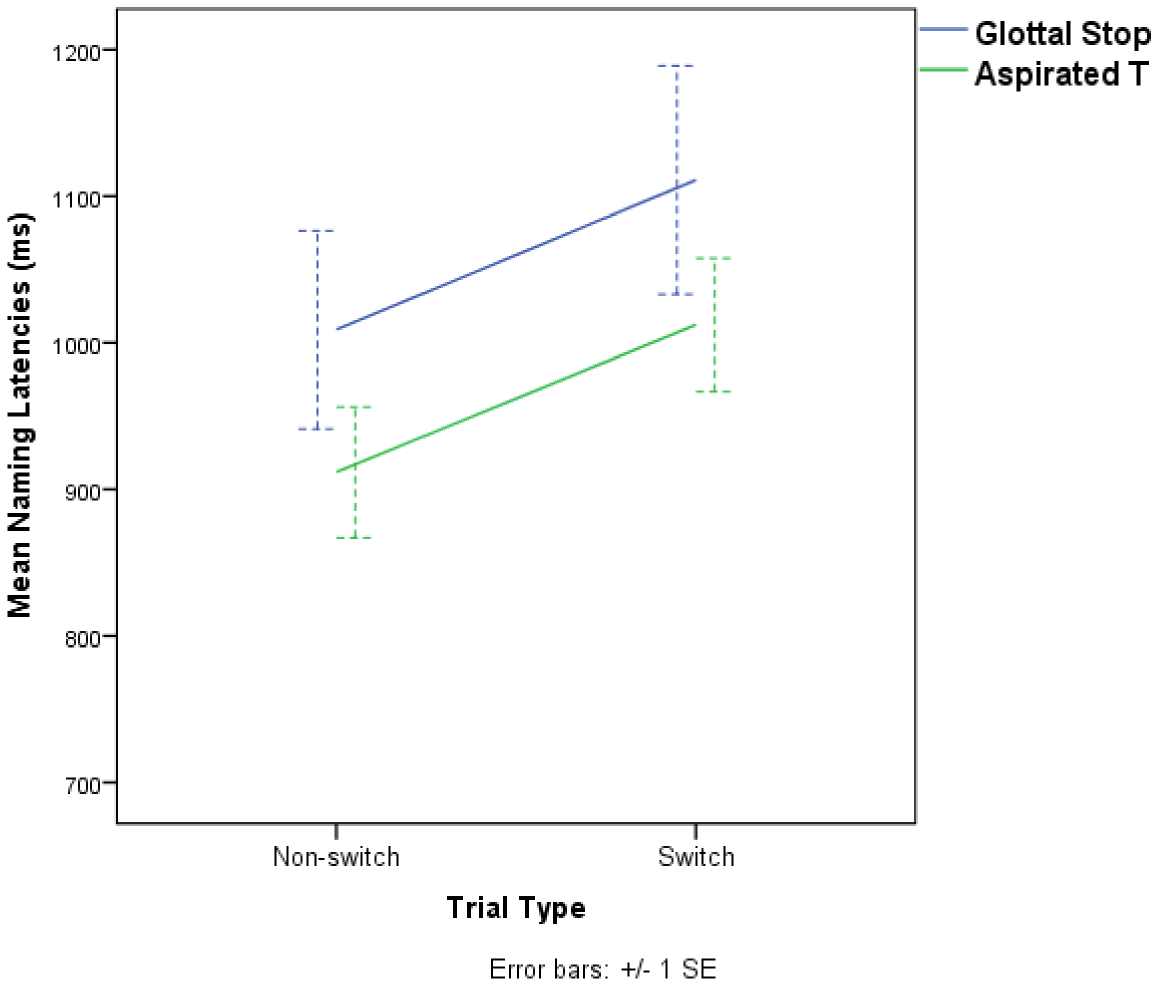

Figure 5.2: Graph displaying mean naming latencies for (and interactions between) Trial Type and Articulatory Setting in the Glottal experiment.

Experiment 2: Whispering vs Normal Volume Switching

Participants

16 (5 male) adults (*M* = 28.69 years, *SD* = 8.36 years, range = 21 – 49 years) participated in Experiment 2. Participants were all Scottish natives currently residing in Dundee (but were from various parts of Scotland, including Dundee) and were paid £5 for participating in this experiment. This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A (iv)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Materials

Background Questionnaire

A background questionnaire was administered which enquired about the participants' general background and also some dialect/language background information (Appendix B (iii)). Participants provided information about their age, current occupation, highest level of education and birthplace, as well as listing any languages or dialects that they use and the usage patterns of these varieties.

Whisper vs Normal Volume Switching Task

The same switching task as in Experiment 1 was used. This was programmed using E-prime version 2 and was run on Windows 7. The switching task contained written instructions detailing the purpose of the task and instructing them of the different articulatory settings they would be switching between. No pre-recorded verbal instructions were given for this task and participants were not informed about the nature of Experiment 1 and the /t/ vs /?/ component of that task.

Once participants had confirmed that they understood the purpose of the task, they were given a practice block which contained all 36 Item X Variety combinations (18 items with whisper as the target articulatory setting, 18 items with normal volume as the target). As performance on the practice block was not being recorded and thus a similar number of switch and non-switch trials was not crucial, these trials were allocated randomly by the E-prime script.

Participants were instructed as to which target articulatory setting to use for that trial by the colour of the border surrounding the item. The mapping of colour to articulatory setting was counterbalanced across participants, with half receiving the target of green = whisper, blue = normal volume and the other half receiving blue = whisper, green = normal volume.

For the main task, each participant was presented with 2 blocks each containing 72 items. The same switch/non-switch sequence lists as used in the Dialect Switching Experiment **(Chapter 4)** and the Glottal vs T experiment were used. These lists were created randomly but were then manipulated in order to ensure an even number of switch vs non-switch trials. Two sequence lists were used: one which began with two non-switch trials and one which began with a non-switch trial followed by a switch trial, and these lists were counterbalanced across subjects and blocks. There were a similar number of switch vs non-switch trials (50.7% vs 49.3%) in each block and sub-lists were used within E-prime to ensure that each item was featured in a similar amount of switch and non-switch trials across both target articulatory settings.

During each trial, the target picture was presented simultaneously with the coloured border, and remained on the screen until participants had started their verbal response. The next trial started 1250ms after onset of the participants' response.

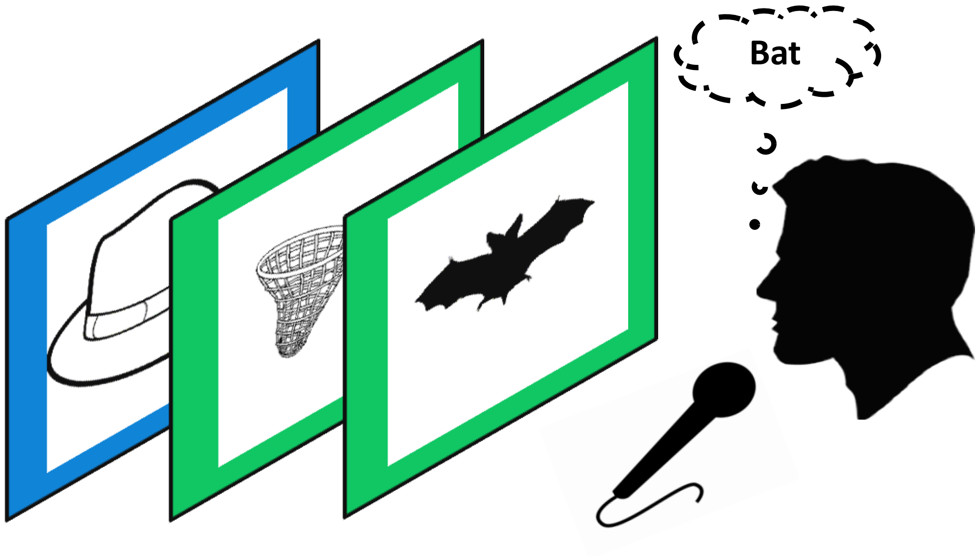

Figure 5.3: Representation of a selection of trials in the "Whisper" Switching Task for a participant given the cue of blue = normal volume, green = whisper. The next trial in the sequence is cued for naming using the same articulatory setting; hence it is a "non-switch" trial. This is then followed by a "switch" trial.

Stimuli

The same stimuli were used for this experiment as in Experiment 1. Eighteen words and their corresponding (black and white) pictures were used, and were obtained from various internet sources. The stimuli are outlined in Table 5.3.

Table 5.3: List of stimuli used in Whisper vs Normal Volume switching task.

Bat	Basket	Butter
Hat	Carrot	Button
Kite	Peanut	Kitten
Net	Puppet	Letter
Pot	Rabbit	Lettuce
Rat	Rocket	Lighter

Procedure

Participants were presented with the written and spoken instructions outlining the nature of the task and the articulatory settings they would be switching between. They were then presented with the eighteen items which were to be used throughout the task and were asked to pronounce each word using both articulatory settings (whisper and normal volume) and to let the experimenter know whether any of the words were unfamiliar to them or if any of the images were unclear.

Participants were then given instructions for the experiment: half were asked to name the items by whispering if the picture was surrounded by a blue border and at normal volume if the border was green (the other half had the assignment: /t/ = whisper, normal volume = blue). They were also instructed to, if possible, omit any extraneous vocalisations (e.g. “um…”) as the microphone would record this as their response and potentially move to the next trial while they continued to vocalise their target response. Participants were also instructed not to be overly concerned with correcting themselves if they made a mistake as often there would not be enough time for two utterances of the word before the next trial began. Lastly, participants were informed that, due to the random allocation of items to switch and non-switch trials, that certain non-switch trials may be a duplicate of the previous trial (e.g. a picture of a basket surrounded by a green border, with the next trial also depicting a basket surrounded by a green border) and visually may not appear to have advanced to the next trial, thus causing a delayed response. Such “replica” trials were removed from the naming latencies analysis.

Naming latencies were measured (using a microphone connected to a serial-response box) from the onset of picture presentation until the participants’ response triggered the voice key. Participants completed the practice block (36 trials), before moving on to the two main experimental blocks (each containing 72 trials).

Design

This experiment also employed a within subjects design. The independent variables were articulatory setting (whispering vs normal volume) and trial type (switch vs non-switch) and the dependent variables were error rates and naming latencies (ms).

RESULTS

Error Rates/Proportion of Correct Responses

Trials that were invalidated due to premature triggering of the voice key (0.2%) as well as first trials of a block, which are undefined as to Trial Type (1.4%), were excluded prior to any further analyses. Of the remaining trials, errors, i.e. trials in which participants produced either the wrong word or the correct word in the wrong variety, comprised 2% of trials. A 2 (Articulatory Setting: normal volume, whisper) by 2 (Trial Type: non-switch, switch) within subjects ANOVA revealed a main effect of Articulatory Setting ($F(1, 15) = 4.77$, $p = .045$, partial $\eta^2 = .24$) with a higher proportion of correct responses given for whispers (.969) than for normal volume responses (.991). No other significant effects were found.

Table 5.4: Means (and standard deviations) for proportion of correct responses and naming latencies for non-switch and switch trials in the normal volume and whisper conditions.

	Normal Volume		Whisper	
	non-switch	switch	non-switch	switch
Proportion Correct Responses	.996 (.01)	.986 (.02)	.974 (.03)	.964 (.07)
Naming Latencies (ms)	742.27 (110.87)	798.17 (110.35)	748.10 (138.73)	858.69 (165.43)

Naming Latencies

For the analyses of naming latencies, recovery trials following an error (2%), replica trials (i.e. those trials which were identical to the previous trial and thus didn't visually appear to be a new trial (1.1%)), as well as items with latencies below 150 ms, above 3000 ms or greater than 3 standard deviations above the participant mean (1.7%) were excluded from the correct trials.

The remaining 91.6% of trials were subject to a 2 (Articulatory Setting: normal volume, whisper) by 2 (Trial Type: non-switch, switch) within subjects ANOVA. This revealed a main effect of Articulatory Setting ($F(1, 15) = 8.82$, $p < .01$, partial $\eta^2 = .37$) with normal volume responses ($M = 770.22$ms, $SD = 104.94$ms) being on average 51.68ms faster than whispered responses ($M = 821.9$ms, $SD = 148.9$ms). A significant effect of Trial Type was also found ($F(1, 15) = 24.90$, $p < .001$, partial $\eta^2 = .62$), with switch trials (M = 828.43ms, $SD = 131$ms) taking on average 64.74ms longer than non-switch trials ($M = 763.69$ms, $SD = 122.3$ms), suggesting a cost involved with switching between these two articulatory settings. The interaction between Articulatory Setting and Trial Type was not significant ($p = .443$) suggesting that these switching costs were symmetrical.

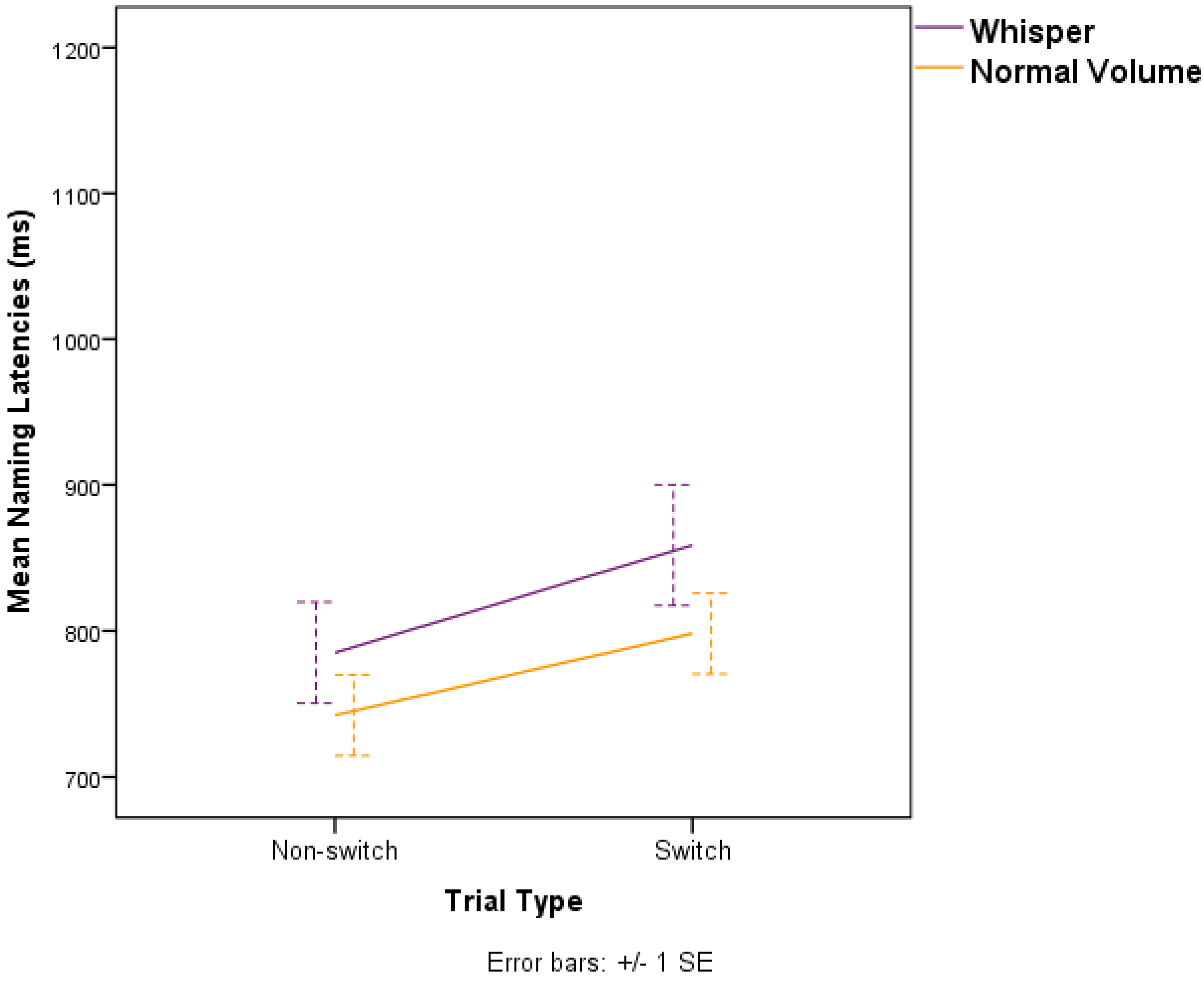

Figure 5.4: Graph displaying mean naming latencies for (and interactions between) Trial Type and Articulatory Setting in the Whisper experiment.

