Predicting executive functions in bilinguals using ecologically valid measures of code-switching behavior

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Abstract

One of the factors claimed to impact on executive functions in bilinguals is code-switching. New insights into how exactly code-switching affects executive functions can be obtained if attention is paid to the kind of code-switching bilinguals engage in, and not just the frequency of code-switching. This raises the question how code-switching habits can be assessed in experimental research. This study presents two ecologically valid, yet efficient, methods of assessing code-switching habits: a frequency judgement task based on authentic stimuli, and a bilingual email production task. The two tasks converged in revealing differences in Dense code-switching in two groups of German-English bilinguals. Moreover, the frequency judgement task predicted code-switching frequency in the ecologically more valid email production task. Importantly, both tasks revealed code-switching patterns that explained group differences observed in executive performance. The bilinguals engaging in frequent Dense code-switching excelled at the aspect of executive functions (conflict-monitoring) predicted to be related to code-switching based on existing processing models. Hence, both methods are recommended for use as code-switching measurements in bilingualism research.

1. Introduction

Bilingualism has been shown to modulate executive functions and the cause of this has been argued to be bilinguals' constant use of cognitive control to monitor language selection (Bialystok, Craik, & Luk, 2012). However, bilingual advantages at executive control are not undisputed as some studies have failed to replicate previous findings (Paap & Greenberg, 2013). At the same time, there currently appears to be relative consensus that a closer inspection of bilinguals' sociolinguistic practices may provide insights into the complex relationship between bilingualism and executive functions (Bak, 2016).

In a field that is largely quantitative and experimental in nature, this is easier said than done. It raises the question of how sociolinguistic habits can be adequately measured in experimental settings outside of bilinguals' social context and speech community. Methods used to capture sociolinguistic habits in experimental research must be both ecologically valid and efficient enough for use with large sample sizes. This paper discusses two novel methods of assessing sociolinguistic habits in bilingualism research: frequency judgement tasks, and emails produced by bilinguals in the "bilingual mode" (Soares & Grosjean, 1984).

The paper focuses on the measurement of a sociolinguistic variable that has been suggested to modulate executive functions (i.e., code-switching (Costa, Hernandez, Costa-Faidella, & Sebastian-Galles,

2009; Green & Li Wei, 2014)). Code-switching is defined as the mixing of languages for structural and socio-pragmatic optimization purposes (Bhatt & Bolonyai, 2011). Different types of code-switching have been suggested to modulate executive functions differentially (Green & Li Wei, 2014). However, in the literature on executive functions little attention has been paid to the different types of code-switching bilinguals engage in. The current study investigated how bilinguals' code-switching practices can be measured, which is a prerequisite for understanding the impact of engaging in different code-switching types on executive functions.

Code-switching typically occurs in informal situations involving high degrees of interlocutor familiarity (Gardner-Chloros, 2009). Hence, the ecologically most valid method of assessing code-switching practices is the recording and transcription of informal conversational data. However, this method is highly time-consuming and labour-intensive, and thus not efficient enough for use with large sample sizes. It is therefore necessary to develop techniques for eliciting informal speech or frequency judgements of it in experimental settings.

Although Gullberg, Indefrey and Muysken (2009) have shown that it is possible to assess code-switching experimentally, most studies investigating code-switching and executive functions to date have relied on questionnaires asking bilinguals to self-report their general code-switching frequency (Rodriguez-Fornells, Kraemer, Lorenzo-

Selva, Festman, & Muente, 2012; Soveri, Rodriguez-Fornells, & Laine, 2011; Verreyt, Woumans, Vandelanotte, Szmalec, & Duyck, 2016). In some studies, bilinguals are also asked to differentiate between inter- and intra-sentential code-switching using questionnaires (Hartanto & Yang, 2016). These studies have contributed to bilingualism research by revealing significant correlations between code-switching and executive functions, but there is considerable divergence in findings.

Whilst some studies find code-switching to correlate positively with task-switching abilities (Soveri et al., 2011), other studies find correlations with inhibitory performance (Hartanto & Yang, 2016; Rodriguez-Fornells et al., 2012; Verreyt et al., 2016). It is possible that an investigation into different types of code-switching may explain these inconsistencies. Moreover, the existing studies rely exclusively on self-reports to measure code-switching. However, self-reported and actual behaviour often diverge and there are several reasons for assuming that this is the case when measuring code-switching.

Firstly, it has been observed that self-reports are less reliable for measuring "complex behaviour" (Zell & Krizan, 2014). Code-switching can certainly be regarded as complex behaviour involving challenging cognitive processes, so self-reports need to be taken with some reservations. Secondly, asking participants to report their code-switching behaviour presupposes high levels of metalinguistic awareness, particularly when it comes to teasing apart the usage of

different code-switching types, e.g. by differentiating between inter- and intra-sentential code-switching (Hartanto & Yang, 2016).

Moreover, some code-switching may happen without conscious awareness. As awareness is a requirement for self-reporting behaviour, it is therefore unlikely that bilinguals can provide a reliable testimony of their code-switching. Even in the case of conscious code-switching, a reliable self-report depends on participants' ability to remember past behaviour. Hence, it is questionable whether bilinguals can reliably differentiate, recall and report whether and how frequently they code-switch.

Importantly, code-switching is a highly stigmatised bilingual practice in many cultures (Gardner-Chloros, 2009; Poplack, 1980). Given participants' tendency to provide socially desirable responses in questionnaires (Dewaele & Li Wei, 2014), code-switching self-reports are likely to be confounded by attitudinal aspects. Attitudes towards inter-sentential code-switching are more positive than attitudes towards intra-sentential code-switching, for instance. These negative attitudes towards intra-sentential code-switching even confounded early code-switching research, which claimed that bilinguals switch languages "according to appropriate changes in the speech situation (interlocutors, topic, etc.), but […] not within a single sentence" (Weinreich, 1963:73).

Clearly, these claims have now been proven wrong as sociolinguistic corpora reveal that intra-sentential code-switching

amongst bilinguals is commonplace (Muysken, 2000). The existence of negative attitudes towards intra-sentential code-switching increases the likelihood of bilinguals scoring their inter-sentential code-switching frequency more highly than their intra-sentential code-switching. The differential effects of inter-sentential and intra-sentential code-switching on executive control observed by Hartanto & Yang (2016) thus need to be interpreted with that limitation in mind. To address the above-mentioned issues, research into code-switching and executive functions should move towards the use of ecologically valid direct methods of assessing code-switching.

A further weakness of existing code-switching questionnaires is that they only investigate code-switching frequency in general, differentiating between intra- and inter-sentential code-switching at best. However, a simple distinction between intra- and inter-sentential code-switching does not capture the variety of code-switching patterns found across different language combinations and bilingual communities. Muysken's (2000) review of sociolinguistic corpora revealed that there is great variation within intra-sentential code-switching, identifying three re-occurring patterns: (1) *Alternation* of structurally independent stretches of languages, (2) *Insertion* of lexical items from the non-matrix language into the grammatical framework of the matrix language, and (3) *Congruent Lexicalisation* or *Dense code switching* involving convergence between lexis and grammar of both languages.

