

Is there a bidialectal cognitive advantage?

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It has been suggested that the cognitive control involved in separating a bilingual's languages on a daily basis spills over into the general domain, giving them an advantage in general executive functioning (i.a. Bialystok et al., 2004, 2009). However, several recent studies have called into question the existence of such an advantage (Paap et al., 2014; de Bruin et al., 2015). Factors that have been argued to enhance the advantage include advanced age and task complexity (Prior & Gollan, 2011; Morales et al., 2013; Vangsnes et al., 2017). Furthermore, it has been suggested that the effect is more prevalent in bilinguals of typologically similar languages, whereby the cognitive demands to keep the languages separate are high (i.a. Costa et al., 2008, 2009; Adesope et al., 2010). An extreme case of such typological similarity can be found in bidialectalism (Kirk et al., 2014; Ross & Melinger, 2016). This study therefore looks for a cognitive advantage for bilinguals *and* bidialectals, while maximising the participant age and task complexity, both factors known to promote the advantage.

Four groups were recruited: monolingual Dutch (n=17, mean age (MA) = 78), monolingual English (n=16, MA=76), bilingual Dutch-English (n=29, MA=78), and bidialectal Dutch-Low Saxon (n=20, MA=78). The participants were recruited through advertisements, personal contacts, and a snowball effect in the Netherlands and around Melbourne, Australia. To assess executive functioning, the participants completed two inhibitory control (IC) and two working memory (WM) tasks. The IC tasks were a 4-colour Simon task (cf. Simon & Wolf, 1963) and a Modified Wisconsin Card Sorting Test (M-WCST) (Schretlen, 2010). The WM tasks were a Reading Span Task (RST) (Daneman & Carpenter, 1980) and a Backward Digit Span (BDS) (Ramsay & Reynolds, 1995). A sociolinguistic questionnaire, mental health and overall processing speed test were used to ensure the groups were balanced and all participants were mentally fit enough to participate.

The groups performed similarly on all four tasks tapping executive function, providing no evidence for a bilingual or bidialectal advantage (see Tables 1 & 2, and Figure 1). One-way ANOVAs run separately for each test found no significant differences between the groups: BDS, $p = .107$; RST, $p = .177$, M-WCST, $p = .837$, Simon effect, $p = .748$. Further analyses showed that within the bidialectal group years of formal education influenced accuracy and reaction time on the Simon task (Years education * accuracy: $r = .527$, $p < .05$; Years education * reaction time: $r = -.601$, $p < .005$).

This study extends the growing body of work that finds no cognitive advantage for bilinguals or bidialectals. The use of older participants and a battery of highly complex tasks maximised the potential for finding an advantage, yet none was found. These results are in line with the two other studies researching a bidialectalism advantage (Kirk et al., 2014; Ross & Melinger, 2016). Further, we find education to be a confounding factor. We therefore conclude that education level may be another critical factor in promoting finding a bilingual cognitive advantage.

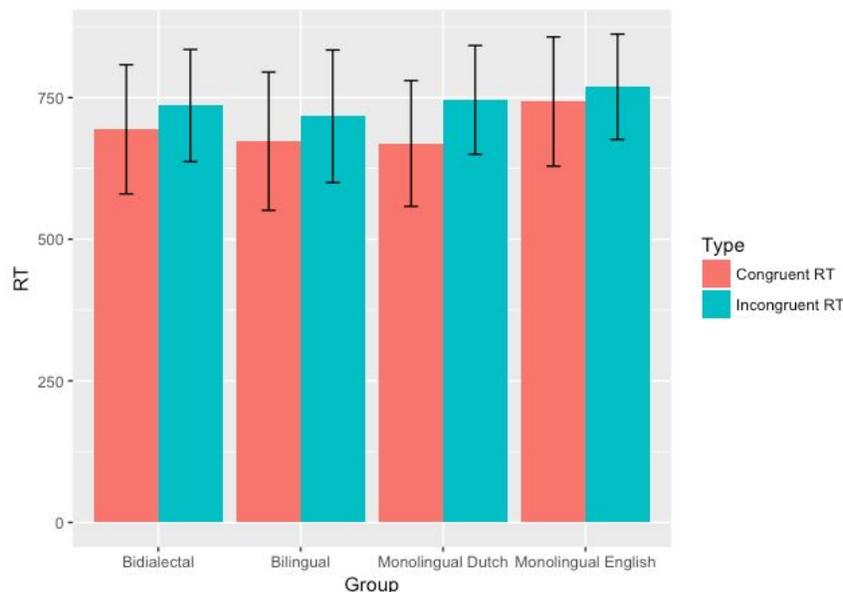
Table 1. Test results (mean(SD)): Backward Digit Span Test, Reading Span Task and Modified Wisconsin Card Sorting Task

Subject group	Mean score BDST (SD)	Mean scores (max=60) RST (SD)	Mean composite raw score M-WCST (SD)
Bilinguals (n=29)	6.29 (1.86)	30.79 (7.360)	108.76 (13.39)
Monolinguals Dutch (n=17)	5.12 (1.58)	31.41 (6.501)	106.35 (15.65)
Monolinguals English (n=16)	6.13 (2.03)	n.a.	109.56 (13.40)
Bilectals (n=20)	5.95 (1.40)	27.10 (6.950)	110.15 (9.95)

Table 2. Simon task results (mean(SD))

Subject group	Mean accuracy score (max=24) (SD)	Mean RT incongruent trials in ms (SD)	Mean RT congruent trials in ms (SD)	Simon effect (RT incongruent - RT congruent) (SD)
Bilinguals (n=29)	18.19 (4.95)	716.78 (116.68)	673.06 (122.15)	43.72 (84.77)
Monolinguals Dutch (n=17)	16.53 (5.51)	746.10 (96.07)	699.51 (110.96)	46.59 (48.38)
Monolinguals English (n=16)	17.69 (3.98)	768.87 (93.41)	742.81 (113.71)	26.05 (81.47)
Bilectals (n=20)	17.44 (6.72)	736.40 (99.13)	693.84 (114.13)	42.55 (67.96)

Figure 1. Simon task reaction times



Selected references

Ross & Melinger (2016). Bilingual advantage, bidialectal advantage or neither? Comparing performance across three tests of executive function in middle childhood. *Developmental Science*. **Kirk, Fiala, Scott-Brown, & Kempe** (2014). No evidence for reduced Simon cost in elderly bilinguals and bidialectals. *Journal of Cognitive Psych.*, 26(6), 640-648. **De Bruin, Treccani, & Della Sala** (2015). Cognitive advantage in bilingualism: An example of publication bias?. *Psych. Science*, 26(1), 99-107. **Paap, & Sawi** (2014). Bilingual advantages in executive functioning: problems in convergent validity, discriminant validity, and the identification of the theoretical constructs. *Frontiers in psychology*, 5, 962. **Adesope, Lavin, Thompson, & Ungerleider** (2010). A systematic review and meta-analysis of the cognitive correlates of bilingualism. *Review of Educational Research*, 80(2), 207-245. **Vangsnes, Söderlund, & Blekesaune** (2017). The effect of bidialectal literacy on school achievement. *International Journal of Bilingual Education and Bilingualism*, 20(3), 346-361.