Validation of Whisper Trials

To ensure that the significant difference in naming latencies between whispered and normal volume responses was not a result of voice key failing to detect the beginning of the whispered responses, a sample of 20 (newly recorded) whisper trials were analysed. This involved using the spectrogram of the recorded trials to manually measure the naming latencies from the beginning of the trial (signified by the addition of a 300ms pure tone to indicate on the spectrogram where the trial began) until the beginning of production of the whispered response, and comparing this with the naming latencies as measured by the E-prime script. A Pearson product-moment correlation coefficient was computed to assess the relationship between the manual measurement and the E-prime measurement, which revealed a significant positive relationship (r = .827, n = 20, p = .006) between the two, indicating that whispered responses were successfully triggering the voice key.

Comparison of Both Experiments

As participants were randomly assigned to either the *Glottal* or *Whisper* experiment and the same stimuli were used in both, a joint analysis was conducted which pooled the data from both experiments. For the purpose of this analysis, Aspirated T and Normal Volume responses were designated as being the default articulatory settings for their respective experiments, and Glottal and Whisper responses were designated as being the deviant settings (see: Figure 5.6).

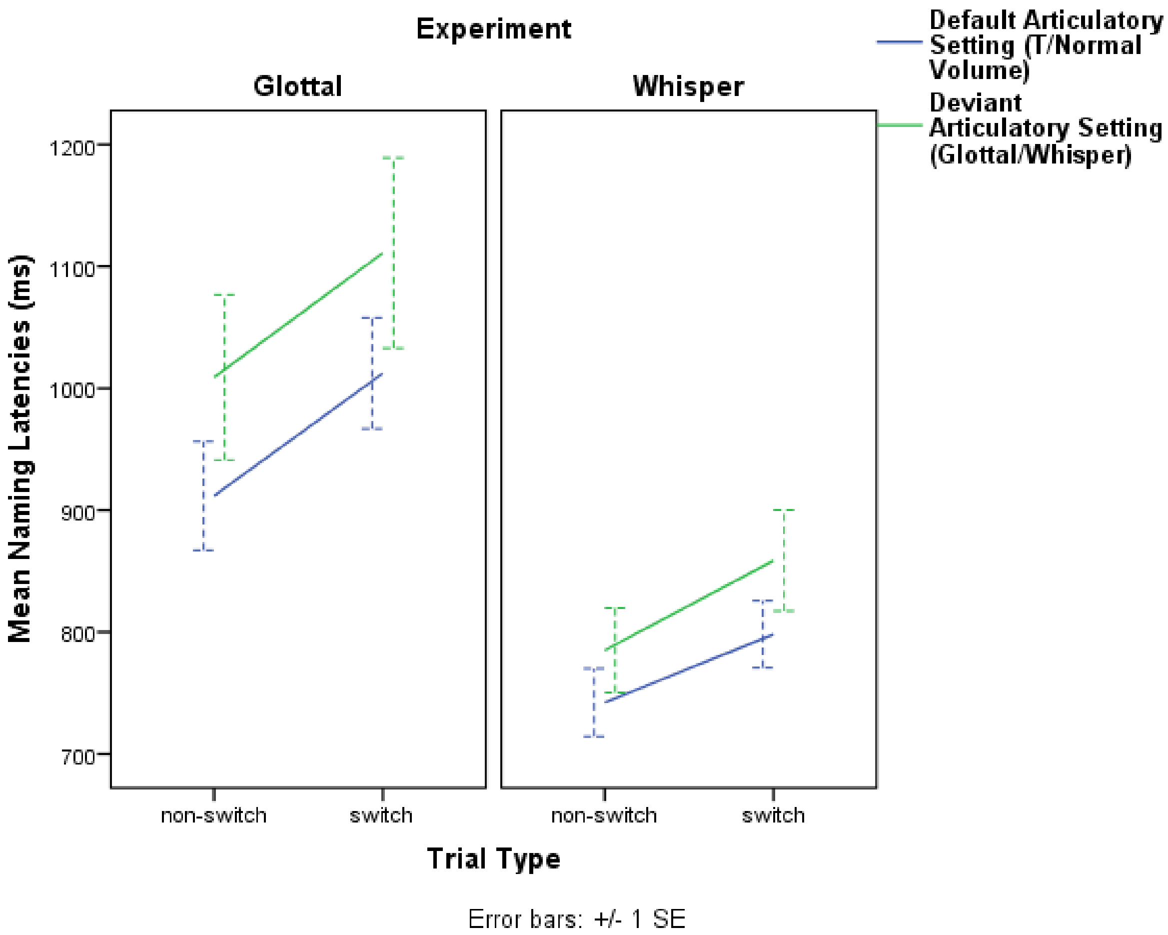

Figure 5.6. Comparison of naming latencies across the Glottal and Whisper experiments, displaying interactions between Articulatory Settings and Trial Type. The blue bars represent “default” articulatory settings (i.e. aspirated t for the Glottal task and normal volume for the Whisper task) and the green bars represent the “deviant” setting (which is glottal stops in the Glottal Task and whispers in the Whisper task.)

This analysis showed a significant main effect of Experiment with naming latencies in the glottal/t experiment (*M* = 1011.05ms, *SD* = 209.66ms) being around 215ms longer than naming latencies in the normal volume/whisper experiment (*M* = 796.06ms, *SD* = 124.02ms); $F(1, 30) = 12.46$, $p < .001$, partial $\eta^2 = .294$. A significant main effect of articulatory setting was also found with trials performed using “default” settings being on average 74ms faster than those with “deviant” settings: $F(1, 30) = 7.27$, $p < .05$, partial $\eta^2 = .195$. There was also a significant main effect of Trial Type with non-switch trials being on average 83ms faster than switch trials: $F(1, 30) = 37.14$, $p < .001$, partial $\eta^2 = .554$. No significant interactions were found suggesting the pattern and magnitude of the switch costs were similar across both experiments.

DISCUSSION

The results of this study showed that when participants were asked to name out loud a series of pictures they had longer naming latencies for trials in which they had to switch between using different sets of articulatory processes, compared with when they were instructed to remain within the same articulatory setting from trial to trial. This held true for both experiments, indicating that switching between glottal stops and aspirated /t/s, and between whispered and normal volume responses, each incurred a switch cost overall. The patterns of these switching costs were symmetrical in both experiments although overall naming latencies were significantly faster in the Whisper experiment than in the Glottal experiment.

In previous language switching experiments, the presence of switch costs has been interpreted as evidence for the employment of inhibitory control processes in line with Green's (1998) IC model. Asymmetries in these switch costs are further explained as being a consequence of the reactive and proportional nature of this inhibitory control, with a greater amount of inhibition being required to suppress the more dominant variety (Meuter & Allport, 1999). While this leads to switch cost asymmetries in unbalanced bilinguals, balanced bilinguals display symmetrical switch costs (Costa & Santesteban, 2004).

Yet, in the present study, the presence of switch costs, even when participants remained within a monolingual setting (and thus should not have been required to engage inhibitory control processes to suppress the activation of different lexical items), provides evidence that switching between articulatory settings is also a costly process. With the evidence of the existence of different default articulatory settings between languages provided by Gick et al. (2004) and Wilson and Gick (2014), it is logical to conclude that the cost associated with a change in articulatory settings could be a contributing factor to previously reported language switching costs. While several previous studies report asymmetrical switch costs in language switching paradigms (e.g. Meuter & Allport, 1999; see also: **Chapter 4** for results of the *Dialect Switching Task)* only symmetrical switch costs were displayed in the current study, although some explanations can be offered to explain why these symmetrical, rather than asymmetrical, costs were found.

The presence of switching costs in the current study may, according to Finkbeiner, Almeida, Janssen, and Caramazza's (2006) account, be a consequence of the use of bivalent stimuli, although this explanation has not been widely accepted (see: Declerck & Philipp, 2015a). Similarly, one could propose that any task which involves switching between different sets of instructions and responses could invoke a cost when switching conditions; however, considering the vast number of studies which are published in which the costs observed are attributed to linguistic processes rather than task switching demands, alongside the studies which have *not* observed language switching costs, it is unlikely that the manifestation of such costs can purely be attributed to the general demands of task switching and not to the linguistic processes being observed (Declerck & Philipp, 2015a).

With that in mind, however, previous studies investigating language switching have failed to account for factors beyond the stages involved in lexical selection and have not considered the time taken to manoeuvre the speech organs into their language-specific articulatory settings (as outlined by Wilson & Gick, 2014). Previous research by Riès, Legou, Burle, Alario, and Malfait (2012; 2014), conducted with regards to monolingual speech production, attempted to isolate naming latencies for words and pictures into the respective durations accounted for by cognitive and articulatory (or motor) processes. By measuring voice onset latencies alongside electromyographic (EMG) activity of facial muscles, the authors were able to fractionate the verbal response latencies into two interval types: premotor times, which reflect cognitive processes, and motor times (measured from EMG onset to vocal onset), which reflect motor execution processes, indicating that these components accounted for different percentages of the overall naming latencies.

Previous models of speech production suggest that these cognitive and articulatory stages are discrete (e.g. Levelt, Roelofs, & Meyer, 1999), although there is evidence to suggest that high levels of cognitive processing may influence low levels of articulatory processing (Mousiko & Rastle, 2015). Although the initial findings of Riès et al. (2012) suggest firm evidence for a cascaded model which provides feedback between these stages, in a corrigendum, Riès et al. (2014) were forced to withdraw this claim after improvements in their data analysis techniques eliminated the significant finding which this theory was based upon[44]. However, If the manoeuvring of articulators into their target settings were influenced by the same cognitive processes involved in lexical selection, such as the inhibitory mechanisms that suppress the selection of lexical items from the non-target variety (as in Green, 1998), then switch costs asymmetries should also have been observed for articulatory settings which are more practiced than others (i.e. switching from the more regularly practiced normal volume speech to whispering should be more costly than the

[44] In essence, Riès et al. (2012) had found significantly longer premotor *and* motor times for naming pictures compared with naming words, indicating that the motor component was influenced by the cognitive processes which commonly result in longer latencies for picture naming. The 2014 corrigendum showed that this was not actually the case, with motor times being equal in both conditions (although premotor times were still longer for naming pictures).

reverse). Given that symmetrical switch costs were found in both studies, this suggests that although switching between different settings does take time, they are not influenced by inhibitory control mechanisms when remaining within the same linguistic variety. This does not exclude the likelihood that switching between language varieties involves a lexical selection component which is subject to inhibitory control processes (Green, 1998; Meuter & Allport, 1999) especially with the presence of asymmetrical switch costs providing strong evidence of these processes (see: Declerck & Philipp, 2015a). However, given that Wilson and Gick (2014) have identified discrete language-specific inter-speech postures for highly proficient bilinguals, it seems logical that switch costs can also be partly accounted for by the preparation of different speech articulators which the current study has demonstrated, particularly with the results of the Whisper experiment.

As acknowledged in the introduction, It is perhaps erroneous to state that the Glottal experiment is one which only required participants to switch between different articulatory processes in order to produce the /t/ and /?/ phonemes. As mentioned previously, t-glottalisation has a sociolinguistic component, and the use of glottal stops is considered to be a characteristic of sloppy, informal, or improper speech (see: Trudgill, 2000). Thus, these phonemes could have different representations at the lemma level[45] and be subject to the inhibitory control processes as outlined by Green's (1998) IC model, and this task could actually be more akin to a hypothetical *Register Switching Task*. In this case, the lack of asymmetrical costs when switching between these targets may reflect the interchangeability of these phonemes and, given that t-glottalisation is a feature of Standard Scottish English and the participants (in both experiments) were all from Scotland, they

[45] For example, glottal stops could be tagged as belonging to informal, impolite or sloppy speech; whereas aspirated /t/s could be tagged as belong to formal, polite or "proper" speech, and be subject to different language task schemas.

were likely to be practiced at doing so. Despite being numerically longer, trials in which the word was produced using a glottal stop were not significantly longer than those produced using an aspirated /t/ - if one was in general more effortful to produce than the other, then this should have been observed as a significant effect of articulatory setting, which was not the case.

The results of the Whisper task, however, did reveal a main effect of articulatory setting, with whispered responses taking around 51.68ms longer than responses produced at normal volume. There is evidence to suggest that whispered speech is both hyperarticulated compared with normal speech (Osfar, 2011) and that airflow rate (through the glottis) is three times higher when producing stage whispers compared with normal phonation (Tsunoda, et al., 2007), which could account for the longer naming latencies in whispered trials. Yet, despite this, the switch costs observed in this experiment were symmetrical despite the production of stage whispers likely being a less practiced process for participants than producing speech at normal volume.

Despite the possibility of the Glottal experiment invoking inhibitory control processes as a result of the sociolinguistic representations of t-glottalisation, the inclusion of this experiment alongside the Whisper experiment, and the decision to use the same stimuli in both, allows for a clean comparison of both studies. This joint analysis revealed that the overall naming latencies were around 215ms longer for the Glottal experiment than for the Whisper experiment, which may reflect the additional representational component that participants in this task had to due to the sociolinguistic nature of t-glottalisation, although a similar magnitude of switch costs was found across both studies.

The current study is the first to demonstrate that changes in articulatory processes may account (at least in part) for language switching costs; however, future studies could attempt to investigate this further by using a similar methodology employed by Riès et al.(2012; 2015) which could potentially isolate the language switching cost into its cognitive and articulatory components.

Chapter 6: Dialect and Language Perception: How Much Exposure is Required for Listeners to Identify and Categorise Familiar and Unfamiliar Varieties?

The work contained within this chapter has been disseminated as follows:

Kirk, N. W., Kempe, V., & Scott-Brown. K. C. (2013). How well can listeners distinguish dialects and unfamiliar languages? Poster presented at the *54th Annual Meeting of The Psychonomic Society, Toronto, Canada.*

INTRODUCTION

The previous experimental chapters have so far focussed on the production aspects of dialect use, yet also of interest is how easily speakers can perceive, identify and categorise different linguistic varieties depending on the amount of previous exposure they have had to a target variety. The speech sounds involved in producing languages, dialects and accents can contain more information than is required for just expressing semantic information to an interlocutor and such information can help listeners identify various social markers of a speaker (Cohen, 2012). The benefit of being able to extract these important features is dependent upon a listener's ability to accurately perceive and attribute these cues to their appropriate categories and this chapter will investigate how easily listeners can identify different dialect and language varieties based upon their previous levels of exposure to them.

The distinctive characteristics of a variety, such as Dundonian Scots, are primarily comprised of its phonetic and phonotactic features, and in spoken form these are part of the indexical features which can help listeners to establish a speaker's geographical background (Hay, Nolan, & Drager, 2006). Indexical features can also help a listener identify and categorise a speaker's gender (Meister, Landwehr, Pyschny, Walger, & Wedel, 2009), age (Drager, 2011), ethnicity (Rakić, Steffens, & Mummendey, 2010), socio-economic status (Hay, Warren, & Drager, 2006), sexual orientation (see: Gowen & Britt, 2006) and social group membership (see: Foulkes & Hay, 2015). Similar categorisation abilities have been demonstrated in very young children, who show a preference for speakers of their own language compared to speakers of a different language (Kinzler, Dupoux, & Spelke, 2007). Kinzler et al. (2007) demonstrated that five year old monolingual English children were significantly more likely to choose an English speaker rather than a French speaker as a potential new friend and were also significantly less likely to opt for a French-accented English speaker over one with a native accent. Furthermore, Kinzler et al., (2007) showed that 10-month-old, and even 5-to-6-month-old infants (raised in English speaking environments) showed a preference towards speakers of native-accented (American) English over either foreign-accented English, French or an unnatural language (i.e. English played in reverse). These findings demonstrate that, even from a very young age, linguistic features are easily identifiable and can serve as markers for in-group and out-group memberships.