Table 1 shows German-English examples of the three code-switching types. The fourth sentence illustrates the high degree of simultaneous co-activation of both languages in Dense code-switching. The English idiomatic expression "to make friends" is transferred into German. At the same time, English lexical items are re-inserted into the sentence. The two languages are so interwoven that it is impossible to identify a clear switch point (Alternation) or a matrix language (Insertion). Hence, Dense code-switching involves the constant monitoring of co-activated languages.

Code-switching type	**Example**
Alternation	*Ich kann heute nicht kommen* BECAUSE I'M ILL.
	I can today not come BECAUSE I'M ILL.
	I cannot come today BECAUSE I'M ILL.
Insertion E > G	*Wir suchen noch* VOLUNTEERS *für das Projekt.*
	We search still VOLUNTEERS *for the project.*
	We are still looking for VOLUNTEERS for the project.
Insertion G > E	*We didn't bring* SCHUHWERK *for hiking.*
	We didn't bring SHOES *for hiking.*
	We didn't bring SHOES for hiking.
Dense code-switching	*Wir haben* FRIENDS *gemacht mit'm* SHOP OWNER.
	We have FRIENDS *made with th'* SHOP OWNER.
	We have made FRIENDS with th' SHOP OWNER.

Table 1. German-English code-switching examples

For bilingualism research, it is crucial to differentiate between these code-switching types because they differ in the amount and type of executive control recruited (Green & Li Wei, 2014). Hence,

previously observed inconsistencies in findings may be addressed by differentiating between different code-switching types. Code-switching types that keep languages more separate (Alternation) recruit high levels of inhibitory control to temporarily suppress the non-target language (Treffers-Daller, 2009). Dense forms of code-switching, on the other hand, place greater demands on bilinguals' conflict-monitoring skills as bilinguals need to manage and consolidate simultaneously co-activated and competing language-specific lexical items and structural rules (Hofweber, Marinis, & Treffers-Daller, 2016). Hence, Dense code-switching differs from Insertion and Alternation because it challenges cognitive processes involved in the micro-management of co-activated languages (Green & Li Wei, 2014). It is predicted that the co-activation of competing linguistic structures during Dense code-switching involves, and thus trains, conflict-monitoring skills.

To summarize, findings about the relationship between code-switching and executive functions have been inconsistent, which may be due to a lack of systematic control for the quality of bilinguals' code-switching. As qualitatively different types of code-switching modulate executive functions differentially (Green & Li Wei, 2014), a more fine-grained assessment of code-switching is needed. Moreover, previous studies have relied on measuring code-switching frequency using questionnaires, which are suitable for measuring attitudes towards code-switching (Dewaele & Li Wei, 2014), but lack ecological

validity when it comes to measuring behaviour. Hence, it is necessary to develop measures of code-switching that are efficient, but ecologically valid and intuitive enough to assess bilinguals' preference for different code-switching types.

This paper presents a detailed review of two code-switching measurements that fulfil the criterion of efficiency, and are more ecologically valid than a mere self-report: a frequency judgement task using utterances from authentic sociolinguistic corpora, and a bilingual email production task. The two techniques were developed to measure code-switching in a recent study investigating the relationship between Dense code-switching and executive functions in two groups of German-English bilinguals (Hofweber et al., 2016). The present paper presents additional data from the Hofweber et al. (2016) study.

In the original study, code-switching was measured using only a frequency judgement task, whilst this paper presents additional findings from a bilingual email production task. The instructions and stimuli of both tasks were carefully drafted to reduce confounds arising from the bilinguals' attitudes towards code-switching, and to minimize the need to possess high levels of meta-linguistic awareness to provide frequency ratings. Bilingual emails have the potential to generate data that taps into bilinguals' intuitive language production, without involving the time-consuming recording and transcription of real-time speech data. Thus, they represent a novel and efficient way of assessing code-switching habits. Frequency judgement tasks are a well-

established method of measuring sociolinguistic habits (Backus, 2015). They are nevertheless based on self-reports, whilst the email task generates freely produced language data. In the current study, the email task was therefore assumed to have greater ecological validity and used as the benchmark of the comparison. If both tasks are valid measures of code-switching habits, then the results were predicted to converge. A lack of such convergence would be interpreted as a lack in validity of the less authentic judgement task. The emergence of code-switching patterns depends on bilinguals' sociolinguistic environment (Muysken, 2000). To be able to compare two groups of German-English bilinguals differing in Dense code-switching frequency, we identified two sociolinguistic environments predicted to lead to different Dense code-switching frequencies: (1) L1-German users of L2-English who are 1st generation immigrants to the UK, (2) 5th generation heritage speakers of German in South Africa. Bilinguals in communities with long-standing traditions of language contact tend to code-switch more Densely, whilst 1st generation immigrants who have only recently become active bilinguals engage primarily in Insertion and Alternation. Hence, the 5th genera tion bilinguals were predicted to engage in more Dense code-switching than the 1st generation bilinguals.

Bilinguals' executive functions were assessed in a flanker task presenting conditions that challenged conflict-monitoring to a greater or lesser degree (Costa et al., 2009). The bilinguals that engaged in

Dense code-switching more frequently were predicted to outperform the other group in the flanker task challenging conflict-monitoring.

To summarize, this paper discusses whether bilingual emails and frequency judgement tasks based on authentic stimuli are valid methods of assessing code-switching. If so, the use of these methods could be extended to measuring other sociolinguistic practices, facilitating their use as independent variables in experimental research. The study design was guided by the following research questions:

Research Question 1: Do the code-switching frequency measures from the judgement task and the bilingual emails converge when it comes to assessing group differences in code-switching patterns?

Prediction 1: If both tasks are equally good measures of code-switching, they should reveal similar code-switching patterns in the group comparison. It is predicted that the 5th generation bilinguals will engage in more Dense code-switching than the 1st generation bilinguals.

Research question 2: Does the frequency judgement task predict actual code-switching production in the bilingual email task?

Prediction 2: If the frequency judgement task is an ecologically valid task of assessing bilinguals' code-switching habits, then it should predict production variance in the ecologically more valid bilingual email task.

Research question 3: How well do the two tasks explain the pattern observed in the executive functions task?

Prediction 3: Frequent Dense code-switchers (5th generation bilinguals) were predicted to outperform infrequent Dense code-switchers (1st generation bilinguals) in the flanker task challenging conflict-monitoring. If both measures of code-switching reveal that group differences observed at conflict-monitoring map onto group differences in code-switching in line with predictions, then this speaks for the robustness of the code-switching measures.

2. Method

2.1. Participants

All participants shared the same German-English language combination, so there were no confounds from differences in typological distance between languages.