The ability to distinguish between languages has also been shown to happen in infants as young as a few days old (see: Mehler, Jusczyk, Lambertz, Halsted, Bertoncini & Amiel-Tison, 1988), and it has been shown that very young infants have with the ability to perceive the universal set of phonetic contrasts regardless of their language experience (see: Werker & Tees, 2002). However, these abilities are gradually lost during development, and, by adulthood, individuals can only (easily) perceive the sounds which are features of their native language(s) (Werker & Tees, 2002); with the ability to successfully discriminate between non-native phonemes in adulthood being subject to individual differences (Kempe, Thoresen, Kirk, Schaeffler, & Brooks, 2012). Anecdotally, some people may be considered to have an “ear” for picking up accents, dialects or languages, and this idea has been empirically investigated by Golestani, Price and Scott (2011) who showed that professional phoneticians were more likely than non-expert controls to have multiple or split transfer gyri in the auditory cortex (which are established *in utero* and are not a result of phonetic training), suggesting that such individuals are more likely to pursue a career in a field where such abilities were advantageous. In addition to the individual differences in brain structures and cognitive capabilities which can predispose individuals towards having a greater ability to discriminate between non-native language sounds in later life, the level of previous exposure an individual has had to a specific language, dialect or accent can also facilitate their ability to identify, understand and/or produce such varieties.

In order to be able to identify a variety, listeners need to be aware of both the phonological and phonetic features that exist within that variety and which may differ from their own. Several studies have shown that with enough exposure, listeners can successfully identify (and subsequently produce) phonemes which do not exist in their native variety, such as Japanese speakers learning the English /r/ and /l/ phonemes after a period of training (Bradlow, Pisoni, Akahane-Yamada, & Tokura, 1997), and Greek speakers learning to discriminate between Hindi dental and retroflex consonants (Vlahou, Protopapas, & Seitz, 2012). Furthermore, studies have investigated how much exposure is required for native listeners to adapt to foreign-accented speech (e.g Witteman, Weber, & McQueen, 2013; 2014), which often contains large amounts of variation, beyond the natural variability that occurs between native speakers. Witteman et al. (2013) demonstrated, using a cross-modal priming paradigm, that listeners with limited exposure to a foreign accent (in this instance, native Dutch speakers listening to German-accented Dutch) were primed by medium and weakly accented words, but not by strongly accented words whereas listeners with more experience of the foreign-accented Dutch were primed by all accent types. In further experiments Witteman et al. (2013) showed that when listeners with limited experience of

German-accented Dutch were exposed to a speaker who read a (4-minute-long) passage from a story using strongly accented tokens, priming began immediately during the subsequent cross-modal priming task; whereas for those exposed to a speaker without strongly accented tokens, priming only emerged in the latter half of the experiment. This suggests that only relatively small amounts of exposure are required for an individual to add variant phonetic representations to their pre-existing mental lexicon although there is evidence to suggest that these phonological variants are stored as part of a pre-lexical processing stage (McQueen, Cutler, & Norris, 2006), indicating that the *sound template* of an accent, dialect or language can be represented even if semantic information is yet to be encoded.

With this in mind, a set of similar processes may have facilitated the English monodialectal participants' swift acquisition of Dundonian words in **Chapter 4**. These participants were given a separate training condition to allow them to learn and produce the Dundonian dialect words used in the *Dialect Switching Task*. Despite initially identifying significantly fewer Dundonian items than the two bidialectal groups in the pre-training test, the monodialectals required only a small amount of training before they could produce the target words used in the main experiment. This may have been facilitated by participants having already established a representation of Dundonian sounds; i.e. a template upon which they could map these new lexical items – which in particular could have aided the acquisition of the cognate items which tended to follow systematic rules such as replacing the phonemes /ae̯/ and /ɐ̟/ with /ɛ̠/ in Dundonian. Ultimately these monodialectal participants showed a significantly different pattern of switching costs compared to the bidialectal groups on the *Dialect Switching Task,* which was presumably caused by their overall reduced proficiency and exposure to Dundonian; however, these participants were still able to initially identify and successfully produce Dundonian words with only a small amount of previous exposure and training.

Relatedly, Rakić, et al. (2010) propose that individual expertise in a dialect or language should also be considered in language categorisation studies, i.e. those with a high level of exposure and proficiency should be able to more successfully identify subtle differences within varieties, whereas “non-experts” can perhaps overlook important (but subtle) cues. This raises the empirical question as to how much previous exposure to a variety is required for an individual to be able to accurately recognise and categorise it? Additionally, how much (or how little) input is required for an individual to be able to recognise a variety, correctly categorise it and thus consequently access the appropriate regional and sociolinguistic cues which are linked to it? In other words, can such information be established from the cues contained in a single spoken word?

The Aim of this Study

The purpose of this chapter is to investigate how dialect and language categorisation differs depending on an individual's familiarity with one, both or neither of the target varieties. Two tasks will be used: the first will require participants to categorise dialect cognate items of Standard Scottish English and Dundonian Scots into their respective varieties, the second requires participants to categorise Russian and German interlingual homophones. Although participants will only ever hear one version of each word (e.g. SSE "dollhouse" or Dundonian "dollhoose"), the amount of overlap between the cognate items within each of the tasks is considerable and will also be spoken by the same speaker[46], thus reducing the overall number of cues the participants can use in order to distinguish between the varieties and accurately categorise them.

Participants will be given a minimal amount of training (two familiarisation sentences, repeated twice) and two practice trials at the beginning of each task. These tasks will be used to determine how accurately and quickly the target varieties can be categorised based on the cues contained within a *single* word, and to determine how much previous exposure to the varieties is required to be able to successfully categorise these varieties. Specifically, do speakers (and/or listeners) of only one of the varieties perform familiarity-based assignments faster than speakers of both varieties who have to call on knowledge about phonetic differences to perform these assignments? Can listeners of previously unfamiliar varieties (who do not have knowledge about which phonetic cues distinguish the two

[46] As outlined in the Methods section, within a task, the same speaker will produce the cognate items. Two different speakers recorded the stimuli for the two different tasks (i.e. a native Dundonian recorded the SSE/Dundonian items for the dialect categorisation task).

varieties in question) assign words based on phonetic differences that can be identified without substantial exposure?

Where appropriate, participants will be grouped depending on their previous exposure to the target varieties (e.g. non-native Russian/German; native Scots etc.). It is predicted that listeners who are familiar with both varieties within a task will be more accurate, although not necessarily faster, than those familiar with one variety. Furthermore, individuals without any familiarity to either variety within a task are predicted to be less accurate and have longer response times than those familiar with one, or both, varieties. Depending on the results, these tasks may potentially be developed for use as a diagnostic tool in future studies to quantify proficiency and experience with a linguistic variety alongside self-report measures.

METHOD

This was an exploratory study, predominantly designed to be correlational in nature, which used convenience sampling – with no exclusion criteria - to recruit participants with differing levels of exposure to the language varieties used therein. Although participants have been categorised into sub-groups for further analysis (e.g. native Scots, native German/Russian etc.), it was not possible to have even numbers of participants in each group due to the difficulty in locally recruiting large numbers of participants from specific language backgrounds.

Experiment 1: Categorisation Tasks with Training

Participants

Fifty participants (17 males) took part in the experiment. Participants were from a range of different language backgrounds, with varying degrees of previous exposure to the target language varieties used in the two Categorisation Tasks. Twenty-three participants were native Scots and 27 were non-Scots, of whom nine were native English speakers (e.g. from England, Canada, Ireland) and eighteen were non-native English speakers (12 of whom were either German or Russian native speakers). All participants were recruited from Dundee and were either living in or visiting the city at the time of testing. No participants reported having a hearing impairment. Some participants were eligible for course credit for taking part in the study, with the remainder participating entirely on a voluntary basis. This study was approved by the University of Abertay Dundee's School of Social and Health Science

Research Ethics Committee (see: Appendix A (v)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Materials

The experiment contained two Categorisation Tasks. Participants completed both tasks and the order of tasks was counterbalanced across participants.

Task 1: Dialect Categorisation Task

A dialect categorisation task was programmed using E-prime v.2 and was displayed on a PC running Windows 7. The task began by presenting a series of questions enquiring about the participants' general and language background (e.g. birthplace, age, years spent living in Scotland, languages/dialects spoken). The main dialect categorisation task contained 46 items which were cognates between Standard Scottish English and Dundonian Scots (outlined in *Stimuli* section) and recordings were made of the items by a native bidialectal speaker who produced each word in both varieties. This native speaker also recorded two familiarisation sentences: "This is how I sound when I speak Standard Scottish English"/"This is how eh soond when eh speak Dundonian".

The dialect categorisation task contained instructions outlining the nature of the task, indicating that the same speaker would be producing words in two different dialects which the participant had to categorise. During the task, participants were presented with a recording of each word over headphones and instructed to press the Left Key - “1” - if they thought the word was spoken in Dundonian and the Right Key - “0” - if it was in Standard Scottish English. Each trial began with a fixation cross which appeared in the centre of the screen for 1000ms. After this fixation cross disappeared, the sound file was played and the names of the dialect varieties appeared on the same side of the screen as the location of the response key for that variety and remained on screen for the duration of the trial. The assignment of variety to key (and thus the on-screen position of the name of the variety) was counterbalanced across participants. Participants were given 2 practice trials with feedback, before moving on to the main experiment which contained 46 trials. At the end of the experiment, participants were asked to give a yes/no (press: “Y”/”N”) response as to whether they wanted feedback on their performance or not.

Dialect Categorisation Task Stimuli

Forty six items were chosen which were cognates between Standard Scottish English and Dundonian Scots (see: Table 6.1). Participants only heard one version of each item in the task, in either Standard Scottish English or Dundonian but never both. Two item lists were constructed with half of the items (23) being presented in their Standard Scottish English form and the other half (23) appearing in Dundonian form (each item was presented in the opposite variety for list 2). The items in each list were controlled for word frequency and syllable length, and the item lists were counterbalanced across participants.

Table 6.1: Table outlining the Standard Scottish English items and their Dundonian counterparts which were used in the Dialect Categorisation Task. Italicised text indicates the item featured in list 1; roman text indicates the item featured in list 2. Item lists were controlled for word frequency (in Standard English) and number of syllables, and were counterbalanced across participants.

Standard Scottish English	**Dundonian Scots**
Afternoon	Efternane
Bargain	Bergin
Council	*Cooncil*
Deny	*Denehh*
Dishwasher	Dishwaasher
Doctor	*Doactor*
Dollhouse	*Dollhoose*
Downstairs	Doonstairs
Driver	Drehver
Exercise	Exercezz
Family	Femily
Farmer	*Fermer*
Flying	*Flehn*
Founder	*Foonder*
Garden	*Gairden*
Glasses	*Glesses*
Housewarming	*Hoosewaarming*
Identify	Ehdentifeh
Jacket	Jaicket
Jeopardize	*Jeoperdezz*
Library	*Lehbrary*
Market	Merket
Minute	*Meenit*
Multiply	Mutlipleh
Neighbour	*Neebour*
Painting	Pentin
Paper	Pipper
Paralyse	*Peralezz*
Playground	Playgroond
Pocket	Poacket
Police	*Polis*
Pounding	*Poondin*
Private	Prehvat
Qualify	*Qualifehh*
Roundabout	Roondaboot
Saturday	Setterday

Sausage	Sassage
Screwdriver	*Screwdrevver*
Shortage	*Shoretage*
Society	*Socehity*
Soundly	Soondly
Strawberry	Strahberry
Supplies	Supplezz
Swimming	*Sweemin*
Warmer	Waarmer
Washing	Waashin

Dialect Categorisation Task Procedure

Participants first completed a series of short language background questions before the main instructions outlining the nature of the task were presented on screen. The participant then heard the native speaker produce the familiarisation sentences with a transcription of the sentence presented (in English) simultaneously on-screen. Each familiarisation sentence was produced twice. Participants were given 2 practice trials (1 Standard Scottish English and 1 Dundonian item chosen at random from the stimuli list) which were presented with feedback. Once this practice was complete, participants moved to the main task which contained 46 trials (23 Standard Scottish English items, 23 Dundonian items) in random order. At the end of the task, the participant had the option of displaying their overall percentage accuracy before the final screen thanked them for their participation.

Task 2: Language Categorisation Task

This task was adapted from the Dialect Categorisation Task and had a similar format. Twenty four cognate words between German and Russian were used in the language categorisation task and a native speaker of both German and Russian recorded the materials. This native speaker also recorded two familiarisation sentences: "I am now speaking German"/"I am now speaking Russian" (spoken in these respective languages). The language categorisation task contained instructions outlining the nature of the task, indicating that the same speaker would be producing words, which existed in two different languages, which the participant had to categorise. During the task, participants were presented with a recording of individual words over headphones and instructed to press the Left Key - "1" - if they thought the word was spoken in German and the Right Key - "0" - if it was in Russian. Each trial began with a fixation cross which appeared in the centre of the screen for 1000ms. After this fixation cross disappeared, the sound file was played and the names of the language varieties appeared on the same side of the screen as the location of the response key for that variety. The assignment of variety to key (and thus the on-screen position of the name of the variety) was counterbalanced across participants. Participants were given 2 practice trials with feedback, before moving on to the main experiment which contained 24 trials. At the end of the experiment, participants were asked to give a yes/no (press: "Y"/"N") response as to whether they wanted feedback on their performance or not.

Language Categorisation Task Stimuli

Twenty-four cognate words between German and Russian were chosen (see: Table 6.2). Although these items are all of German origin and historically were loan words into Russian, they are also treated as bona fide Russian words and thus have a distinctive Russian pronunciation (like *"schadenfreude*" between English and German speakers, or akin to the differences in pronunciation of "*garage"* between British English and American English). Participants only heard one version of each item in the task, in either German or Russian but never both. Two item lists were constructed with half of the items (12) being presented in their German form and the other half (12) appearing in Russian form (with each item presented in the opposite variety for list 2). The items in each list were controlled for word frequency and syllable length, and the item lists were counterbalanced across participants.

Table 6.2: Table outlining the German items and their Russian counterparts which were used in the Language Categorisation Task. Italicised text indicates the item featured in list 1; roman text indicates the item featured in list 2. Item lists were controlled for word frequency (in German) and number of syllables and were counterbalanced across participants.

German	**Russian**
Absatz	абзац
Anschlag	*аншлаг*
Blockhaus	блокхауз
Bollwerk	*больверк*
Bürger	бюргер
Eisberg	*айсберг*
Endspiel	эндшпиль
Fackel	факел
Feuerwerk	*фейерверк*
Globus	*глобус*
Kartoffel	картофель
Lager	*лагерь*
Landschaft	ландшафт
Massstab	*масштаб*
Nickel	никель
Pudel	*пудель*
Rucksack	рюкзак
Schlagbaum	*шлагбаум*
Schnitzel	*шницель*
Spagat	*шпагат*
Stempel	штемпель
Stoepsel	*штепсель*
Zeitnot	цейтнот
Zugzwang	цугцванг

Language Categorisation Task Procedure

Participants first completed a series of short language background questions before the main instructions outlining the nature of the task were presented on screen. The participant then heard the native speaker produce the familiarisation sentences in those varieties with a transcription of the sentence in English presented simultaneously on-screen. Each familiarisation sentence was produced twice. Participants were given 2 practice trials chosen at random from the stimuli list which were presented with feedback. Once this practice was complete, participants moved to the main task which contained 24 trials (12 German and 12 Russian items) in random order. At the end of the task, the participant had the option of displaying their overall percentage accuracy before the final screen thanked them for their participation.

Design

The dependent variables in both tasks were reaction times (ms) and sensitivity to Dundonian or Russian (as measured by *A′* scores). With its foundation in Signal Detection Theory, *A′* is a sensitivity measure which corrects for differences in response biases and produces a score between 0 and 1 (with .5 corresponding to chance) (see: McNichol, 1972). In the *A′* calculations for the Dialect and Language Categorisation Tasks, Dundonian and Russian respectively were chosen as the target varieties for which Hits, Misses, Correct Rejections and False Alarms were computed, ultimately giving a sensitivity measure to Dundonian in the Dialect Categorisation Task and Russian in the Language Categorisation Task (and will be reported as such in the results section). However, computing these values with respect to sensitivity to Standard Scottish English and German would ultimately yield the same results.

RESULTS

<u>Dialect Categorisation Task</u>

Sensitivity towards Dundonian

Computed across all participants, the *A′* score, as a measure of sensitivity towards identifying Standard Scottish English and Dundonian cognates, was almost at ceiling (M = .939, SD = .099). One sample t-tests were conducted which showed performance to be significantly above chance for both the native Scots (n = 23, M = .951, SD = .12; $t(22)$ = 37.63, p < .001) and the non-Scots (n =27, M = .930, SD = .06; $t(26)$ = 18.04, p < .001) (see: Figure 6.1). However, no significant difference in *A*′ scores were found between these two groups ($t(48)$ = -.79, p = .435).

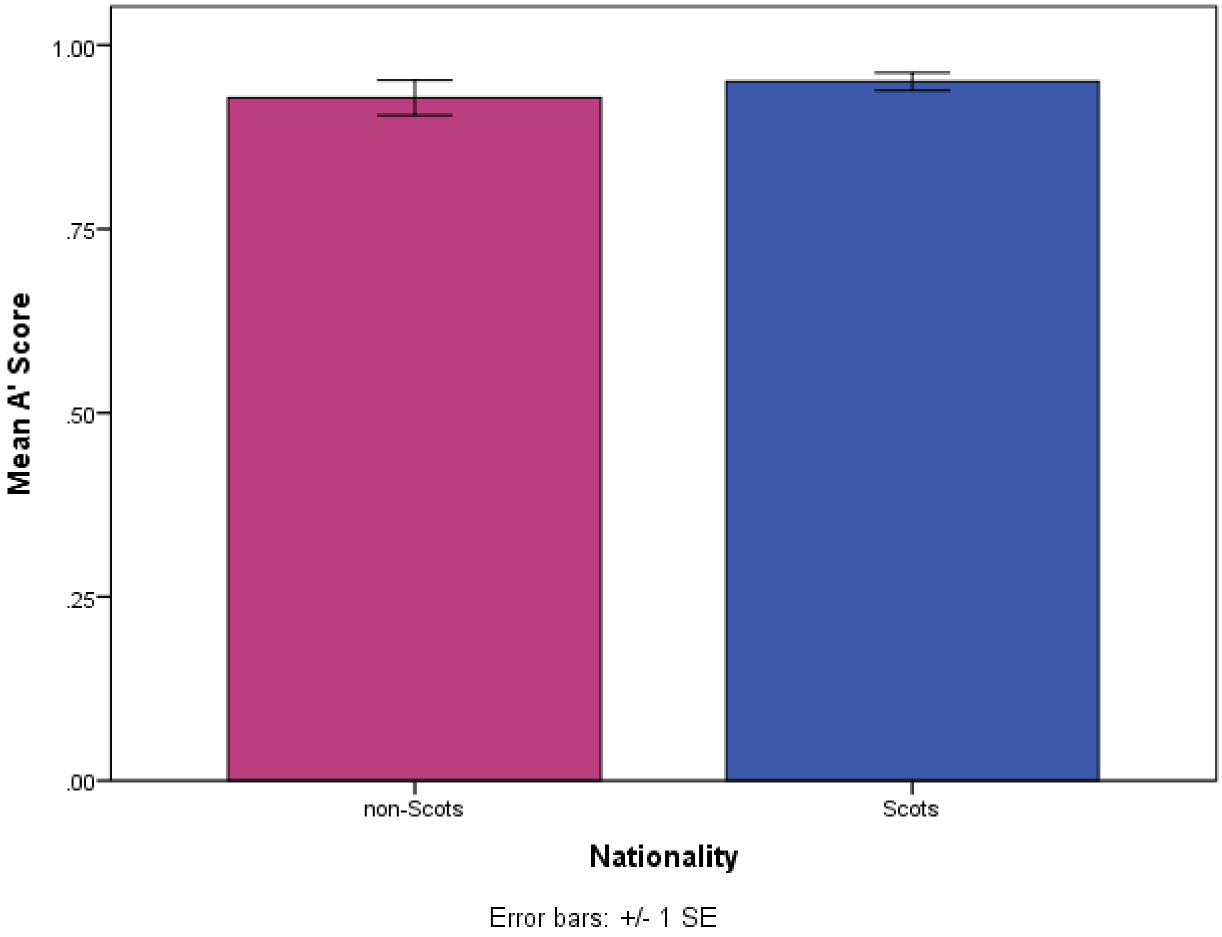

Figure 6.1: Bar chart showing mean *A′* scores in the Dialect Categorisation Task for the Scots and non-Scottish participants. Both groups had *A′* scores which were significantly above chance performance (*A′* = 0.5) but there was no significant difference between the groups.

Relationship between A′ score and Exposure to Standard Scottish English and Dundonian

Although no significant difference was found between the Scots and non-Scots, the amount of exposure the non-native participants had to the target varieties as a result of living in Scotland varied.

To determine whether level of exposure was correlated with sensitivity to Dundonian, a Pearson product-moment correlation coefficient was computed for the non-Scots participants to assess the relationship between their proportion of life spent living in Scotland and *A′* scores. No significant correlation was found(r = .139, n = 27, p = .488)[47] suggesting that even extremely limited prior exposure to these target varieties, or the training given at the beginning of the task, was enough to account for the ability to correctly discriminate between the two varieties.

Reaction Time Analysis

For the reaction time analysis, incorrect trials (9.3%) were removed as were trials in which the reaction times were either 3 standard deviations over the mean, 3 standard deviations under the mean, or under 150ms (comprising an additional 1.7% of trials). To test the hypothesis that those who were familiar with both varieties would have longer reaction times, reaction times were submitted to a 2 (Linguistic Variety: Standard Scottish English, Dundonian) by 2 (Nationality: Scots, non-Scots) mixed ANOVA which did not show any significant main effect of Linguistic Variety (p = .697) or Nationality (p = .964), nor was there a significant interaction between the two variables (p = .841).

[47] This relationship was not significant even when the native Scots were included (r =.118, N = 50, p = .415)

Relationship between Reaction Times and Exposure to Standard Scottish English and Dundonian

To determine whether the level of exposure to the target varieties was correlated with overall mean reaction times, a Pearson product-moment correlation coefficient was computed for the non-Scots which showed no significant relationship between proportion of life spent in Scotland and mean Dundonian/Standard Scottish English RTs (r = - .210, n = 27, p = .292).[48]

Language Categorisation Task

Sensitivity towards Russian

Computed across all participants, the mean *A′* score, as a measure of sensitivity in discriminating between German and Russian cognates, was lower than for the Dialect Categorisation Task (M = .748, SD = .168). One sample t-tests were conducted which showed significantly above chance *A′* scores for the native German or Russian participants (n = 12, M = .826, SD = .17; $t(11)$ = 6.67, p < .001), the non-German/Russian participants who had previously studied German or Russian (n = 20, M = .736, SD =.18; $t(19)$ = 5.93, p < .001) and even those who had never studied German or Russian before (n = 18, M = .701, SD = .15; $t(17)$ = 6.12, p < .001) (see: Table 6.4). No significant differences in *A*′ scores were found between these three groups ($F(2, 47)$ = 1.88, p = .163) (see: Figure 6.2).

[48] Again, this relationship remained non-significant when the native Scots were included (r = -.029, N = 50, p = .840)

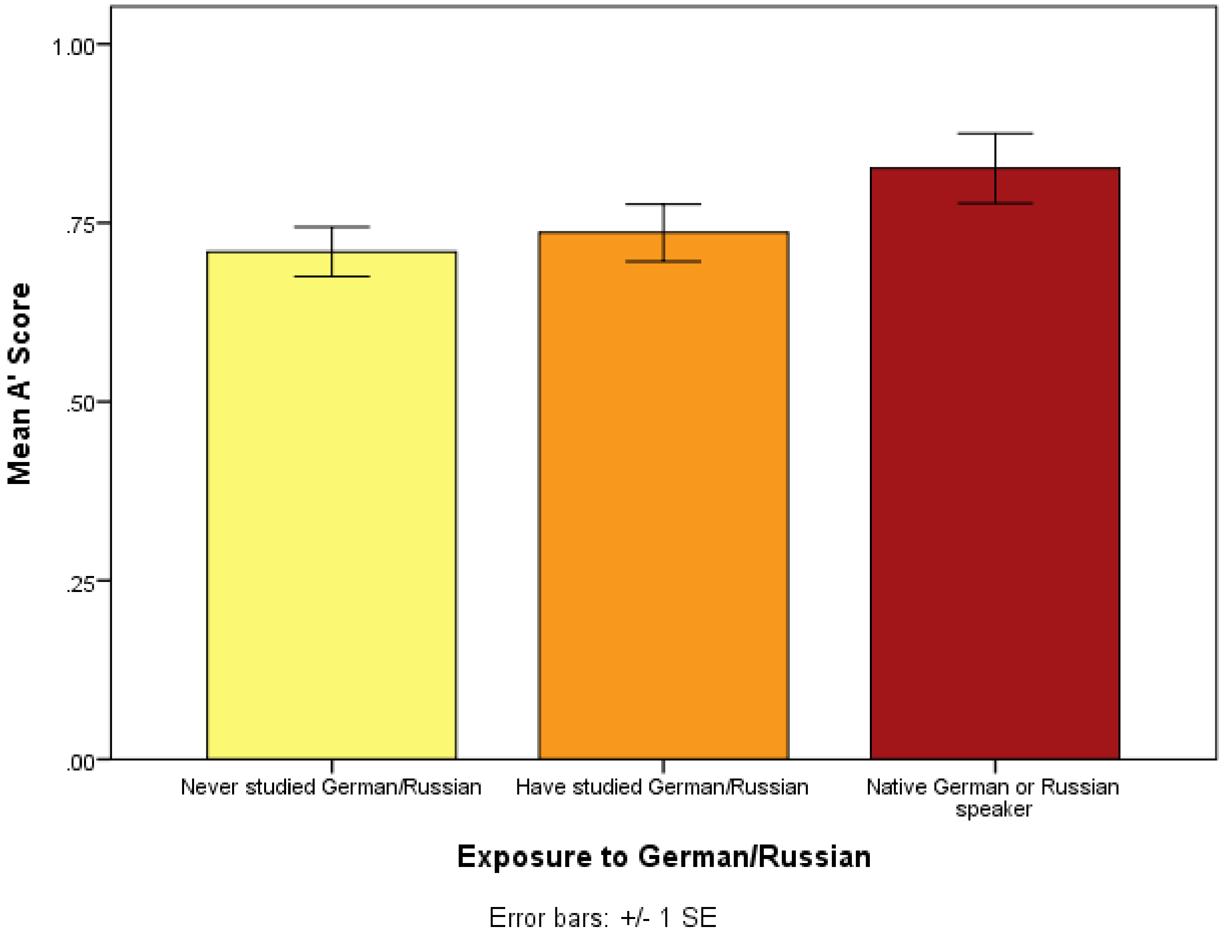

Figure 6.2: Bar chart showing mean *A'* scores in the Language Categorisation Task for the native German/Russians, those who had previously studied German/Russian, and those who had never studied either language. All groups had *A'* scores which were significantly above chance performance (*A'* = 0.5) but there were no significant differences between the groups.

Relationship between A' score and Exposure to German and Russian

Although no significant difference was found between the native German/Russians, those who had studied either of the languages and those who had never studied German or Russian, the amount of exposure the non-native participants had to the target varieties varied.

To determine whether level of previous exposure was correlated with sensitivity to Russian, a Pearson product-moment correlation coefficient was computed for the non-native German/Russian participants to assess the relationship between their amount of years spent studying German and/or Russian and *A′* scores. No significant correlation was found ($r = .242$, $n = 38$, $p = .143$)[49] again suggesting that the ability to discriminate between these varieties could be gained with extremely limited exposure.

Reaction Times

For the reaction time analysis, incorrect trials (31.4%) were removed as were trials in which the reaction times were either 3 standard deviations over the mean, 3 standard deviations under the mean, or under 150ms were excluded (comprising an additional 1% of trials). To test the hypothesis that those who were familiar with both varieties would have longer reaction times, reaction times were submitted to a 2 (Linguistic Variety: German, Russian) by 3 (Exposure Level: Native German/Russian, Studied German/Russian, Never Studied German/Russian) mixed ANOVA which did not show any significant main effect of Linguistic Variety ($p = .617$) or Exposure Level ($p = .298$), nor was there a significant interaction between the two variables ($p = .281$).

Relationship between Reaction Times and Exposure to German and Russian

To determine whether the level of exposure to the target varieties was correlated with overall mean reaction times, a Pearson product-moment correlation coefficient was

[49] This was significant, however, when the native German/Russians were included ($r = .362$, $N = 50$, $p < .05$).

computed for the non-German/Russian natives which showed no significant relationship between amount of years spent studying German/Russian and mean German/Russian reaction times (r = .191, n = 38, p = .251)[50].

Summary of Results

The results of the Dialect Categorisation Task showed a high level of performance across all participants, with mean *A′* scores above .9 and no differences in *A′* scores or reaction times between the native Scots and non-Scots. No correlation was found between *A′* scores and proportion of life spent living in Scotland, nor was there any significant relationship between proportion of life spent living in Scotland and mean reaction times.

The results from the Language Categorisation Task were similar: Again, all participant groups had mean *A′* scores that were significantly above chance and there were no significant differences in *A′* scores between the Native German/Russian participants, those who had studied either of the languages, and those who had never formally studied either language. No correlation was found between amount of years spent studying the two languages and *A′* scores, or between reaction times and years spent studying the languages.

Results from both tasks indicate that very little exposure is required for participants to perform well at these tasks. This may have been due to the passive exposure participants had in their everyday lives or the training they were given in the beginning of each task. In

[50] This remained non-significant when the native German/Russians were included (r = -.189, N = 50, p = .189).

both tasks, participants were given a nominal amount of training, which consisted of 2 familiarisation sentences (repeated twice) and 2 practice trials. To determine whether this small amount of training had been enough exposure to allow participants to discriminate above chance, the experiment was re-run with a new set of participants with the training component removed.

Experiment 2: Categorisation Tasks without Training

The results from Experiment 1 show that the ability to discriminate between varieties on both tasks was significantly above chance and this ability to discriminate between varieties (as measured by *A′* scores) was not correlated with previous amount of exposure to the target varieties. To determine whether the nominal amount of training the participants received was enough for them to "tag" and represent the phonetic and phonotactic features of the varieties, a second experiment was conducted. Experiment 2 partially replicated Experiment 1; however, the familiarisation sentences and practice trials were removed.

Participants

31 participants (9 males) took part in Experiment 2. As in Experiment 1, participants had a range of different language backgrounds and levels of exposure to the target varieties although none of the participants in Experiment 2 were native German or Russian speakers. Twenty-two participants were native Scots; the remaining 9 were non-Scots (3 of whom were non-native English speakers). Language Categorisation Task data for one participant were not recorded due to equipment malfunction. This study was approved by the University of Abertay Dundee's School of Social and Health Science Research Ethics Committee (see: Appendix A (v)) and all participants were informed of the experimental protocols both verbally and in writing before giving their consent.

Materials

The experiment contained two Categorisation Tasks. Participants completed both tasks and the order of tasks was counterbalanced across participants.

Dialect Categorisation Task/Language Categorisation Task

The tasks, stimuli and procedures for Experiment 2 were identical to Experiment 1, except the familiarisation sentences and practice trials were removed to determine whether this short exposure was enough to account for the high levels of performance in Experiment 1. Without this training, participants had to rely on any previous exposure and knowledge of the target varieties to complete the task.

RESULTS

Dialect Categorisation Task

Sensitivity towards Dundonian

Computed across all participants, the *A′* score, even without training, was almost at ceiling (*M* = .941, *SD* = .068). One sample t-tests were conducted which showed performance to be significantly above chance (*A′* = .5) for both the native Scots (*n* = 22, *M* = .953, *SD* = .05; $t(21) = 39.44$, $p < .001$) and the non-Scots (*n* =9, *M* = .911, *SD* = .09; $t(8) = 13.06$, $p < .001$). However, no significant difference in *A*′ scores was found between these two groups ($t(29) = -1.59$, $p = .124$). These results are outlined in Figure 6.3.