Group 1: 5th generation heritage speakers of German in South Africa (N = 11). German was their first language. Exposure to English began after the age of 6. These bilinguals lived in communities with long-standing multilingual traditions and spoke at least one additional local language, e.g., Afrikaans, Zulu, Setswana.

Group 2: 1st generation German immigrants in the UK (N = 11). German was their first language. English was the second language acquired after the age of 8. All bilinguals spoke additional school-taught languages.

Although the sample size was small, theadvantage of this was that participants in the two groups could be carefully matched for a range of non-linguistic (Table 2) and linguistic variables (Table 3) that modulate executive functions.

		5th generation bilinguals	1st generation bilinguals	F-value	df	p-value
Age	M	38.9	39.1	0.001	1, 20	0.98
	SD	16.1	15.6			
Education	M	3.8	3.6	0.225	1, 20	0.64
	SD	0.4	1.2			
Non-verbal IQ	M	108.5	108.6	0.000	1, 20	0.99
	SD	12.0	17.0			
SMG	M	6.0	6.8	3.130	1, 20	0.09
	SD	0.8	1.4			
SME	M	5.8	6.6	4.183	1, 20	0.05
	SD	0.7	1.3			
WMG	M	4.3	4.8	1.311	1, 20	0.27
	SD	0.8	1.3			
WME	M	4.6	4.9	0.391	1, 20	0.54
	SD	0.9	1.3			

Table 2. Non-linguistic control variables

As can be seen from Table 2, the groups did not differ in Age, Education (indicator of SES) or cognitive abilities. Non-verbal IQ was measured using Raven's Standard Progressive Matrices (Raven, Raven, & Court, 1998). Short term memory (SM) and working memory (WM) were measured using Wechsler's (1997) digit span,

administered in English (SME, WME) and German (SMG, WMG) language separately.

		5th generation bilinguals	1st generation bilinguals	F-value	df	p-value
German Proficiency	M	6.8	6.9	1.29	1, 20	0.27
	SD	0.1	0.1			
English Proficiency	M	6.2	6.3	0.12	1,20	0.74
	SD	0.2	0.2			
Balance	M	0.5	0.5	0.00	1,20	0.96
	SD	0.2	0.2			
AoO	M	6.5	11.0	5.43	1, 20	*0.03
	SD	1.4	1.4			

Table 3. Linguistic control variables

To assess the bilinguals' language background, the online language history questionnaire (Li, Zhang, Tsai & Puls, 2014) was administered. All bilinguals rated their English proficiency as advanced but declared that German was their native language. Balance was computed as the difference between the participants' proficiency in the two languages (Kupisch & De Weijer, 2016). Both groups were German-dominant. The only linguistic control variable in which the two groups differed was Age of Onset (AoO) of English with 5th generation bilinguals displaying an earlier AoO than 1st generation bilinguals. The 5th generation bilinguals had been systematically exposed to English from age 6 (primary school), whilst the 1st generation bilinguals started acquiring the L2 at age 11 (secondary school).

The 5th generation bilinguals displayed a high level of proficiency and literacy in their home language because schooling in

the heritage language is available. The German-speaking schools in South-Africa are run by a network of Lutheran communities. Although German-speakers have lived in South-Africa since the 19th century, they have maintained their heritage language because of their strong cultural bonds with the German language due to a continued effort to stay in contact with Lutheran communities in Germany (Franke, 2008). The high levels of proficiency are further explained by the fact that all participants were using German in their workplace. The German-speakers in South-Africa migrated primarily from Northern parts of Germany, so South-African German can be classified as Northern German variety with some minor contact-induced modifications limited mainly to vocabulary (Franke, 2008).

2.2. Tasks

All online tasks were created using Psychopy 1.81 and presented on a 13-inch-screen laptop.

2.2.1. Frequency judgment task

Frequency judgement tasks have been argued to be representative of cognitive embedding, indicating language use (Backus, 2015). The frequency ratings in judgement tasks require less metalinguistic awareness than those in questionnaires because participants rate concrete example sentences, rather than abstract judgements about

their language-switching behaviour. In this study, participants were visually and auditorily presented with 56 utterances containing 14 code-switches of each type: 1) Insertion English into German, 2) Insertion German into English, 3) Alternation, and 4) Dense code-switching. To increase the validity of the task, the stimuli were taken from existing German-English code-switching corpora (Clyne, 2003; Eppler, 2005). The sentences were matched for number of words (M = 8) and syllable length (M = 14). Insertional code-switches were also matched regarding the syntactic function of the inserted element, so that the number of inserted subjects, verbs and objects was identical for both directions of Insertion.

The code-switches were presented in pseudo-randomized order to avoid priming participants into a code-switching mode. To induce an informal language mode, evoking the contexts in which code-switching occurs, the participants were instructed to imagine that they were having an informal conversation with a German-English bilingual friend. They were asked to rate the frequency with which they would encounter "utterances similar to the stimuli" on a scale from 1 = "never" to 7 = "all the time". We asked about "frequency" because the term "acceptability" would introduce an unintended attitudinal element and would lead participants to refer to norms that are prevalent in a monolingual mode rather than in a bilingual mode (Onar Valk & Backus, 2013).

Moreover, we did not ask participants to report their own behaviour, but to simply state whether they "encountered" these types of sentences in informal conversations. This was done to reduce the attitudinal aspect even further, assuming bilinguals would be less likely to distance themselves from behaviour in their speech community than from their own behaviour. This approach was introduced by Onar Valk (2014) who successfully used it to measure the conventionality of Turkish grammatical patterns among Dutch-Turkish bilinguals. Evidence for the validity of the task will be sought through a comparison with the bilingual email task (see section 2.2.2) for which participants produced emails containing code-switching. Future research could investigate the impact of different wordings for the instructions in frequency judgement tasks.

2.2.2. The bilingual emails

To tap into free language production, a discourse completion task (DCT) asking participants to compose a bilingual email was administered to participants. In DCTs participants are asked to respond to a given text in written format. DCTs are an economical way of collecting language output from large numbers of participants (Sweeney & Hua, 2012). However, due to their written format, they have been criticized for not being fully representative of authentic language use. As the email is a written form of communication, this limitation applies to a lesser extent to this study.

Nevertheless, the written format represents a limitation because code-switching predominantly occurs in informal contexts involving spontaneous online processing (Gardner-Chloros, 2009). Written language on the other hand is typically associated with a high degree of formality and controlled processing. However, there are forms of communication that combine the formal characteristics of written language with the spontaneity and informal character of spoken registers (Koch & Oesterreicher, 2007). Its relative informality suggests that the email is such a hybrid medium (Crystal, 2006). Email communication is therefore assumed to be an informal context encouraging code-switching. Hence, the email DCT was deemed to be indicative of participants' code-switching habits in real speech. At least, it was assumed that participants' code-switching frequency in emails would provide a conservative estimate of their code-switching in real speech because speech will generally be less formal, thus generating more frequent and more Dense code-switching.