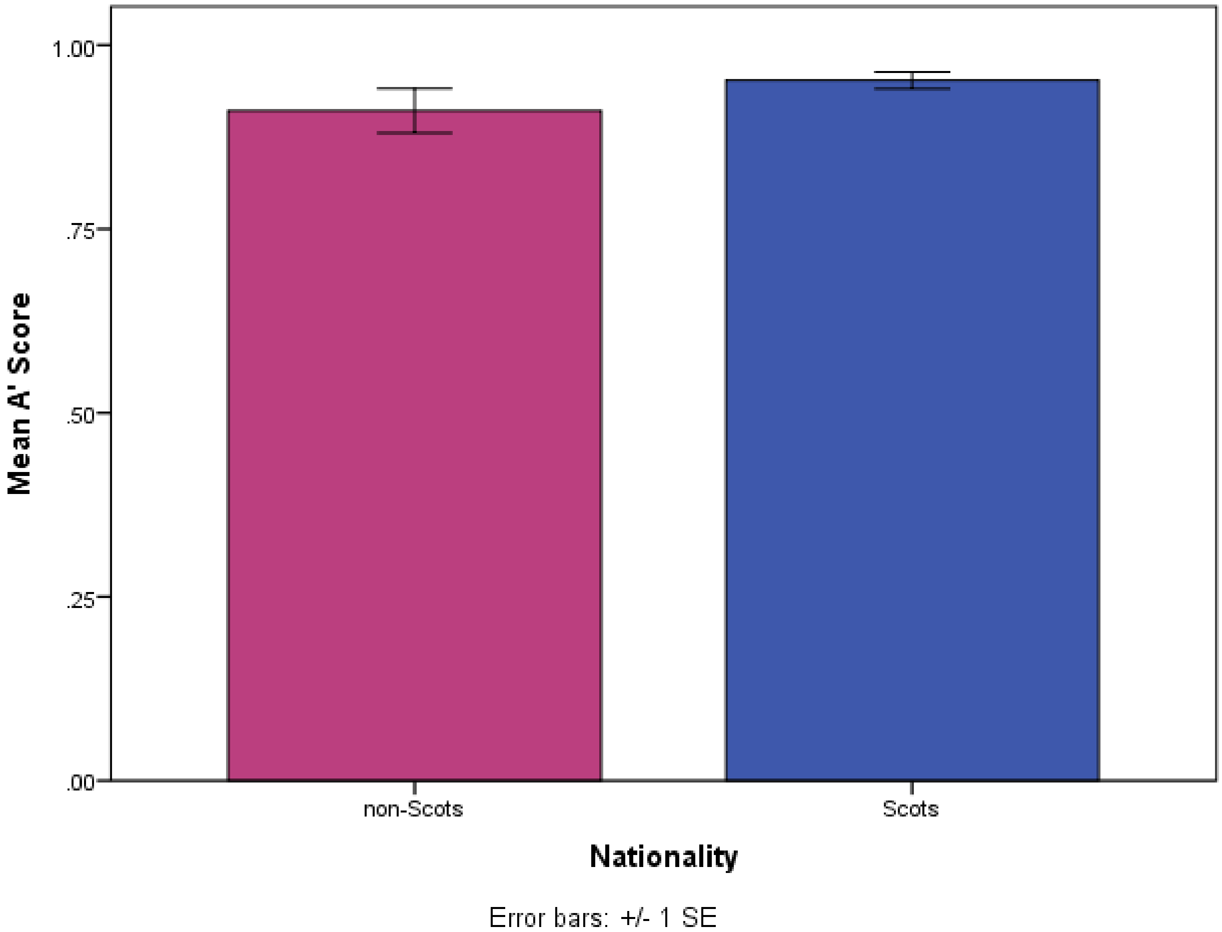

Figure 6.3: Bar chart showing mean *A′* scores in the Dialect Categorisation Task (without training) for the Scots and non-Scottish participants. Both groups had *A′* scores which were significantly above chance performance (*A′* = 0.5) but there was no significant difference between the groups.

Relationship between A′ score and Exposure to Standard Scottish English and Dundonian

Even without training, no significant difference was found between the Scots and non-Scots, however, the amount of exposure the non-native participants had to the target varieties as a result of living in Scotland varied.

To determine whether level of exposure was correlated with sensitivity towards Dundonian, a Pearson product-moment correlation coefficient was computed for the non-Scots participants to assess the relationship between their proportion of life spent living in Scotland and *A′* scores. No significant correlation was found (r = .428, n = 9, p = .250)[51] suggesting that even extremely limited prior exposure to these target varieties was enough to account for the ability to correctly discriminate between them.

Reaction Times

For the reaction time analysis, incorrect trials (9.9%) were removed as were trials in which the reaction times were either 3 standard deviations over the mean, 3 standard deviations under the mean, or under 150ms were excluded (comprising an additional 1.9% of trials). To test the hypothesis that those who were familiar with both varieties would have longer reaction times, reaction times were submitted to a 2 (Linguistic Variety: Standard Scottish English, Dundonian) by 2 (Nationality: Scots, non-Scots) mixed ANOVA which showed a significant main effect of Linguistic Variety (p = .029), with reaction times for Dundonian (M = 1424.28ms, SD = 388.5ms) being longer than Standard Scottish English (M = 1360.21ms, SD = 310.1ms). There was no significant effect of Nationality (p = .236), nor was there a significant interaction between Linguistic Variety and Nationality (p = .066).

[51] However, when the Scots were included there was a significant positive relationship (r = .387, N = 31, p < .05).

Relationship between Reaction Times and Exposure to Standard Scottish English and Dundonian

To determine whether the level of exposure to the target varieties was correlated with overall mean reaction times, a Pearson product-moment correlation coefficient was computed for the non-Scots which showed no significant relationship between proportion of life spent in Scotland and mean Dundonian/Standard Scottish English RTs (r = - .069, n = 9, p = .859).[52]

<u>Language Categorisation Task</u>

Sensitivity towards Russian

Computed across all participants, the mean *A′* score, as a measure of sensitivity towards identifying German and Russian cognates, was lower than for the Dialect Categorisation Task (M = .652, SD = .142) although this is unsurprising given that no native German or Russian participants took part in this (no-training) task. One sample t-tests were conducted which showed significantly above chance *A′* scores for those who had never studied German or Russian before (n = 24, M = .649, SD = .14; $t(23)$ = 5.35, p < .001) although, curiously, not for the non-German/Russian participants who had previously studied German or Russian (n = 6, M = .663, SD =.07; $t(5)$ = 2.25, p = .075); however, given the small number of participants this should be interpreted cautiously. The difference in *A′* scores were not significant between those who had never studied German or Russian and those who had studied either German or Russian (p = .842). These results are outlined in Figure 6.4.

[52] This relationship remained non-significant when the native Scots were included (r = -.202, N = 31, p = .277).

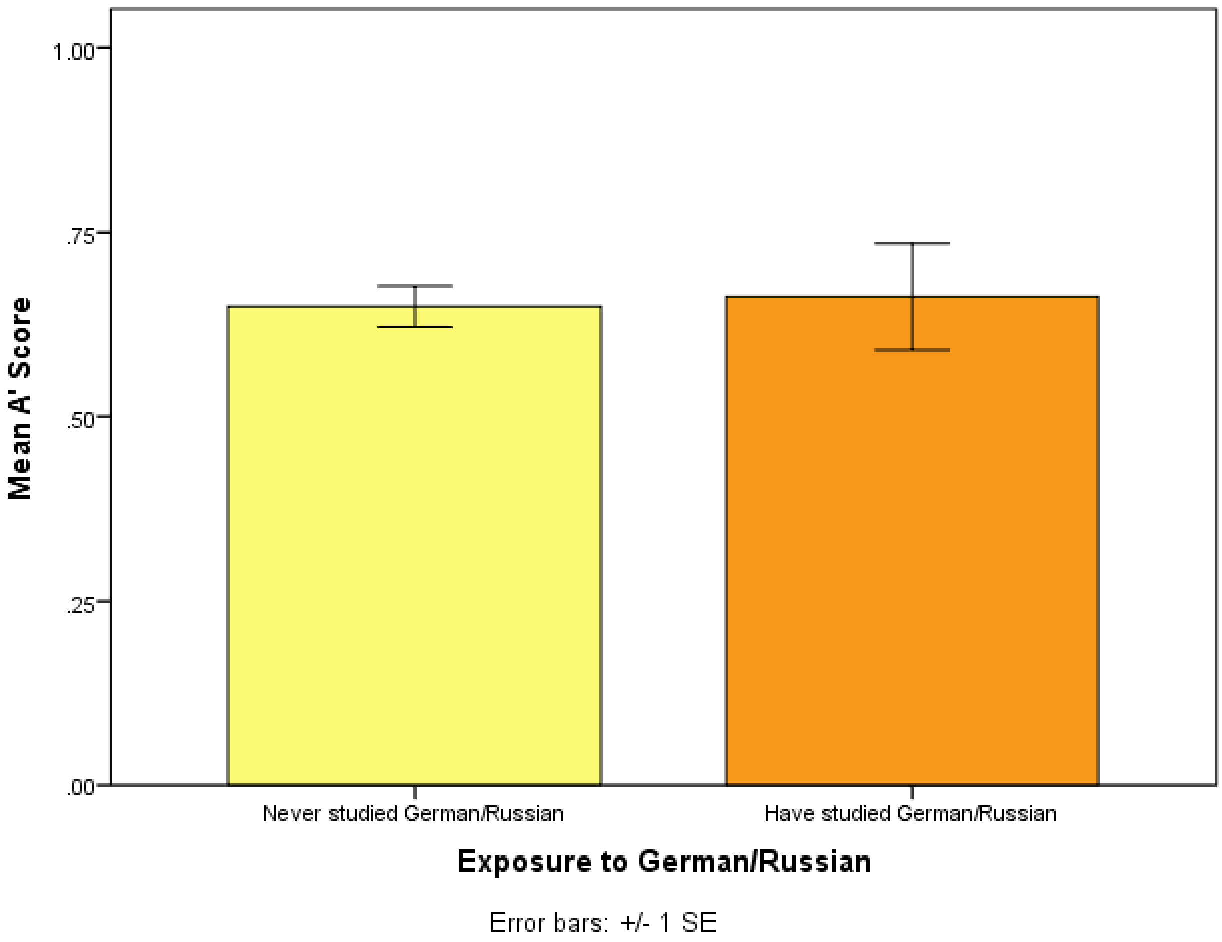

Figure 6.4: Bar chart showing mean *A′* scores in the Language Categorisation Task (without training) for those who had previously studied German/Russian and those who had never studied either language (no native German/Russian speakers participated in this condition). Both groups had *A′* scores which were significantly above chance performance (*A′* = 0.5) but there was no significant difference between the groups.

Relationship between A′ score and Exposure to German and Russian

To determine whether level of previous exposure was correlated with sensitivity to Russian, a Pearson product-moment correlation coefficient was computed for the non-native German/Russian participants to assess the relationship between their amount of years spent studying German and/or Russian and *A′* scores. No significant correlation was found

(r = -.017, n = 30, p = .930) again suggesting that the ability to discriminate between these varieties could be gained with extremely limited passive every-day exposure.

Reaction Times

For the reaction time analysis, incorrect trials (39.6%) were removed as were trials in which the reaction times were either 3 standard deviations over the mean, 3 standard deviations under the mean, or under 150ms were excluded (comprising an additional 0.9% of trials). To test the hypothesis that those who were familiar with one or both varieties would have longer reaction times, reaction times were submitted to a 2 (Linguistic Variety: German, Russian) by 2 (Exposure Level: Studied German/Russian, Never Studied German/Russian) mixed ANOVA which (although marginal) did not show any significant main effect of Linguistic Variety (p = .053) or Exposure Level (p = .083), nor was there a significant interaction between the two variables (p = .213).

Relationship between Reaction Times and Exposure to German and Russian

To determine whether the level of exposure to the target varieties was correlated with overall mean reaction times, a Pearson product-moment correlation coefficient was computed for the non-German/Russian natives which showed a significant positive relationship between amount of years spent studying German/Russian and mean German/Russian reaction times (r = .451, n = 30, p < .05). This relationship indicated that more time spent studying German/Russian was correlated with *longer* reaction times, although given the small number of those who had *ever* studied German or Russian (n = 6) and what would appear to be outliers in this sample, this result should be interpreted cautiously (see: Figure 6.5)

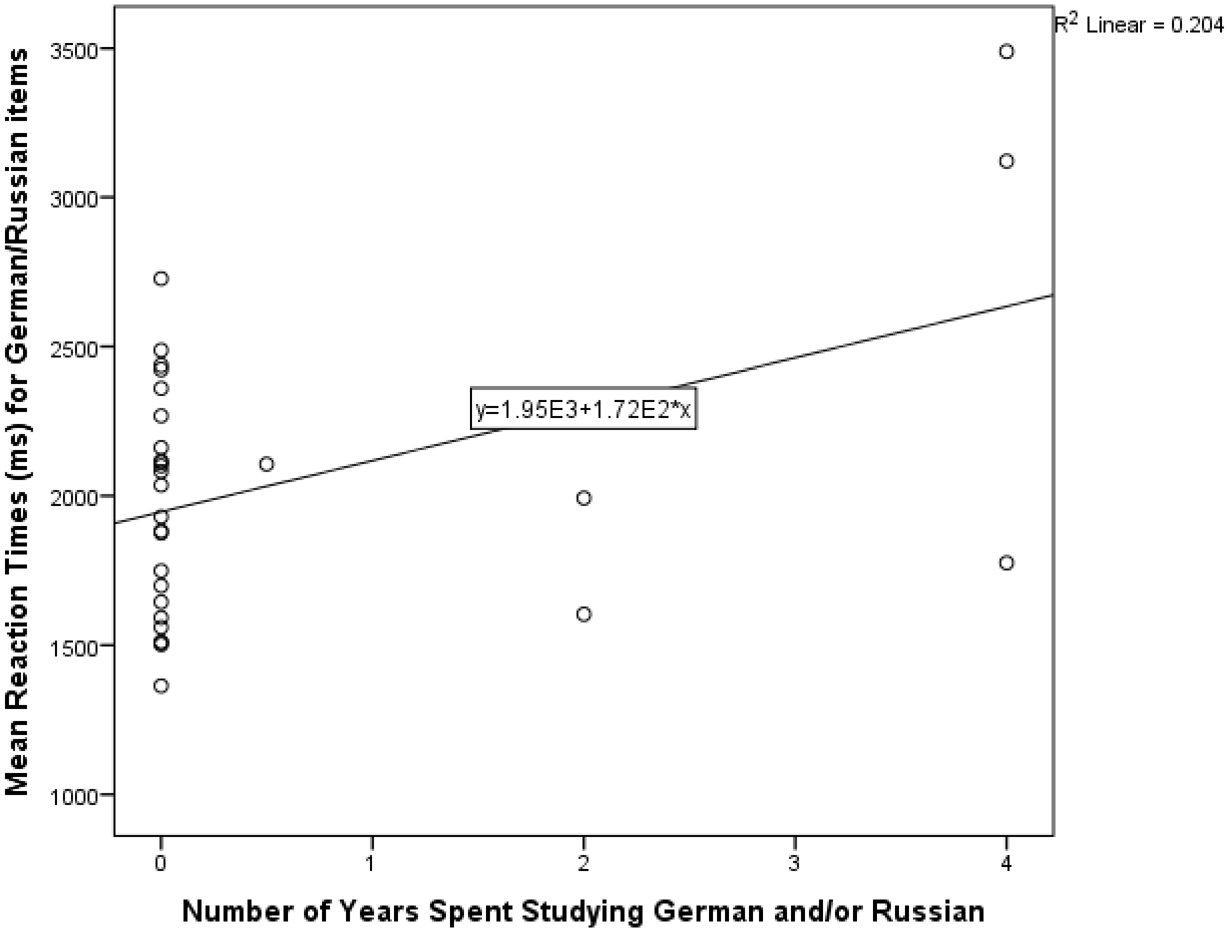

Figure 6.5: Scatter plot showing a significant positive relationship between number of years spent studying German and/or Russian and Mean Reaction Times.

Summary of Results

The results from the second experiment were similar to the first: performance in the Dialect Categorisation Task was high for all participants, with both groups displaying *A′* scores which were significantly above chance (and no significant difference in *A′* scores was found between the Scots and non-Scots). Again, the proportion of time spent living in Scotland was not correlated with either *A′* scores or reaction times.

The results were also similar for the Language Categorisation Task: even those who had never had any experience of studying German or Russian had *A′* scores which were significantly above chance performance.

Effect of Training vs No Training

The data from both experiments (training and no-training) were combined to allow a joint analysis to be conducted to examine the effects of training on both the Dialect and Language Categorisation Tasks. Tables 6.3 (for the Dialect Categorisation Task) and 6.4 (for the Language Categorisation Task) provide a comparison of mean *A′* scores and Reaction Times across the training and no-training conditions for each language group.

Dialect Categorisation Task

Sensitivity to Dundonian

A joint analysis, which included data from both experiments, produced a 2 (Training Condition: training, no training) by 2 (Nationality: Scots, non-Scots) between-subjects ANOVA which showed no significant main effects of Training Condition (p = .711) or Nationality (p = .142) on *A′* scores (see: Table 6.3). There was also no significant interaction between the two variables (p = .652).