It would be an oversimplification to state that all email communication is equally informal. There are differences in register, depending on a variety of factors, such as the relationship between the interlocutors: an email written to a work colleague will be more formal than an email written to a friend. To induce an informal mode mimicking the contexts in which code-switching occurs, participants were instructed to write an email to another German-English bilingual friend telling them what they had done at the weekend and suggesting

going to the cinema together. The instructions themselves contained some code-switching, naturally generating a bilingual mode.

Instead of drafting an email on the given topic, participants could also provide an authentic email they had written prior to taking part in the study. Indeed, most participants opted for providing authentic emails, thus increasing the ecological validity of the collected response emails. In addition to being instances of authentic language production, the advantage of the real emails is that the observer's paradox effect (Labov, 1972) is minimal as these emails had been written prior to bilinguals' participation in the study. Participants may nevertheless have selected the emails specifically for this study, which means that their selection may not have guided by the frequency of code-switching. However, this project focused on the relative frequency of code-switching types rather than on overall code-switching frequency. Even if participants had provided emails containing an above-average amount of code-switches, the distribution of code-switches will still be representative from the point of view of assessing the relative frequency of different code-switching types.

2.2.3. Flanker task

Executive performance was measured using the flanker task. The flanker task was chosen because its instructions are simple and intuitive, which reduces confounds from working memory present in other executive tasks with more complex stimulus-response

associations, such as the Simon task. Participants were presented with rows of 5 arrows and instructed to indicate the direction of the central arrow. In the congruent condition, all arrows were pointing in the same direction. In the incongruent condition, the arrows surrounding the target arrow faced in the opposite direction, so participants needed to inhibit the distractors. The increased inhibitory effort is measured in the conflict effect, calculated as the difference between RTs in the congruent and incongruent conditions.

Crucially, there were three conditions differing in the proportion of congruent-incongruent trial-switching and resulting load to conflict-monitoring (Costa et al., 2009). The first task block was the *low-monitoring* condition, which comprised 92% congruent and 8% incongruent trials. The second task block was the *high-monitoring condition*, which presented participants with 50% congruent and 50% incongruent trials. The third condition was a *medium-monitoring* condition involving 75% incongruent and 25% congruent trials. Each condition comprised 96 flanker trials. The order of task blocks was motivated by the rationale that the condition that is easiest from a monitoring perspective, i.e. the low-monitoring condition, would always precede the crucial high-monitoring condition.

The manipulation of the trial split allowed for the calculation of inhibitory performance under the high-monitoring condition, requiring increased levels of conflict-monitoring, relative to the low-monitoring condition. The high-monitoring condition involved a constant

readiness to activate inhibition in incongruent trials. This was assumed to mirror the frequent de- and re-activation of inhibitory schemata to select items from within co-activated languages in Dense code-switching. Hence, performance in the high-monitoring condition was of special interest to the current study as it was predicted to be enhanced by frequent Dense code-switching.

3. Results

3.1. Group differences in code-switching

As the two groups differed in AoO of English, this variable was entered as a co-variate in the following analyses.

3.1.1. Frequency judgment task

Bilinguals in both groups reported to engage in all types of code-switching to some extent. Moreover, both groups displayed a preference for Insertion of English into German (M = 4.42, SD = 1.50) over Insertion of German into English (M = 2.20, SD = 1.02) in an ANCOVA with Matrix language (German versus English) as the within-subject variable and Group (5^{th} generation, 1^{st} generation) as the between-subject variable [$F(1,20) = 44.92$, $p < 0.000$, $\eta^2 = 0.69$]. The interaction between Group and Matrix language was not significant [$F(1,20) = 0.06$, $p = 0.82$, $\eta^2 = 0.00$], suggesting that both groups used

German as the matrix language. The subsequent analyses therefore focus only on Insertion of English into German.

To address group differences in code-switching frequency ratings, an ANCOVA with the between-subject variable Group (5^{th} generation, 1^{st} generation) and the within-subject variable Code-switching (Alternation, Insertion, Dense) was conducted. The main effect of Group was not significant [$F(1,20) = 0.45$, $p = 0.51$, $\eta^2 = 0.02$]. However, the analysis revealed a significant effect of Code-switching [$F(1,20) = 11.13$, $p < 0.01$, $\eta^2 = 0.37$], as well as a marginally significant Group*Code-switching interaction [$F(1,20) = 3.27$, $p < 0.07$, $\eta^2 = 0.15$] suggesting that the pattern across the two groups differed. In line with the prediction that the two groups would differ in Dense code-switching frequency, a group comparison revealed that the interaction was due to a marginally significant Group difference in Dense code-switching frequency [$F(1,20) = 4.25$, $p = 0.05$, $\eta^2 = 0.18$]. The 5^{th} generation bilinguals reported a greater Dense code-switching frequency ($M = 3.4$, $SD = 1.2$) than the 1^{st} generation bilinguals ($M = 2.4$, $SD = 0.9$).

3.1.2. Email production task

Code-switches occurring in the email production task were classified using a method developed by Deuchar, Muysken & Wang (2008). The aim of this approach is to quantify the classification of code-switching. Each code-switching instance is assessed using a catalogue of criteria

(Appendix 1). For each criterion, each code-switch is given either a neutral score of 0, a negative score of -1 or a positive score of +1. These individual scores are added up and the code-switching type receiving the highest score is taken to be the predominant pattern of a given code-switching instance.

For instance, a +1 score for Insertion is given if a matrix language can be identified, or if the inserted item is a content word that is not peripheral in the sentence structure (i.e., a complement rather than an adjunct). Scores of -1 are given when a criterion strongly confutes the presence of a code-switching pattern. Flagging of the switch point through commas or speech pauses is for instance associated with a -1 score for Dense code-switching because it clearly marks the switch point, indicating an Alternational pattern. If a criterion is not applicable, the 0 score applies. Many code-switches in naturally occurring data bear characteristics of more than one code-switching type. It is therefore often impossible to unambiguously allocate code-switches exclusively to one category. This approach considers the fluidity of bilingual speech phenomena by locating each code-switching instance on a continuum for each code-switching type.

The bilingual emails generated 617 words in the 5th generation bilinguals and 631words in 1st generation bilinguals. There were 54 instances of code-switching in the 5th generation bilingual group and 47 in the 1st generation bilingual group. Appendix 2 provides example emails from each group. It is noteworthy that 52 of the 53 instances of

Insertions were based on a German matrix language. Hence, there was a strong preference for using German as the base language. As the number of English matrix language Insertions was negligible, the two types of Insertion were combined into one category. Table 4 shows the proportions of the different code-switching types in the two groups.

%	**5th generation bilinguals**	**1st generation bilinguals**
Insertion	44.4	61.7
Alternation	24.1	23.4
Dense	31.5	14.9

Table 4. Proportion of code-switching types in the email production task by group

Based on Muysken's (2000) observation that Dense code-switching occurs predominantly in communities with long-standing bilingual traditions, it had been predicted that the 5th generation bilinguals would use more Dense code-switching than the 1st generation bilinguals. Hence, an interaction between location and Dense code-switching frequency had been predicted. Indeed, a Chi-square test confirmed a marginally significant interaction (Chi-square (1, 100) = 3.87, p = 0.05). 5th generation bilinguals Densely code-switched more than twice as frequently as 1st generation bilinguals.

3.2. Regression analyses

Regression analyses were conducted to investigate the explanatory value of the judgement task when predicting actual code-switching in the email data. To increase the sample size, the data sets from the two groups were combined. The frequency judgement task ratings for each code-switching type were used as predictors in an exploratory stepwise regression. The frequencies of the different code-switching types occurring in the emails were used as outcome variables. Three separate analyses were conducted for each code-switching type as the outcome variable. The case-wise diagnostics did not identify any outliers.

The regression analyses with the outcome variables Insertion and Alternation produced no conclusive results. Crucially, the stepwise regression with the outcome variable Dense code-switching (in emails) identified the judgement task ratings for Dense code-switching as the only significant predictor explaining 22.6% of variance at Dense code-switching production [$R(1,20) = 0.51$, Adj. $R^2 = 0.226$, F-change = 7.12, $p = 0.02$, $B = 0.10$, $\beta = 0.51$]. Hence, the regression analyses suggest that the frequency ratings from the judgement task predicted bilinguals' use of Dense code-switching in the email production task.

3.3. Executive performance in the flanker task

This section presents the key findings of the original Hofweber et al. (2016) study, adding AoO as a covariate. An ANCOVA was conducted with Group (5^{th} generation, 1^{st} generation) as the between-subject

factor, Monitoring condition (low, medium, high) as the within-subject factor and the Conflict effect as the dependent variable. The effects of Group [$F(1.39,26.33) = 0.29$, $p= 0.60$, $\eta^2 = 0.02$] and of Monitoring [$F(1.39,26.33) = 4.09$, $p = 0.20$, $\eta^2 = 0.08$] were not significant. However, the significant Group*Monitoring Interaction [$F(1.39,26.33) = 4.09$, $p = 0.041$, $\eta^2 = 0.18$] of the original study was replicated.

In line with the original analysis, the interaction was due to a significant Group effect in the high-monitoring condition [$F(1,20) = 5.66$, $p = 0.03$, $\eta^2 = 0.23$]. The 5^{th} generation bilinguals who Densely code-switched more frequently experienced a smaller conflict effect ($M = 47.56$ms, $SD = 27.53$ms) than the bilinguals engaging in less Dense code-switching ($M = 80.36$ms, $SD = 16.00$) in the condition posing greatest load to conflict-monitoring.

4. Discussion

This paper contributes to the development of ecologically valid, yet efficient, methods of assessing sociolinguistic habits in bilingualism research. It compared two novel tasks assessing code-switching: a frequency judgement task based on authentic stimuli, and an email production task. The tasks were administered to two groups of German-English bilinguals who were predicted to differ in Dense code-switching frequency. Convergence of the two tasks was taken as evidence for their ecological validity. The results of the two tasks are

also discussed in relation to a group comparison of executive performance.

Results from the email production task converged with results from the frequency judgement task both in the regression analyses and in the group comparison. Firstly, results from the judgement task explained a considerable proportion of variance in the frequency of Dense code-switches occurring in the production data. Secondly, both tasks confirmed the predicted greater preference for Dense code-switching amongst the 5th generation bilinguals, compared to the 1st generation bilinguals. In view of the converging evidence, the results from the free production task support the ecological validity of the more experimental frequency judgement task.

The two tasks also converged in showing that the preferred matrix language in Insertional code-switching was German in the sociolinguistic circumstances investigated by this study. Hence, there was no evidence of a matrix language turnover (Myers-Scotton, 1996), as described for other German heritage language settings (Fuller, 1996a). This confirms Franke's (2008) observation that the German heritage language in South-Africa is preserved to a high degree.

However, these observed convergence needs to be considered with an important limitation in mind. The crucial group difference at Dense code-switching was only marginally significant. Hence, the two tasks only converged in revealing a trend. Nevertheless, these marginal results are relevant for three reasons. Firstly, it is likely that the

relationships would have been significant if the sample size had been greater. Secondly, the 0.05 p-value criterion represents an arbitrary cut-off point and there is a growing (and we believe justified) tendency in psychological research to conceive of the reliability of findings as a scalar concept, rather than a dichotomy (Pritschet, Powell, & Horne, 2016). Thirdly, this paper is primarily concerned with investigating task convergence and the two tasks did converge in revealing identical trends, although these trends were only marginally reliable.

The predictions for the differential code-switching patterns in the two groups were derived from Muysken's (2000) observations, which in turn were based on authentic sociolinguistic corpora. It was predicted that the 5th generation bilinguals would engage in more Dense code-switching than the recent bilinguals because Dense code-switching is a language practice that typically emerges in communities with long-standing bilingual traditions. This prediction was confirmed by both the judgement task and the bilingual email production task. The alignment of the task results with Muysken's (2000) empirically grounded framework suggests that both tasks represent assessment methods with a high level of ecological validity.

Importantly, the results from the executive function task corresponded with the group differences revealed by both the email production task and the frequency judgement task. Existing models of code-switching suggest that Dense code-switching will recruit executive functions involved in the management of co-activated

languages and competing linguistic items and structures (Green & Li Wei, 2014). It is likely that Dense code-switching therefore trains bilinguals' conflict-monitoring skills. Indeed, the re-analysis of the Hofweber et al. (2016) results confirmed that the group engaging in more Dense code-switching showed enhanced performance in the high-monitoring condition of the flanker task. The group differences at Dense code-switching were revealed by both the email production task and the frequency judgement task. Hence, both tasks were well-suited for explaining the observed group differences at executive functions.

A potential concern surrounding the email production task was whether production in a written medium would be representative of language practices in the spoken modality. The instructions of the judgement task asked participants to indicate their frequency of using the stimulus utterances in spoken conversations and the stimuli were presented in an auditory format, whilst the email production task only focused on written communication. Despite this difference in modality between the two tasks, the tasks converged in revealing the crucial group difference in Dense code-switching.

Even though oral and written forms of communication may differ, for instance in sentence length, leading to different code-switching choices, the two tasks in this study revealed similar code-switching patterns, regardless of the modality. This suggests that code-switching in emails is to some extent representative of code-switching in speech. This observation may be extended to other digitally

produced language data obtainable without time-consuming transcription, such as chats, blogging or forum discussions. These data sources create new avenues for assessing bilinguals' sociolinguistic habits in an economical fashion.