Table 6.3: Means (and standard deviations in brackets) for *A′* scores (top line) and Reaction Times (bottom line) in milliseconds for the *Dialect Categorisation Task,* broken down by Training Condition and Nationality.

	Training	**No-Training**
Scots	.951 (.06)	.953 (.05)
	1259.14 (310.77)	1346.4 (271.69)
Non-Scots	.929 (.12)	.911 (.09)
	1254.87 (355.18)	1504.32 (448.7)

Reaction Times

A joint analysis was also conducted for reaction times, producing a 2 (Training Condition: training, no training) by 2 (Linguistic Variety: Standard Scottish English, Dundonian) by 2 (Nationality: Scots, non-Scots) mixed ANOVA which revealed significant main effects of language variety ($F(1, 77) = 5.47$, $p < .05$, partial $\eta^2 = .07$) with RTs for Dundonian (M = 1323.98ms, SD = 378.56ms) being longer than for Standard Scottish English (M = 1293.34ms, SD = 320ms), and Training Condition ($F(1, 77) = 4.30$, $p < .05$, partial $\boldsymbol{\eta^2 =}$ .05) with RTs in the No-Training condition (M = 1392.25ms, SD = 332.68ms) being longer than the task with the Training component (M = 1256.84ms, SD = 332.12ms). The two-way interactions of Linguistic Variety and Nationality (p = .063), and Linguistic Variety and Training Condition (p = .058) fell short of significance. There was no significant effect of Nationality (p = .347) and no interactions between Nationality and Training Condition (p = .321) or between Linguistic Variety, Nationality and Training Condition (p = .098)

Relationships between Exposure to Standard Scottish English and Dundonian and A′ score/Reaction Times

The data were combined from the Training and No-Training versions of the Dialect Categorisation Task, to determine whether there was a relationship (for the non-Scots) between proportion of life spent living in Scotland and Reaction Times/*A′* scores.

There was no significant relationship between proportion of life spent living in Scotland and mean Dundonian/Standard Scottish English reaction times (r = .026, n = 36, p = .882)[53], nor was there a significant relationship between proportion of life spent living in Scotland and *A′* scores (r = .147, n = 36, p = .392)[54].

<u>Language Categorisation Task</u>

A joint analysis was also conducted for the Language Categorisation Task which combined data from the Training and No-Training versions of the task (see: Table 6.4 for *A′* scores and reaction times).

[53] This was not significant even when the native Scots were included (r = -.001, N = 81, p = .996).
[54] Not significant even when including the native Scots (r = .174, N =81, p = .120).

Table 6.4: Means (and standard deviations in brackets) for *A′* scores (top line) and overall German/Russian Reaction Times (bottom line) in milliseconds for the *Language Categorisation Task,* broken down by Training Condition and Level of Exposure to German/Russian.

	Training	**No-Training**
Native German/Russian	.826 (.17) 1641.71 (583.6)	N/A
Have Studied German/Russian	.736 (.18) 1844.3 (474.45)	.663 (.18) 2348.39 (770.05)
Never Studied German/Russian	.710 (.15) 1910.05 (357.34)	.649 (.14) 1964.03 (372.23)

Sensitivity to Russian

Data from both versions of the Language Categorisation Task produced a 2 (Training Condition: training, no-training) by 3 (Exposure Level: Native German or Russian, Have studied German or Russian, Have never studied German or Russian) between-subjects ANOVA which showed no significant main effects of Training Condition (p = .133) or Exposure Level (p =.137) on *A′* scores. There was also no significant interaction between the two variables (p = .882).

Reaction Times

A joint analysis of both *Language Categorisation* experiments produced a 2 (Training Condition: training, no-training) by 2 (Linguistic Variety: German, Russian) by 3 (Exposure Level: Native German or Russian, Have studied German or Russian, Have never studied

German or Russian) mixed ANOVA which revealed a significant main effect of Training Condition ($F(1, 75) = 4.55$, $p < .05$, partial $\eta^2 = .06$) with RTs in the training condition (*M* = 1819.35ms, *SD* = 468.02ms) being faster than those in the no-training condition (*M* =2040.9ms, *SD* = 486.4ms) . There were no other significant main effects or interactions (all p's > .1).

Relationships between A′ score/Reaction Times and Exposure to German and Russian

The data were combined from the Training and No-Training versions of the Language Categorisation Task, to determine whether there was a relationship (for the non-native German or Russian participants) between previous exposure to the languages and Reaction Times/*A′* scores.

No significant relationship between mean German/Russian reaction times and the amount of years spent studying German or Russian was found ($r = .151$, $n = 68$, $p = .218$)[55], and the relationship between *A′* scores and the amount of years spent studying German or Russian fell short of significance: ($r = .236$, $n = 69$, $p = .053$)[56].

[55] This was not significant even when the native German/Russians were included ($r = -.184$, $N = 80$, $p = .103$)
[56] This was significant when the native German/Russians were included ($r = .373$, $N = 80$, $p < .01$) but it should again be highlighted that no native German/Russian participants took part in the "no-training" experiment.

DISCUSSION

The results of the *Dialect* and *Language Categorisation Tasks* in both the training and no-training experiments overwhelmingly show that an extremely limited amount of previous exposure (which the participants may not even have been aware of themselves) is sufficient for listeners to successfully categorise words as belonging to a target variety. Categorisation accuracy (as measured by *A′* scores) for the *Dialect Categorisation Task* was almost at ceiling, which likely reflected the fact that the majority of participants were currently residing in an area where these varieties are regularly spoken. Categorisation performance on the *Language Categorisation Task* was not as high; however, even the participants who reported no experience of ever formally learning German or Russian were able to significantly distinguish cognate items between these varieties above chance. This suggests that casual passive exposure was enough to form the representations of the sound templates of these languages in line with McQueen et al. (2006). This subsequently allowed the participants to recognise these varieties based on cues which were independent of any semantic knowledge related to the target items. No significant group differences were found in *A′* scores on both the *Dialect* and *Language Categorisation Tasks,* nor did categorisation accuracy differ across the training and no-training conditions which suggests that the minimal amount of training given in Experiment 1 did not lead to a substantially better performance, nor was it solely responsible for allowing participants to form a representation of the sound templates of the target varieties.

There were also no significant group differences in reaction times across both the *Dialect* and *Language Categorisation Tasks,* apart from in the no-training version of the

Language Categorisation Task. In this version, the participants who had studied either German or Russian had significantly *longer* reaction times than those who had studied neither language, which is the opposite of what had been predicted previously. However, given the small number of participants (n = 6) which constituted the group who had ever studied German or Russian (combined with the presence of a participant with unusually long reaction times) this result should be interpreted with caution. For the most part, the predictions outlined in the introduction - namely that those with familiarity and high levels of exposure to both target varieties would have longer reaction times than those only familiar with one[57], and the longest reaction times being present in those unfamiliar with either variety - were not confirmed: there were no significant differences between groups (apart from the aforementioned anomalous result). Overall reaction times did, however, significantly differ between the two experiments, with reaction times in the no-training conditions being longer than those in the training conditions across both the *Dialect* and *Language Categorisation Tasks.* These longer reaction times may reflect a more hesitant approach towards performing the task in the no-training condition, given the absence of any initial reference points for the different categories or emphasise a rapid learning curve associated with the minimal amount of training. Indeed, the inclusion of training components resulted in mean reaction times that were 135.41ms faster than in the no-training version of the *Dialect Categorisation Task,* and 221.55ms faster than in the no-training version of the *Language Categorisation Task.*

Although using different paradigms, the current results are in line with the findings of Witteman et al. (2013; 2014) and Hisagi and Strange (2011), which also demonstrate that

[57] This is based on the hypothesis that familiarity with one variety might lead to a simple familiar vs unfamiliar categorisation strategy, whereas those familiar with both varieties employ a different strategy to correctly match the phonetic and phonotactic cues with their respective variety.

subtle phonological and phonetic differences can exert an effect on performance with extremely limited exposure to a target variety. With languages, dialects and accents being such important markers for identifying the characteristics of a speaker such as their geographical background (Hay, Nolan, & Drager, 2006), gender (Meister, Landwehr, Pyschny, Walger, & Wedel, 2009), age (Drager, 2011), ethnicity (Rakić, Steffens, & Mummendey, 2010), socio-economic status (Hay, Warren, & Drager, 2006), sexual orientation (see: Gowen & Britt, 2006) and general in-group vs out-group membership, it is perhaps not surprising that these categories can be identified with such limited prior exposure (and even before any semantic knowledge can be gained). Pietraszewski and Schwartz (2014a; 2014b) provide evidence supporting the notion that accent categorisation is an important beneficial skill, which has arisen via evolution through natural selection, and has culminated in a set of cognitive mechanisms which are suited for a speedy, reliable, and relatively inexpensive ability to infer important information from the speech patterns of others. Visual characteristics, such as race, can also indicate group differences; however, Pietraszewski and Schwartz (2014b) propose that categorisation of in-groups and out-groups by accent is part of a dedicated cognitive system, whereas categorisation by race is a by-product of other systems, as during the time periods in which these abilities evolved, humans travelled over relatively short distances and would not “have exceeded the geographic scale of the features that currently constitute race” (p. 52) i.e. unlike the modern world, individuals would not have the opportunity to encounter people of different races in everyday life.

The more linguistic features two individuals share, the more likely they spent their early lives as part of the same social community and within the same local geographic proximity (Pietraszewski & Schwartz, 2014a). Inferences can be made about those with differing linguistic features, such as out-group members having potentially different skills, knowledge, culture and exposure to different pathogens etc. based on the different social and geographic environments which they inhabit, making the ability to easily categorise out-group membership based on speech patterns an important one for survival (Pietraszewski & Schwartz, 2014b). Yet Pietraszewski and Schwartz (2014a; 2014b) also propose that it is not viable to strictly make binary in-group vs out-group classifications: different out-groups need more precise categorisations rather than all being simply tagged as belonging to one category. To illustrate this, speakers of Linguistic Variety A may have previously been attacked by a group of speakers of Linguistic Variety B; yet, a coalition with the neighbouring speakers of Linguistic Variety C might be beneficial and ensure the survival of group A. Without the ability to further discriminate between out-groups, this potential for survival would be lost.

While the evidence suggests a strong evolutionary benefit to being able to categorise individuals based on their speech patterns, these processes are undoubtedly different to those involved in successfully producing a different accent, dialect or language. The results of this study suggest that humans find it easy to identify and categorise linguistic varieties that indicate membership of an out-group, yet faithfully reproducing the exact sounds involved in native-like pronunciation of an unfamiliar variety is notoriously difficult (Cohen, 2012). While it may be easy to identify and categorise the linguistic features which indicate membership of an out-group, if reproducing these features (and thus being subsequently indistinguishable from members of that group) were as easy as this initial categorisation ability, then presumably this highly specialised system of accent categorisation as a skill for survival would have become redundant and not have been selected for (see: Cohen, 2012). Coincidentally, Pietraszewski and Schwartz (2014a) conjecture that the ability to identify linguistic variations is experience-dependent and without such prior (frequent) experience subtle linguistic features may not be perceived at all (and thus eliminate the ability to categorise), yet the results of the present study show that actually very little exposure is necessary to be able to successfully categorise However, the lack of group differences in accuracy and speed of categorisation in the present study make paradigms such as the *Dialect* and *Language Categorisation Tasks* unsuitable for diagnosing proficiency with a linguistic variety.

Chapter 7: General Discussion

The purpose of this thesis was to investigate whether dialects are represented as separate varieties and to determine whether bidialectals are more cognitively similar to bilinguals or monolinguals as a result of their use and knowledge of two dialects. As bidialectal language representation is a relatively unexplored topic with very few studies published in this area compared with bilingual language representation, this thesis has served as a preliminary platform to determine which experimental paradigms might be best suited to investigate this issue further.

Summary of Main Findings

Chapter 3 investigated whether bidialectals would display an advantage in non-linguistic inhibitory control over monolinguals as a result of their knowledge and use of two dialects, as has previously been reported for bilinguals (e.g. Bialystok, Craik, Klein, & Viswanathan, 2004). If dialects (which have a large amount of typological overlap) are represented cognitively like separate languages (which typically are more typologically distinct), then presumably bidialectal speakers should regularly engage the same inhibitory control processes that bilinguals use to control their language production, as has been outlined in Green's (1998) Inhibitory Control (IC) model, the benefits of which are proposed to transfer to general, non-linguistic, domains (Bialystok et al., 2004). Thus, the presence of a bidialectal advantage in non-linguistic inhibitory control over monolinguals would indicate that bidialectals are more cognitively similar to bilinguals in this regard.

In investigating this question, this study was mindful of the potential confounds that are associated with bilingualism, such as differences in immigration status, ethnicity, culture, and socioeconomic status, and aimed to match a series of monolingual, bidialectal and bilingual groups on these background measures. An additional bilingual group, which differed on some of these measures, was also included for comparison. The results of this study showed no significant differences between any of the language groups on their levels of non-linguistic inhibitory control. This meant that, not only was there no evidence for a bidialectal advantage in non-linguistic inhibitory control, but the previously reported bilingual advantage was not replicated in either of the bilingual groups. The results from this chapter were published as Kirk, Fiala, Scott-Brown and Kempe (2014) and joined the growing body of literature that has challenged this previously established finding (see: Paap, Johnson & Sawi, 2015). Ultimately, the lack of any discernible group differences in this study meant that this paradigm was not a useful one for comparing monolingual, bidialectal and bilingual language representation.

Chapter 4 investigated more directly whether bidialectals employ the same cognitive mechanisms as bilinguals as a result of using two dialects. In this study, a Dialect Switching Task (adapted from previous language switching paradigms) was used to determine whether switching between Standard English and Dundonian when naming pictures would incur a switch cost as has been found for bilinguals. In previous studies (see: Declerck & Philipp, 2015a; Meuter & Allport, 1999), these switch costs are often interpreted as being a marker of the employment of inhibitory control processes (within the linguistic domain), as outlined in Green's (1998) IC model, which allow a bilingual to control their language output. Asymmetrical switch costs are often found for unbalanced bilinguals or second language learners, which suggests a greater cost for switching into one variety compared to the other.

Paradoxically, this greater cost is associated with switching to the more dominant variety, as a consequence of the greater amount of inhibition that was required to suppress it in the first place (as proposed by Green, 1998). Balanced bilinguals often produce symmetrical switch costs, indicating an equal level of inhibition is applied to both varieties (Delerck & Philipp, 2015a), although some studies (e.g. Costa & Santesteban, 2004) have suggested that, when a high enough level of proficiency has been reached in both languages, mechanisms other than inhibition are responsible for bilingual language selection (although ultimately this process still manifests itself in symmetrical switch costs).

The results from the Dialect Switching Task replicated these findings for bidialectals: Asymmetrical switch costs were displayed by monodialectals who had only limited proficiency with Dundonian, with a greater switch cost associated with their L1, Standard English. This suggests Dundonian was a more weakly represented variety and a larger amount of inhibition was required in order to suppress the activation of their more dominant English. Conversely, active - and even passive - bidialectals showed symmetrical switch costs suggesting separate, but equally dominant, representations of their two varieties, replicating the pattern of results found for balanced bilinguals. This finding suggests that bidialectal speakers of typologically related varieties are cognitively similar to bilingual speakers of typologically more distinct languages and are subject to the same language selection mechanisms. Moreover, this also holds true for those who do not regularly *speak* both varieties but are regularly exposed to and have high levels of proficiency in both.

Thus, the level of linguistic differences between Standard Scottish English and Dundonian Scots could be interpreted as being distinct enough to render them as separate languages cognitively (and those with equal proficiency in both as cognitively bilingual) leading to the pattern of switch costs displayed by the different dialect groups. These results suggest this paradigm is a useful one for investigating the differences in language representation between monolinguals, bidialectals and bilinguals.

Chapter 5 investigated an additional component that may account for the presence of language switching costs: that of changes in articulatory settings, which are often required to produce native-like utterances in different language varieties. Previous research has shown that highly proficient bilinguals possess discrete articulatory settings for each of their languages (Wilson & Gick, 2014), which the speech organs must manoeuver between when switching from one language to the other. Therefore some of the language switch costs reported in previous studies may be accounted for by this motor component.

To investigate this further, two experiments were conducted which required participants to switch between articulatory settings while remaining within a monolingual setting. The first required participants to switch between using the /?/ (glottal stop) and /t/ phonemes; and the other required participants to either produce responses at normal volume or by whispering them. Both experiments involved changing between different articulatory processes, although arguably the process of t-glottalisation also contains a sociolinguistic component with glottal stops often considered to be a marker of improper speech (Trudgill, 2000). The same stimuli were used in both experiments and participants took part in either the Glottal or the Whisper experiment, but not both.

The results of this study showed the presence of switch costs in both experiments. The patterns of switch costs were symmetrical and the magnitude of these costs was the same across both experiments. However, naming latencies in the Whisper experiment were significantly faster than those in the Glottal experiment which may have reflected the exclusive articulatory nature of the Whisper experiment, compared with the articulatory and lexical representational aspects of the Glottal experiment. These findings provide evidence to suggest that switching between articulatory settings is a costly process and may account for some of the previously reported language switching costs. Future studies could attempt to further isolate these costs into their cognitive and motor components.

Chapter 6 moved the focus away from the production aspect of dialect use and instead focused on the ability to perceive and categorise different language varieties. Initially, this study was designed with the view that the results could potentially inform the design of a task which could be used as a diagnostic measure of dialect (and language) proficiency alongside self-report measures. However, the results of both the Dialect and Language categorisation tasks indicated that the ability to identify and categorise varieties was one that individuals were very proficient at using, even with extremely limited prior exposure to the target varieties. Thus, no significant differences in accuracy or reaction times emerged between the different language groups. Interestingly, even participants with no semantic knowledge of the varieties that were being presented, and who reported no formal of experience of ever learning them, were able to correctly categorise these varieties significantly above chance. To determine whether the minimal amount of exposure the participants were given in the training component at the beginning of each task was enough to allow them to form a representation of the sound template of a variety, the experiment was repeated with the training component removed.

The results of this second experiment were the same: even without training, those with no previous knowledge or formal exposure to the target varieties were able to significantly identify them above chance from the cues contained within a single word. In this chapter, various explanations with their roots in evolutionary psychology were discussed to explain these results, which suggest that humans have evolved a dedicated set of cognitive processes which make extracting indexical features from speech an important one for making in-group versus out-group distinctions (see: Pietraszewski and Schwartz, 2014a; 2014b). Ultimately, the high levels of performance across all conditions of these categorisation tasks indicate that this paradigm is not suited towards the development of a diagnostic tool, which could indicate a listener's proficiency with a dialect or language.

How do these Findings Relate to Each Other?

If interpreted within the framework of one of the most influential models of bilingual language representation - Green's (1998) Inhibitory Control model – the results from this thesis can offer several novel insights into bidialectal language representation. The results of the categorisation tasks show that the formation of a representation of the sound template of a language or dialect (see: McQueen, Cutler, & Norris, 2006) can be achieved with extremely limited prior exposure to a target variety. The categorisation of these sound templates could be similar to the formation of tags associated with specific varieties proposed by Green (1998), albeit at a pre-lexical level. Presumably, these sound templates can be built upon to form complete lexical representations, which are then tagged in direct accordance with Green's (1998) model. The formation of such sound templates may account for the relative ease the monodialectal participants in **Chapter 4** had in representing new (Dundonian) lexical items prior to their participation in the *Dialect Switching Task.* However, despite the monodialectal participants quickly acquiring these new lexical items, they still displayed a pattern of switch costs that was significantly different from the more experienced and proficient bidialectal groups, suggesting that a critical amount of exposure[58] is required for these varieties to become represented with equal strength.

At face value, the symmetrical switch costs displayed by the active and passive bidialectals, alongside the asymmetry displayed by the monodialectals, suggests that a variety such as Dundonian Scots, which is often considered a dialect of Standard Scottish English (despite the history of these varieties outlined in **Chapter 2**), is distinct enough from the standard variety to be cognitively represented like a separate language.

Switch costs were also displayed in a task that required participants to change between using different articulatory processes while remaining within a monolingual setting, yet this finding does not negate the interpretation of the results from the *Dialect Switching Task*. Rather, the results of this study serve to highlight an additional component involved in language switching which may contribute (without accounting entirely for) the overall cost

[58] The term "exposure" is used here rather than any reference to "production" to acknowledge the performance of passive bidialectals. Passive bidialectals did not report regularly producing both dialects but still displayed a similar performance to the active bidialectals who do regularly speak both varieties.

involved when switching between varieties. Given that asymmetrical switch costs were not observed in this study, and such a pattern of costs is associated with higher level cognitive processes (see: Declerck & Philipp, 2015a), it may be assumed that the presence of asymmetry in the monodialectal group in the *Dialect Switching Task* is indeed evidence of the presence of inhibitory control processes involved in the selection of competing lexical items between dialects. If asymmetrical switching costs were to be observed in a task which exclusively involved the switching of articulatory settings (and not different lexical representations), and articulatory processes are subject to the same inhibitory processes which apply to lexical selection, greater costs should presumably also be found for switching into the dominant articulatory setting.

Although it is beyond the scope of this thesis to determine if the productions of Standard (Anglo/Scottish) English and Dundonian Scots are subject to significantly different inter-speech postures (see: Wilson & Gick, 2014), the considerable amount of typological overlap between these varieties could mean that the differences between these settings is minimal. Thus, in this instance, the influence of the motor components on the cost involved when switching between these dialect varieties could be less pronounced than in varieties that have more distinctive speech sounds, which presumably require significantly differently positioned articulators.

With the results of the *Dialect Switching Task* suggesting that bidialectals employ similar inhibitory control mechanisms as bilinguals in order to maintain their two varieties, given the logic proposed by (amongst others) Bialystok, et al. (2004), the constant application of these inhibitory processes should have resulted in an advantage in non-linguistic inhibitory control for bidialectals over monolinguals. The evidence from this thesis suggests that the regular practice of these mechanisms does not transfer to non-linguistic domains and that subsequently, certain cognitive benefits, which arise as a result of the use of more than one language variety, are not as evident as previous research would suggest.

Some of the findings in this thesis have been recently corroborated in a paper by Scaltritti, Peressotti, and Miozzo (2015). In their paper, Scaltritti, et al. (2015) also failed to find a bidialectal advantage in non-linguistic inhibitory control for Italian-Venetian bidialectals, and also demonstrated a pattern of symmetrical switching costs for the same type of dialect speakers.

What are the Implications of these Findings?

The results of this thesis suggest that bidialectals may be more cognitively similar to bilinguals than monolinguals. Thus, with reference to the *Continuum of Increasingly Diverging Language Varieties* outlined in Figure 1.3, dialects and bidialectals should be categorised as being part of the bilingual range of the continuum as opposed to the monolingual end, as outlined in Figure 7.1.

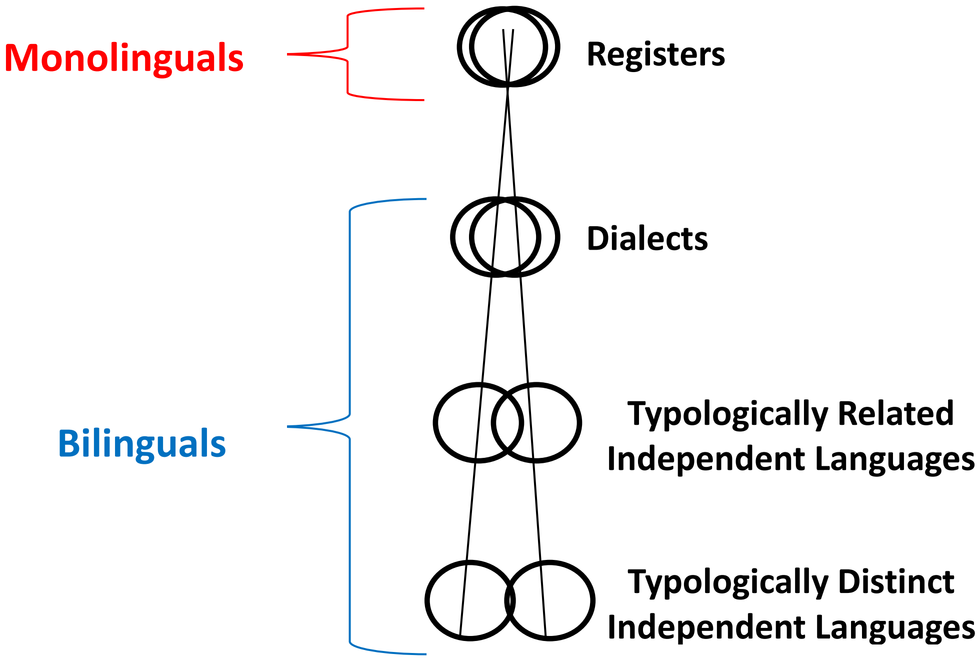

Figure 7.1. An updated illustration of the *Continuum of Increasingly Diverging Language Varieties,* which categorises bidialectals as being more cognitively similar to bilinguals. However, without measures that are sensitive to their dialect use, bidialectals may still be erroneously categorised as monolingual.

Previous research has often not concerned itself with the typological distance between languages. Perhaps it has been taken for granted that the use of any two varieties, no matter how closely related, is enough to engender the cognitive effects that are sometimes observed in bilinguals relative to monolinguals. However, even if this is the case, the results of this thesis have highlighted the methodological implications that can arise if non-standard language varieties are not taken into consideration when categorising participants into monolingual and bilingual groups, and can potentially lead to the erroneous categorisation of bidialectals as monolinguals.

Chapter 1 and **Chapter 2** highlight the range of factors that contribute to the categorisation of certain varieties as being either a dialect or a language. Scots, despite being regarded as an independent language by some authorities such as the Scottish Government (see: Scottish Government, 2010), is not considered a language by the majority of Scottish citizens, with a report commissioned by the Scottish Government (2010) showing that 64% of respondents do not "really think of Scots as a language – it's more just a way of speaking". While the results of this thesis may provide evidence to suggest that varieties of Scots are indeed cognitively represented as a separate language to Standard Scottish English, this does not necessarily overcome the views held by its speakers, or by those who decry its use (see: J. Costa, 2015; Kay, 2012).

With the subjective nature as to what is considered a "language" in mind, popular tools used to measure participants' language proficiency, such as the LEAP-Q (Marian, Blumenfeld, & Kaushanskaya, 2007), do not clearly specify the inclusion of non-standard, or low status, varieties. Although a recent study by Marian, (Schroeder, Lam, & Marian, 2015), one of the authors of the LEAP-Q, acknowledges the existence of bidialectal speakers, the LEAP-Q itself does not reflect this awareness. Thus, if sensitive measures are not implemented to encourage their inclusion, varieties that are considered of low status are likely to be overlooked not only by researchers (who may be totally unaware of the presence of such varieties in the environment from which they sample their participants), but also by these speakers themselves.

A recent example of a study which did not account for the presence of non-standard language varieties is provided by de Bruin, Bak, and Dela Sala (2015), who compared active and passive Gaelic-English bilinguals with a group of English monolinguals on a series of measures of non-linguistic inhibitory control. These monolingual participants were recruited from the Inner Hebridean Isles of Scotland, an environment where Scots is also used alongside Standard Scottish English. However, the participants' use and knowledge of Scots was not accounted for in de Bruin, et al.'s (2015) procedure. In addition to the explanations offered by de Bruin et al. (2015), with the results of the current thesis in mind (which suggests that bidialectals are cognitively similar to bilinguals) the lack of significant group differences in de Bruin, et al.'s (2015) study could also have been a result of the comparison of a bidialectal group, erroneously categorised as "monolingual", with a cognitively similar bilingual group; again highlighting the need for researchers to have a sensitivity and awareness of all the potential language varieties used in a given environment.

Future Directions

As a starting point to investigate bidialectal language representation, this thesis has identified several potential directions for future study:

As previously discussed in **Chapter 3,** although some recent studies have shown a positive effect of bilingualism (e.g. Verreyt, Woumans, Vandelanotte, Szmalec, & Duyck, 2015), most recently published evidence does not support a bilingual advantage in non-linguistic inhibitory control, therefore this avenue of research is one which, at present, does not worth seem worthwhile to pursue in order to determine the differences between, and processes involved in, monolingual, bidialectal and bilingual language representation.

The adapted language switching paradigms used in **Chapters 4** and **5**, however, have provided valuable insight into language representation in bidialectals, and the different components involved in language switching. Future research could explore the origin of language switch costs further, by using techniques which fraction reaction times into their premotor and motor components, to determine the extent to which switch costs are indicative of articulatory rather than inhibitory processes.

Although the findings of the Glottal experiment tentatively suggest that switching between registers could also incur a cost, future research could explore this more explicitly by adapting a switching paradigm for use with specific registers, such as normal and child-directed speech.

In the current thesis, adults had a high level of performance across all the categorisation tasks used in **Chapter 6**. However, it is unclear whether young children would also be able to acquire enough passive knowledge of the varieties to be able to perform these tasks. This research would need to take into consideration certain methodological problems involved with testing young children, such as how to represent and label categories, and to ensure these labels can be remembered. Indeed, none of the work contained in the current thesis involved the testing of children, and taking this future research down a developmental route may offer insights into how dialects are acquired and represented, and whether the presence of dialects can have an effect on the acquisition of literacy.

Finally, this thesis has shown that, on certain cognitive tasks, bidialectals are similar to bilinguals, but has also highlighted the methodological issues that may lead to the erroneous categorisation of bidialectals as monolinguals. Therefore, future research could also attempt to produce new self-report measures, or improve existing ones, such as adapting the LEAP-Q (Marian, Blumenfeld, & Kaushanskaya, 2007), so that they are sensitive towards participants' use and knowledge of non-standard language varieties. Only then can bidialectals, and other users of non-standard varieties, be categorised into their correct language groups.

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Appendices

Appendix A

(i): Ethical Approval for Non-Linguistic Inhibitory Control Study

LC/JS

Neil Kirk

5 Peterburn Terrace

Gowrie Park

Dundee

DD2 4TZ

Dear Neil

Dialect use in the (over 60) population in Tayside

The SHSREC has reviewed your application for ethical approval for the above study, and we are pleased to say that you have **conditional approval** for this research, but is subject to the following conditions:

You must remain in regular contact with your project supervisor

Your supervisor must see a copy of all experimental materials and your procedure ***prior to commencing data collection.***

If you make any substantive changes to your project plan you must submit a new ethical approval application to the committee. Application forms and the accompanying explanatory document are on the Portal. Completed forms should be handed in to the School Office, School of Social and Health Sciences, Level 5, Kydd Building.

Please ensure that potential participants have sufficient time in which to consider the PIS before deciding whether to take part

Please insert a little more detail into the PIS regarding the purpose of the study – particularly in relation to the age of participant aspect. Also, the use of the phrase 'short puzzle tests' (in both PIS and debrief sheet) to represent any IQ test we feel is slightly misleading and your reference to such a test should be slightly more explicit. For example you could say something like: '*The test will measure aspects of people's thinking and memory processes*'. This being the case, you should have a protocol in place for dealing with participants' enquiries about their scores, even if this is to explain to participants that due to the anonymising of data, individual scores cannot be pulled out from the dataset. Whatever you decide please put the information in the PIS.

Please insert into the PIS in the 'confidentiality' section information about your publication intentions (if any) and if necessary give assurances that participant anonymity will be guaranteed (e.g. in relation to verbatim quotes from the interview). We would also suggest that the meaning of the term 'preservation' in relation to cognitive abilities might not be obvious to lay people.

Please review your assurances about participant withdrawal – if data are to be fully anonymised, then participants may not be able to withdraw their data after collection.

It is usual with questionnaires to allow participants the opportunity to omit questions; please consider a justification for not offering such an option (if this is what you intend) otherwise mention this option in the PIS

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

I would be grateful if you could let me know as soon as possible if you accept the conditions stated. Should you have any queries please contact your supervisor.

Good luck with your research

Yours sincerely

Dr Lloyd Carson

Chair, School Ethics Committee

School of Social and Health Sciences

(ii): Ethical Approval for Dialect Switching Task

RL/CW/CR/SHS/13/P/011

12th December 2013

Neil Kirk

5 Peterburn Terrace

Gowrie Park

Dundee

DD2 4TZ

Dear Neil

Are dialects cognitively represented as separate languages?