To summarize, this study suggests that both the frequency judgement task using authentic utterances from corpora and the bilingual email production task are suitable methods of assessing bilinguals' code-switching habits. However, several limitations apply. Firstly, the data set was small, so only limited generalisations can be made. Secondly, we did not have a benchmark of actual bilingual speech data, which would be necessary to fully assess the ecological validity of the two tasks. Thirdly, and possibly due to the small data set, the group differences at code-switching were only marginally significant.

Future research should investigate additional methods of eliciting production data, such as sentence repetition (Marinis, 2010). Indeed, Gullberg et al. (2009) argue that important new insights into code-switching can be obtained through such experimental techniques. A future large-scale study that assesses the validity of a range of tasks and task instructions by systematically comparing quasi-authentic data to a corpus of authentic speech data from the same participants could pave the way for considering sociolinguistic practices more frequently as independent variables in bilingualism research.

5. Conclusion

This study presented two novel and efficient methods of assessing code-switching practices in bilingualism research: a frequency judgement task and a bilingual email production task. The two tasks converged in describing similar and differential code-switching patterns in two groups of bilinguals with different sociolinguistic backgrounds. Moreover, the two tasks assessing code-switching provided useful data for explaining an observed group difference at executive functions. The use of similar tasks to assess sociolinguistic practices as independent variables in bilingualism research is therefore recommended.

References

Backus, A. (2015). A usage-based approach to codeswitching: The need for reconciling structure and function. In: G. Stell and K. Yapko (Eds*). Code-switching at the crossroads between structural and sociolinguistic perspectives* (pp. 19-37), Mouton de Gruyter, Berlin. doi: 10.1515/9783110346879.19

Bak, T. (2016). Cooking pasta in La Paz: Bilingualism, bias and the replication crisis. *Linguistic Approaches to Bilingualism*, *6*(5), 699-717. doi: 10.1075/lab.16002.bak

Bhatt, R., & Bolonyai, A. (2011). Code-switching and the optimal grammar of bilingual language use. *Bilingualism: Language and Cognition, 14*, 522-546. doi: 10.1017/S1366728910000295

Bialystok, E., Craik, F.I.G., Luk, G. (2012). Bilingualism: Consequences for Mind and Brain. *Trends in Cognitive Science*, *16*, 240-250. doi: 10.1016/j.tics.2012.03.001

Clyne, M. (2003). *Dynamics of Language Change*. Cambridge Approaches to Language Contact, Cambridge University Press. doi: 10.1017/cbo9780511606526

Costa, A., Hernandez, M., Costa-Faidella, J., & Sebastian-Galles, N. (2009). On the bilingual advantage in conflict processing: Now you see it, now you don't. *Cognition, 113*, 135-149. doi: 10.1016/j.cognition.2009.08.001

Crystal, D. (2006). *Language and the internet*. Cambridge University Press. doi: 10.1017/cbo9780511487002

Deuchar, M., Muysken, P., & Wang, S. (2008). Structured Variation in Codeswitching: Towards an Empirically Based Typology of Bilingual Speech Patterns. *International Journal of Bilingual Education and Bilingualism*, *10*, 298-34. doi: 10.2167/beb445.0

Dewaele, J. M., & Li Wei (2014). Attitudes towards code-switching among adult mono-and multilingual language users. *Journal of Multilingual and Multicultural Development*, *35*(3), 235-251. doi: 10.1080/01434632.2013.859687

Eppler, E. (2005). *The Syntax of German-English code-switching*. PhD Thesis, University College London.

Franke, K. (2008). *"We Call It Springbok-German!": Language Contact in the German Communities in South Africa*. PhD Thesis, Monash University.

Fuller, J. M. (1996a). When cultural maintenance means linguistic convergence: Pennsylvania German evidence for the matrix language turnover hypothesis. *Language in Society*, *25*, 493–514. doi: 10.1017/S0047404500020790

Gardner-Chloros, P. (2009). *Code-switching*. Cambridge: Cambridge University Press. doi: https://doi.org/10.1017/cbo9780511609787

Green, D.W., & Li Wei (2014). A control process model of code-switching. *Language, Cognition and Neuroscience*, *24*, 499-511. doi: 10.1080/23273798.2014.882515

Gullberg, M., Indefrey, P., & Muysken, P. (2009). Research techniques for the study of code-switching. In: B.E. Bullock and J. A. Toribio (Eds.). *The Cambridge Handbook of linguistic code-switching* (pp. 21-39), Cambridge University Press. doi: 10.1017/cbo9780511576331.003

Hartanto, A., & Yang, H. (2016). Disparate bilingual experiences modulate task-switching advantages: A diffusion-model analysis of the effects of interactional context on switch costs. *Cognition*, *150*, 10-19. doi: 10.1016/j.cognition.2016.01.016

Hofweber, J., Marinis, T., & Treffers-Daller, J. (2016). Effects of dense code-switching on executive control. *Linguistic Approaches to Bilingualism, 6*(5), 648-668. doi: 10.1075/lab.15052.hof

Koch, P., & Oesterreicher, W. (2007). Schriftlichkeit und kommunikative Distanz. *Zeitschrift für germanistische Linguistik, 35*(3), 346-375. doi: 10.1515/zgl.2007.024

Kupisch, T., & Van de Weijer, J. (2016). The role of the childhood environment for language dominance: A study of adult simultaneous bilingual speakers of German and French. In: C. Silva-Corvalan and J. Treffers-Daller (Eds.). *Language Dominance in Bilinguals. Issues of Measurement and Operationalization* (pp. 174-195), Cambridge University Press. doi: 10.1017/cbo9781107375345.009

Labov, William (1972). *Sociolinguistic Patterns*. Philadelphia: University of Pennsylvania. doi: 10.2307/412715

Li, P., Zhang, F., Tsai, E., & Puls, B. (2013). Language history questionnaire (LHQ 2.0): A new dynamic web-based research tool. *Bilingualism: Language and Cognition, 17*, 673-680. doi: 10.1017/S1366728913000606

Marinis, T. (2010). Using on-line processing methods in language acquisition research. In: E. Blom and S. Unsworth (Eds.). *Experimental methods in language acquisition research* (pp. 139-162), John Benjamins, Amsterdam. doi: 10.1075/lllt.27.09mar

Muysken, P. (2000). *Bilingual Speech: A Typology of Code-mixing*. Cambridge: Cambridge University Press. doi: 10.1017/s004740450224405x

Myers-Scotton, C. (1998). A way to dusty death: The Matrix Language turnover hypothesis. In: L. A. Grenoble and L.J. Whaley (Eds.). *Endangered languages: language loss and community response* (pp. 289-316). doi: 10.1017/cbo9781139166959.013

Onar Valk, P., & Backus, A. (2013). Syntactic change in an immigrant language: from non-finite to finite subordinate clauses in Turkish. *Journal of Estonian and Finno-Ugric Linguistics*, *4*(2): 7-29. doi: 10.12697/jeful.2013.4.2.01.

Onar Valk, P. (2014) Convergent Developments on Dutch Turkish word order: A comparative study between 'production' and 'comprehension' data: *Converging evidence*?'. *Applied Linguistics Review*, *5(2)*, 351-372.

✓

Paap, K.R., & Greenberg, Z.I. (2013). There is no coherent evidence for a bilingual advantage in executive processing, *Cognitive Psychology*, *66*, 232-258. doi: 10.1016/j.cogpsych.2012.12.002

Poplack, S. (1980). Sometimes I'll start a sentence in Spanish Y TERMINO EN ESPAÑOL: toward a typology of code-switching. *Linguistics*, *18*(7-8), 581-618. doi: 10.1515/ling-2013-0039

Pritschet, L., Powell, D., & Horne, Z. (2016). Marginally significant effects as evidence for hypotheses: Changing attitudes over four decades. *Psychological Science, 27*(7), 1036-1042. doi: 10.1177/0956797616645672

Raven, J., Raven, J. C., & Court, J. H. (1998). *Manual for Raven's progressive matrices and vocabulary scales*. Oxford: Oxford Psychologists Press. doi: 10.1037/t10910-000

Rodriguez-Fornells, A., Kraemer, U.M., Urbano, L., Festman, J., & Muente, T.F. (2012). Self-assessment of individual differences in language switching. *Frontiers in Psychology, 2,* 388. doi: 10.3389/fpsyg.2011.00388

Soares, C., & Grosjean, F. (1984). Bilinguals in a monolingual and a bilingual speech mode: The effect on lexical access. *Memory & Cognition, 12*, 380-386. doi: 10.3758/bf03198298

Soveri, A., Rodriguez-Fornells, A., & Laine, M. (2011). Is there a relationship between language switching and executive functions in bilingualism? Introducing a within-group analysis approach. *Frontiers in Psychology, 2,* 183. doi: /10.3389/fpsyg.2011.00183

Sweeney, E., & Zhu Hua (2010). Accommodating toward your audience: Do native speakers of English know how to accommodate their communication strategies toward non-native speakers of English?. *The Journal of Business Communication*, *47*(4), 477-504. doi: 10.1177/0021943610377308

Treffers-Daller, J. (2009). Code-switching and transfer: an exploration of similarities and differences. In: B.E. Bullock and J. A. Toribio (Eds). *The Cambridge Handbook of Linguistic Codeswitching* (pp.58-74), Cambridge University Press. doi: 10.1017/cbo9780511576331.005

Verreyt, N., Woumans, E., Vandelanotte, D., Szmalec, A., & Duyck, W. (2016). The influence of language-switching experience on the bilingual executive control advantage. *Bilingualism: Language and Cognition*, *19*(1), 2016, 181–190. doi: 10.1017/S1366728914000352

Wechsler, D. (1997). *Wechsler Memory Scale–Third Edition*. San Antonio, TX: The Psychological Corporation. doi: 10.1002/9780470373699.speced2206

Weinreich, U. (1963). On the semantic structure of language. *Universals of language*, *1*, 142-215. doi: 10.9783/9781512819267-004

Zell, E., & Krizan, Z. (2014). Do people have insight into their abilities? A metasynthesis. *Perspectives on Psychological Science*, *9*, 111 – 125. doi: 10.1037/e571452013-137

Appendix 1

Predominant pattern Insertion

Criteria	Insertion	Alternation	Dense	Wie war denn Euer *holiday* in den Bahamas?	Insertion score	Alternation score	Dense score
single constituent	+	0	0	+	1	0	0
several constituent	-	+	0	-	1	-1	0
non-constituent	-	-	+	-	1	1	-1
nested aba	+	-	0	+	1	-1	0
non-nested aba	-	+	+	-	1	-1	-1
DIVERSE SWITCHES	-	0	+	-	1	0	-1
long constituents	-	+	-	-	1	-1	1
complex constituents	-	+	-	-	1	-1	1
content word	+	-	-	+	1	-1	-1
function word	-	-	+	-	1	1	-1
adverb, conjunction	-	+	-	-	1	-1	1
selected element	+	-	+	+	1	-1	1
emblematic or tag	-	+	0	-	1	-1	0
major clause boundary	0	+	0	-	0	-1	0
peripheral	0	+	0	-	0	-1	0
embedding in discourse	0	+	0	-	0	-1	0
flagging	-	+	-	-	1	-1	1
dummy word insertion	+	0	-	-	-1	0	1
BIDIRECTIONAL SWITCHING	-	+	+	-	1	-1	-1
linear equivalence	0	+	+	+	0	1	1
telegraphic mixing	+	-	-	-	-1	1	1
morphological integration	+	-	+	+	1	-1	1
doubling	-	+	-	-	1	-1	1
HOMOPHONOUS DIAMORPHS	0	-	+	-	0	1	-1
triggering	0	0	+	-	0	0	-1
mixed collocations	0	-	+	-	0	1	-1
self-corrections	-	+	-	-	1	-1	1
Score					16	-11	2

Predominant pattern Alternation

Criteria	Insertion	Alternation	Dense	Danach, *quite by chance,* kam der Nachbar reingeschneit.	Insertion score	Alternation score
single constituent	+	0	0	-	-1	0
several constituent	-	+	0	-	1	-1
non-constituent	-	-	+	+	-1	-1
nested aba	+	-	0	-	-1	1
non-nested aba	-	+	+	+	-1	1
DIVERSE SWITCHES	-	0	+	-	1	0
long constituents	-	+	-	0	0	0
complex constituents	-	+	-	0	0	0
content word	+	-	-	-	-1	1
function word	-	-	+	-	1	1
adverb, conjunction	-	+	-	0	0	0
selected element	+	-	+	-	-1	1
emblematic or tag	-	+	0	+	-1	1
major clause boundary	0	+	0	-	0	-1
peripheral	0	+	0	+	0	1
embedding in discourse	0	+	0	+	0	1
flagging	-	+	-	+	-1	1
dummy word insertion	+	0	-	-	-1	0
BIDIRECTIONAL SWITCHING	-	+	+	+	-1	1
linear equivalence	0	+	+	0	0	0
telegraphic mixing	+	-	-	-	-1	1
morphological integration	+	-	+	-	-1	1
doubling	-	+	-	-	1	-1
HOMOPHONOUS DIAMORPHS	0	-	+	-	0	1
triggering	0	0	+	-	0	0
mixed collocations	0	-	+	-	0	1
self-corrections	-	+	-	-	1	-1
Score					-7	9