This is to notify you that the Ethics Committee have looked at your resubmission and you have been granted **full ethical approval** to collect data for your project as entitled above. This is subject to the following standard conditions:

i You must remain in regular contact with your project supervisor

ii Your supervisor must see a copy of all experimental materials and your procedure prior to commencing data collection

iii If you make any substantive changes to your project plan, you must submit a new ethical approval application to the Committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be handed in to the School Office, School of Social & Health Sciences, Level 5, Kydd Building, Dundee iv Any changes to the procedures must be negotiated with your supervisor

The Committee also highlighted the following:

A separate risk assessment form must be completed for ***all projects***. This is the case even for studies where there are minimal issues. This is a requirement of the University Health and Safety Committee, ratified by the University Research Committee, and implemented by the School Research Ethics Committee. This should be logged with the Secretary for the School Research Ethics Committee prior to data collection beginning.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

Should you have any queries please contact your Supervisor.

Yours sincerely

School Ethics Committee

School of Social & Health Sciences

(iii): Ethical Approval for Dialect Ratings Study

JM/NMc/CR/SHS/14/P/015

27th January 2015

Neil Kirk

5 Peterburn Terrace

Gowrie Park

Dundee

DD2 4TZ

Dear Neil

Rating the authenticity of dialectal pronunciations

This is to notify you that the Ethics Committee have looked at your submission and you have been granted **full ethical approval** to collect data for your project as entitled above. This is subject to the following standard conditions:

i You must remain in regular contact with your project supervisor

ii Your supervisor must see a copy of all experimental materials and your procedure prior to commencing data collection

iii If you make any substantive changes to your project plan, you must submit a new ethical approval application to the Committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be resubmitted through the Research Ethics Blackboard course.

iv Any changes to the procedures must be negotiated with your supervisor

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

Should you have any queries please contact your Supervisor.

Yours sincerely

School Ethics Committee

School of Social & Health Sciences

(iv): Ethical Approval for Articulatory Settings Project

RL/CW/CR/SHS/13/P/021

20th May 2014

Neil Kirk

5 Peterburn Terrace

Gowrie Park

Dundee

DD2 4TZ

Dear Neil

This is to notify you that conditional approval has been granted for you to collect data for your project entitled '***Are changes in articulatory settings responsible for the language switching cost?***', but is subject to the following conditions:

You must remain in regular contact with your project supervisor.

Your supervisor must see a copy of all research tools and your procedure *prior to commencing data collection.*

If you make any substantive changes to your project plan you must submit a new ethical approval application to the committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be handed in to the School Office, School of Social and Health Sciences, Level 5, Kydd Building.

You must complete and submit a full risk assessment and submit this to the SHSREC before data collection can begin.

Please ensure all future submissions are completed on the most up-to-date version of the Ethical Submission paperwork.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

I would be grateful if you could contact Mrs Carol Ramsey in the School Office on c.ramsey@abertay.ac.uk as soon as possible to advise that you accept the conditions stated.

Should you have any queries please contact your supervisor.

Yours sincerely

School Ethics Committee

School of Social and Health Sciences

(v): Ethical Approval for Categorisation Tasks

RL/CR/SHS/P/12/016

28th March 2013

Neil Kirk

5 Peterburn Terrace

Gowrie Park

Dundee

DD2 4TZ

Dear Neil

This is to notify you that **conditional approval** has been granted for you to collect data for your project entitled '***How do speakers assign words to dialects or languages?'***, but is subject to the following conditions:

You must remain in regular contact with your project supervisor

Your supervisor must see a copy of all research tools and your procedure ***prior to commencing data collection.***

If you make any substantive changes to your project plan you must submit a new ethical approval application to the committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be handed in to the School Office, School of Social and Health Sciences, Level 5, Kydd Building.

The Committee felt that this study is fine in principal and touches upon only minimal ethical issues. However there are several items of information that need to be confirmed before it could begin:

A risk assessment form must be completed for all projects. This needs to be completed on a University Risk Assessment Form. ***This should be logged with the Secretary for the School Research Ethics Committee prior to data collection beginning*.**

The proposal states that all participants will complete an adapted language background questionnaire. A copy of the questions should have been included. ***This should be logged with the Secretary for the School Research Ethics Committee prior to data collection beginning*.**

You have not stated the number of participants. All studies must at least state a maximum recruitment number. This is to prevent studies being open-ended, to ensure limits are in place, and to prevent over-powering the study. It is also desirable to state a minimum recruitment number. Please discuss the maximum number of participants that you will recruit with your supervisory team. Studies must always have an upper limit. In any future submissions please be sure to include this information.

Part of your data collection method (online) means that you may potentially access people who do not fit your inclusion/exclusion criteria. Please discuss this with your supervisory team and ensure any future projects include a statement on how you will prevent inappropriate individuals completing the questionnaire.

You have made no statement about how informed consent will be collected with the online section of the test. It is assumed that this will be displayed on the first page of the Survey Monkey forms with a tick box or other similar approach but this should have been stated in the proposal.

The informed consent form for the offline version of the study requires all participants to sign the same sheet. This violates guidelines for confidentiality in research studies. Your informed consent form should be separate for each participant and include a list of all the conditions they are agreeing to (e.g., I agree I have read all the information provided, I agree to participate etc.)

You have used the old ethical checklist form. New ones are available on the Portal. Please ensure you use the most recently updated form in any future submissions.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

I would be grateful if you could contact Mrs Carol Ramsey in the School Office on c.ramsey@abertay.ac.uk as soon as possible to advise that you accept the conditions stated. Should you have any queries please contact your supervisor.

Yours sincerely

School Ethics Committee

School of Social and Health Sciences

Appendix B

(i):Dialect Background Questionnaire (Inhibitory Control Project)

Background Questionnaire - Participant # ____

In order to analyze the results of this study, we need some background information about your language abilities and dialect usage. These data will remain strictly confidential.

1. Age: _________ 2. Sex: _________

3. Place of Birth ________________

4. I would like to ask you about your school days.

What Secondary School did you go to? ________________________

a) What age did you leave school? ________________________

[If less than 15 stop here move to Employment Question.]

b) Do you remember what subjects you took in your O-levels (or equivalent)?

____

[If no, Stop here and go to employment]

c) Did you go to college or University?   Yes []   No []

If yes, what was the highest qualification you gained?

____

5.a) I would like to ask you about your employment history. Could you please tell me what jobs you have held once you finished school or college/university?

____

b) When did you retire or when do you plan to retire?

6. Do you know any other languages apart from English?

Yes []   No []

If Yes, please indicate which languages these are:

(ii) Can you rate yourself on the language you know best on a scale of 1-6 for each of the following:

Speaking   ________

Listening   ________

Reading   ________

Writing   ________

7. Are you left or right handed?

Left [] Right [] Ambidextrous (both) []

b) Were you forced to change your handedness in school?

Yes [] No []

Dialect Usage

8. Do you ever communicate using a specific dialect (by this I don't mean standard Scottish accent)?

Yes [] No []

If yes, what would you call this dialect?

____

9. I'd like to ask you how often you think you use dialect in different circumstances. When you are at home, what percentage of the time would you say you used dialect at this point in your life? Where 100% would be all the time and 0% not at all.

i) At Home ___________

Now I'd like to ask you the same question for work

ii) At Work ___________

And with friends?

iii) With Friends ___________

Lastly, what percentage of the time would you say you used dialect in any other situations

iv) Other Situations ___________

10. a) To what extent was this pattern of dialect usage true throughout your life?

b) Have you lived outside of Scotland for any length of time?

Thank you.

(ii) Dialect Usage Questionnaire (Dialect Switching Task)

#_______

In this questionnaire, we are trying to find out the ways and in which situations people use local dialect. By local dialect we mean varieties such as Dundonian, a version of Scots, which is spoken in the Dundee area. There are other forms of local dialects in Scotland, for example, Doric and Glaswegian.

These local dialects are different from what is known as Standard Scottish English (SSE), which is the language one would hear, for example, in the news on Scottish TV and which is taught in the classroom. Standard Scottish English (SSE) might also just be described as "Standard English" which is spoken with a Scottish accent.

Here are some examples of words and phrases pronounced in both Standard Scottish English (SSE) and Dundonian:

Standard Scottish English	**Dundonian**
Don't know	Dinna ken
School	Skale
He's five years old	He's fev year auld
I sat down on the floor	Eh sat doon on the flair

Completing the questionnaire is entirely voluntary and you are free to leave any of the questions unanswered if you wish.

General Background Information

1. Age: _________ 2. Sex: _________ 3 a) Place of Birth ________________

3 b) How long have you lived in Dundee? _____________________

4. a) How old were you when you left school? ________________________

b) What is the highest level of qualification that you have gained? (Please Circle One)

School Leavers Certificate Standard Grades/O-Level Highers

College University Postgraduate

c) If you are currently a university student please list which year you are in

____

5a) Please list the types of jobs you have held since you finished school or college/university?

____

b) Are you retired? Y / N If yes, how old were you when you retired? _________

Language Background Information

6. Do you know any other languages apart from English?

Yes [ ]   No [ ]   If No, skip to Question 8.

If yes, please indicate which languages these are in order of fluency:

____

7. Please rate yourself on the language **you know best** (other than English) on a scale of: 1 (very poor) to 7 (completely fluent)

for each of the following:

speaking ________

understanding ________

reading ________

writing ________

Dialect Usage

8a) We are interested in whether you ever communicate using a specific Scots dialect (such as Dundonian). For example, using words like "doon" instead of "down", "ken" instead of "know", "bairn" instead of "child" or describing the weather as "dreich".

Which would you say is your native variety? (the one you spoke first)

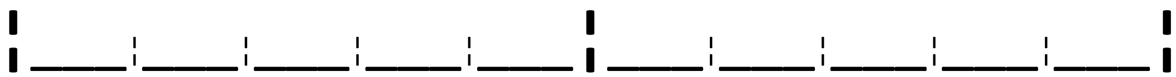
Standard Scottish English [ ]   Dundonian [ ]   Both [ ]

If you speak a different Scots dialect (other than Dundonian) please name it here:

____

b) What percentage of the time do you use Standard Scottish English (SSE) and Dundonian? Please mark an X where you think you fit on the scale below:

I use SSE 100% of the time (0% Dundonian)	I switch between SSE and Dundonian and use each around 50% of the time	I use Dundonian 100% of the time (0% SSE)



9. On a scale of 1– 7 please rate your ability to **UNDERSTAND** what a Dundonian speaker is saying. (please circle)

1 2 3 4 5 6 7
can't understand completely understand

10. Please rate, by placing an **x** under the appropriate number, how much you agree with the following statements.

1 = completely disagree 4 = not sure 7 = completely agree

	1	2	3	4	5	6	7
Parents should encourage their children to use Dundonian.							
I think speaking Dundonian may be useful in the workplace.							
Parents should discourage their children from using Dundonian as it is not the proper way to speak.							
People should be encouraged to use their local dialect as much as possible.							
Standard Scottish English is the correct way for people in Scotland to speak.							
I would correct my child if they said *"hoose"* instead of *"house"* or *"dinna"* instead of *"don't"*.							
I would correct my child if they used words like *"dreich"* instead of *"overcast/rainy"*, or *"scunnered"* instead of *"disgusted/sick of"*.							
People should be encouraged to use Dundonian as a way of expressing their local identity.							

Thank you very much for your time and cooperation!

All the information gathered in this questionnaire will be treated as confidential and you will not be identifiable from it.
This research is being conducted by the University of Abertay Dundee. If you have any questions or comments about the questionnaire or any future research projects which you would like to be involved in, please contact:

Neil Kirk - email: n.kirk@abertay.ac.uk
Prof. Vera Kempe - email: v.kempe@abertay.ac.uk phone: 01382 308586

(iii): Articulatory Settings Background Questionnaire

General Background Information #__________

1. Age: _________ 2. Sex: _________ 3a). Place of Birth ________________

b) How many years have you lived in Scotland? ____________________

4. a) How old were you when you left school? ________________________

b) What is the highest level of qualification that you have gained? (Please Circle One)

School Leavers Certificate Standard Grades/O-Level Highers

College University Postgraduate

c) If you are currently a university student please list which year you are in

____

5a) Please list the types of jobs you have held since you finished school or college/university?

____

b) Are you retired? Y / N If yes, how old were you when you retired? _________

Language Background Information

6. Do you know any other languages apart from English?

Yes [ ] No [ ]

If yes, please indicate which languages these are in order of fluency:

---

7. Please rate yourself on the language **you know best** (other than English) on a scale of: 1 (very poor) to 7 (completely fluent)

for each of the following:

speaking ________

understanding ________

reading ________

writing ________

Dialect Usage

8a) We are interested in whether you ever communicate using a specific Scots dialect (such as Dundonian). For example, using words like "doon" instead of "down", "ken" instead of "know", "bairn" instead of "child" or describing the weather as "dreich".

Which would you say is your native variety? (the one you spoke first)

Standard Scottish English [ ] Scots e.g. Dundonian [ ] Both [ ]

If you speak a different Scots dialect (other than Dundonian) please name it here:

____

b) What percentage of the time do you use Standard Scottish English (SSE) and Scots?
Please mark an X where you think you fit on the scale below:

I use SSE 100% of the time (0% Scots)	I switch between SSE and Scots and use each around 50% of the time	I use Scots 100% of the time (0% SSE)

▌_____¦_____¦_____¦_____¦_____▌_____¦_____¦_____¦_____¦_____▌

9. On a scale of 1– 7 please rate your ability to **UNDERSTAND** what a Scots e.g. Dundonian speaker is saying. (please circle)

	1	2	3	4	5	6	7	
can't understand								completely understand

Thank you very much for your time and cooperation!

All the information gathered in this questionnaire will be treated as confidential and you will not be identifiable from it.
This research is being conducted by Abertay University. If you have any questions or comments about the questionnaire or any of the future research projects which to be involved in, please contact:

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Appendix C

(i): Mixed Effects Analysis: Dialect Switching Task Error Rates

Non-standardised coefficients, z and p-values for significant effects in mixed-effect logit models for error rates with fixed effects of Linguistic Variety, Cognate Status and Trial Type and crossed random effects of participants and items. The top model includes Dialect Group, effect-coded for passive bidialectals and monodialectals; the three bottom models present effects for each dialect group separately.

Fixed effect	β	z	$p <$
Cognate Status	0.33	-2.92	.01
Cognate Status x Linguistic Variety	0.16	-2.86	.01
Cognate Status x Passive Bidialectals	0.17	-2.05	.05
Cognate Status x Trial Type x Passive Bidialectals	0.13	-2.01	.05
Ling. Variety x Cogn. Stat. x Trial Type x Monodial.	0.11	-2.12	.05
active bidialectals			
No significant effects.			
passive bidialectals			
Cognate Status	0.60	-2.49	.05
Cognate Status x Trial Type	0.29	-2.17	.05
monodialectals			
Trial Type	0.25	-2.78	.01
Cognate Status	0.27	-2.18	.05

(ii): Mixed Effects Analysis: Dialect Switching Task Naming Latencies

Non-standardised coefficients, t and p-values for significant effects in mixed-effect models for naming latencies with fixed effects of Linguistic Variety, Cognate Status and Trial Type and crossed random effects of participants and items. The top model includes Dialect Group, effect-coded for passive bidialectals and monodialectals; the three bottom models present effects for each dialect group separately.

Fixed effect	*β*	*df*	*t*	*p* <
Trial Type	41.40	45	7.87	.001
Cognate Status	83.59	29	9.48	.001
Cognate Status x Linguistic Variety	15.36	12059	7.01	.001
Trial Type x Linguistic Variety	4.83	12046	2.20	.05
Cognate Status x Trial Type	6.01	12058	2.70	.01
Trial Type x Monodialectal Group	11.86	45	2.36	.05
Ling. Var. x Cogn. Status x Trial Type	-4.31	12046	-1.96	.05
Ling. Variety x Trial Type x Monodial. Group	6.80	12052	2.68	.01
active bidialectals				
Trial Type	32.01	19	5.63	.001
Cognate Status	91.17	27	6.09	.001
Cognate Status x Linguistic Variety	9.61	4032	2.78	.01
passive bidialectals				
Trial Type	87.85	22	7.17	.001
Cognate Status	35.92	15	5.22	.001
Cognate Status x Linguistic Variety	19.94	4116	5.69	.001
Cognate Status x Trial Type	7.54	4138	2.12	.05
Linguistic Variety x Cognate Status x Trial Type	-8.48	4117	-2.42	.05
monodialectals				
Trial Type	57.28	15	5.63	.001
Cognate Status	71.25	23	5.32	.001
Cognate Status x Linguistic Variety	16.50	3900	3.74	.001
Trial Type x Linguistic Variety	16.41	3901	3.72	.001