Predominant pattern Dense code-switching

Criteria	Insertion	Alternation	Dense	Der neue „Digger“ kam dann sehr handy.	Insertion score	Alternation score	Dense score
single constituent	+	0	0	-	-1	0	0
several constituent	-	+	0	-	1	-1	0
non-constituent	-	-	+	+	-1	-1	1
nested aba	+	-	0	-	-1	1	0
non-nested aba	-	+	+	-	1	-1	-1
DIVERSE SWITCHES	-	0	+	+	-1	0	1
long constituents	-	+	-	0	0	0	0
complex constituents	-	+	-	0	0	0	0
content word	+	-	-	+	1	-1	-1
function word	-	-	+	+	-1	-1	1
adverb, conjunction	-	+	-	0	0	0	0
selected element	+	-	+	+	1	-1	1
emblematic or tag	-	+	0	-	1	-1	0
major clause boundary	0	+	0	-	0	-1	0
peripheral	0	+	0	-	0	-1	0
embedding in discourse	0	+	0	-	0	-1	0
flagging	-	+	-	+	-1	1	-1
dummy word insertion	+	0	-	-	-1	0	1
BIDIRECTIONAL SWITCHING	-	+	+	+	-1	1	1
linear equivalence	0	+	+	0	0	0	0
telegraphic mixing	+	-	-	-	-1	1	1
morphological integration	+	-	+	-	-1	1	-1
doubling	-	+	-	-	1	-1	1
HOMOPHONOUS DIAMORPHS	0	-	+	+	0	-1	1
triggering	0	0	+	+	0	0	1
mixed collocations	0	-	+	+	0	-1	1
self-corrections	-	+	-	-	1	-1	1
Score					-3	-9	8

Appendix 2: Example emails

Hi XX,

Hi XX,

long time no see (a), aber es tat gut, mal wieder von dir zu hören. Wie war denn euer **holiday (i)** in den Bahamas? Habt ihr denn auch *long time no see (a), but it was good, once again from you to hear. How was then your holiday (i) in the Bahamas? Have you then also* ge**suntanned (d)**? Schick doch mal ein paar **snapshots (i)** von euch auf **der beach (d)**! **My old man (i)** und ich haben am **weekend (i)** im *suntanned (d)? Send do once a few snapshots (i) of you on der beach (d)! My old man (i) and I have at the weekend (i) in the* Garten geschuftet. Der neue **„Digger“ (i)** **kam dann sehr handy (d)** und **verkürzte** die Arbeit **by half (d)**. Danach, **quite by chance (a)**, *garden laboured. The new „Digger“ (i) came in then very handy (d) and shortened the work by half (d). Then, quite by chance (a),* kam der Nachbar reingeschneit - wollte sich 'nen Spaten leihen, sah den **Digger (i)** und war **blown away mit der neuen technology (d)**. *came the neighbour wandering in – wanted himself a spade to borrow, saw the Digger (i) and was blown away with the new technology (d).* **What happened then? (a) Sure (a),** jetzt baggert das Ding bei ihm im Garten und bei uns ist Ebbe**!** So ein cooles Gerät will ja jeder haben, *What happened then? (a) Sure (a), now digs the thing at his place in the garden and at ours is over! Such a cool device wants everybody to have* **not so (a)**? XZ geht's **so-so (i)**. Hat schon wieder Kopfschmerzen, **like there's no tomorrow (a)**. **Throbbing (a)**, sagt sie. **Oh well (a),** was soll *not so (a)? XZ is so-so (i). Has already again headaches, like there's no tomorrow (a). Throbbing (a), says she. Oh well (a), what should* man erwarten wenn sie jede Nacht **durch partied (d)**? Looks to me **als ob die Jugend nie auslernt (a)**! Müssen ja alle erst **aus Erfahren ihre** *one expect if she every night parties through (d)? Looks to me as if young people never stop learning (a)! Have all first from experience their* **lessons lernen (d)**! Und **gibt sie eine helping hand (d)** in der Küche? Nichts da. Mama ist ja **hands on (i)**. War ich auch so als **teenager (i)**? *lessons to learn (d)! And gives she a helping hand (d) in the kitchen? Never ever. Mum is hands on (i). Was I also like that as a teenager (i)?* Mensch haben unsere Eltern uns **jobben lassen (d)**. Weißt du noch? Nichts von wegen **all night out (i)**, und so! Ja, **times are changing (a)**, sag ich dir! *Gosh have our parents us work hard made (d). Know you still? Nothing like all night out (i), and so on! Yes, times are changing (a), say I to you!* **All the best (a),** Bruderherz und grüß mir dein **little wife (i)**. Deine XY

All the best (a), dear brother and say hello for me to your little wife (i). Yours XY

Coding: (i) Insertion (a) Alternation (d) Dense code-switching

Email by 5th generation bilingual

Hi **hun (i)**,
*Hi **hun (i)**,*
hab das Gefühl ich hab dich schon seit Monaten nicht mehr gesehen. Bist du aktuell in der **city (i)** oder mal wieder
*have the feeling I have you already for months not any more seen. Are you currently in the **city (i)** or once again*
on holiday (i)? Letzdes Wochenende war XY da, die hätte dich auch gern mal wieder gesehen. War aber auch so ein
***on holiday (i)**? Last weekend was XY here, she would have you also liked once again seen. Was but also like this a*
top Wochenende. Das war mehr oder weniger ein Wochenend-**Pub Crawl (i)**. Freitag waren wir ein bisschen
*top weekend. It was more or less a weekend-**Pub Crawl (i)**. Friday were we a bit*
sightseeing (i) machen und **shop**pen **(i)**, abends haben wir uns dann aufgestylt und sind in **eine nice Rooftop bar**
sightseeing (i)** do and **shop**ing **(i)**, in the evening have we us then dressed up and have in a **nice Rooftop bar (d)
in Shoreditch gewesen, was ganz praktisch war, weil wir nachts **easy und cheap (d)** mit einem **cab (i)** nach Hause konnten.
*in Shoreditch been, which quite handy was, because we at night **easy und cheap (d)** with a **cab (i)** home could go.*
Wird Zeit, dass ab September die **tube all night (d)** fährt. Samstag kam dann eine alte Freundin von ihr aus Essex, die sie noch
*It's time that from september the **tube all night (d)** runs. Saturday came then an old friend of hers from Essex, whom she still*
aus der **Boarding School (i)** kennt. Ging dann wieder nach Shoreditch. Erst **dinner (i)**, dann **drinks (i)** und dann in einen alten
*from the **Boarding School (i)** knows. Off then again to Shoreditch. First **dinner (i)**, then **drinks (i)** and then onto an old*
warehouse club (i), coole Atmosphäre. **Anyways (a)**, wollte eigentlich wissen, wann wir uns endlich mal wieder auf **urgently**
warehouse club (i)**, cool atmosphere. **Anyways (a)**, wanted actually to know, when we us finally once again for **urgently
needed drinks (i) treffen? **Catch-up (i)** ist Pflicht! Irgendwo in Soho? Falls du noch nicht wieder in der **city (i)** bist, meld dich
***needed drinks (i)** meet? **Catch-up (i)** is duty! Somewhere in Soho? If you yet not again in the **city (i)** are, get in touch*
wenn du **back (i)** bist!
*when you **back (i)** are!*
Kisses xx (i)
Coding: (i) Insertion (a) Alternation (d) Dense code-switching

Email by 1st generation bilingual