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Has a National Policy Focus on Early Childhood Made a Difference for Indigenous Children? An Analysis of LSAC Data

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The Australian policy environment has undergone significant changes with a move towards evidence-based policy development. It is in this climate that the Longitudinal Study of Australian Children (LSAC) began collecting data. The study began in 2003 with 2 cohorts of children (birth-1 year and 4-5 years) and the 5th wave of data collection occurred in 2011/12. In this analysis we use the data from the first wave of data (collected in the 6 months between August 2003 and March 2004) and the third wave, collected in the 9 months between July 2007 and April 2008. This latter was a time when a range of initiatives addressing Indigenous disadvantage through early childhood interventions had been in operation for some time: both early childhood and Indigenous policy was strongly focused on the quality of early childhood service provision, with a strong focus on evidence-based service development. In this paper we present a comparison of outcomes for Indigenous and non-indigenous Australian children who have grown up in these 2 different policy eras.

Key words: early childhood policy, Indigenous policy, outcomes for children

Introduction

Ten years ago the Organization for Economic Co-operation and Development (OECD) pointed out that Australia lacked the necessary research in early childhood needed to drive the development of effective policy (Ishimine, Tayler, & Thorpe, 2009). International research, whilst useful, these authors claimed, does not provide sufficient or valid evidence upon which to base policy development in the Australian context. The lack of such evidence brings with it a number of risks including a tendency to substitute evidence with a focus on political ideology, economic priorities and political party machinations (Ishimine et al., 2009). These ideological and economic discourses drove Australian early childhood policy for many years (Bown, Sumsion, & Press, 2010) with

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the resulting policy environment consisting of "... cannabalised products of multiple (but circumscribed) influences and agendas" (Ball, 2006, p. 45).

At the same time the early childhood policy agenda was developing in this environment of sparse research evidence, so too was the political agenda addressing indigenous issues. The development of Indigenous policy was, for many years, based on values and beliefs which assumed that the best outcome for Indigenous Australians was complete assimilation (Sims, 1999). These ideological positions resulted in "Indigenous policy to the detriment of Indigenous Australians (Evans, 2006, pp. 1-2) providing "... raw evidence of a disastrous failure..." (Sutton, 2001, p. 125). In more recent years, as in early childhood policy, there has been increasing pressure for research evidence upon which to base policy, and a move away from ideologically-driven policy (Sanders, 2010). In a 2008 press release about the Northern Territory Intervention, Minister Jenny Macklin is quoted as saying: "I emphasized to the taskforce that my whole approach in indigenous affairs will be based on evidence. I'm not interested in ideology. What I'm interested in is what works" (Macklin, 2008). The Closing the Gap Clearinghouse run on behalf of the government (http://www.aihw.gov.au/closingthegap/) by the Australian Institute of Health and Welfare and the Australian Institute of Family Studies is one attempt to gather, assess and collate evidence upon which such policy may be based.

Recent policy developments in both early childhood and Indigenous affairs are thus based, as much as possible, on available evidence (Banks, 2009). Much of this evidence-driven policy action occurred in the latter half of the last decade (2005 and onwards). The Council of Australian Governments has been active in setting directions in both early childhood and Indigenous areas and the new Children and Family Roundtable begun in December 2011 (http://www.jennymacklin.fahcsia.gov.au/mediareleases/2011/pages/future_child_family_policy_301111.aspx) may also contribute. In the Indigenous arena, COAG have focused on developing policy aimed at decreasing existing differences in outcomes between Indigenous and non-indigenous Australians. One outcome from COAG initiatives is the national Closing the Gap agenda which aims to (http://www.aihw.gov.au/closingthegap/resources/targets.cfm):

- close the gap in life expectancy within a generation
- ensure all Indigenous four-year olds in remote communities have access to early childhood education within five years
- halve the gap for Indigenous students in year 12 equivalent attainment by 2020
- halve the gap in employment outcomes between Indigenous and non-indigenous Australians within a decade

- halve the gap in mortality rates for Indigenous children under five within a decade
- halve the gap in reading, writing and numeracy achievements for Indigenous children within a decade

In the early childhood arena, COAG have been active in establishing a National Quality Framework (http://www.deewr.gov.au/earlychildhood/policy_agenda/quality/pages/home.aspx) which aims to establish a:

- National legislative framework
- National Quality Standard
- National quality rating and assessment process
- New national body called the Australian Children's Education and Care Quality Authority

This represents a significant shift in policy emphasis in early childhood: from a focus on supporting the labour participation of parents to a stronger emphasis on the importance of quality early learning experiences for children (Office of Early Childhood Education and Child Care, 2010). Early childhood and Indigenous policy initiatives have come to share many understandings over this time with a growing recognition around the world that the early years of life play a significant part in shaping adult outcomes. Such evidence arises not only from longitudinal studies but from epigenetic research where the impact of the environment is tracked to the genomic level (Sims, 2011b; Sims & Hutchins, 2011). Thus it is clear that to address Indigenous goals, such as those in the Closing the Gap Agenda, efforts must be made to include early childhood initiatives.

The policy initiatives of the recent decade combining an early childhood and Indigenous focus have led to the development of targeted interventions, some focused only on Indigenous populations, and others on geographic areas of high disadvantage where there are significant numbers of Indigenous families. For example Brighter Futures is a programme designed to protect NSW children identified as at risk of abuse and/or neglect through supporting their families using case management, childcare, parenting programs, and home visiting (Hilferty et al., 2010). The programme was offered to Indigenous and non-indigenous families and appeared to be moderately successful, although there were some families where no benefit was demonstrated, in particular, Indigenous families with complex needs. At the Federal level, the then Department of Families, Housing, Community Services and Indigenous Affairs set up the Stronger Families Stronger Communities (SFSC) initiative (2004–2009) under which a number of programmes were operated. Much of the evidence of these programmes is collected on the Child, Family, Community Australia Research, Practice and Policy Information Exchange website (http://www.aifs.gov. au/cfca/)[1] and the most promising practices are identified in Soriano, Clark and Wise (2008). Indigenous families were

identified as the most difficult to engage in these programmes and this remained the case even when services were designed to specifically target these families (Cortis, Katz, & Patulny, 2009).

The Australian policy environment, then, over the past 5-6 years, has undergone significant changes with a move towards evidence-based policy development. Programmes arising from this policy base are themselves more focused on their role to not only deliver services, but to evaluate these services so forming a further evidence base for subsequent developments. It is in this climate that the Commonwealth of Australia undertook an ambitious national project, collecting data from Australian families over multiple waves. The purpose of this longitudinal undertaking, titled Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC), is concerned with an in-depth examination of Australian families and their children over the years as they grow and learn. The first wave of data was collected in the 6 months between August 2003 and March 2004, at the very beginning of the early SFSC initiative. The children in this wave of data collection were between birth and 1 year (B cohort) and between 4 and 5 years of age (K cohort). The third wave was collected in the 9 months between July 2007 and April 2008 when the B cohort children were between 5-6 years of age and the K cohort children were aged between 9-10 years of age. Between these years a range of initiatives addressing Indigenous disadvantage through early childhood interventions had been in operation. Thus children in the first wave lived their early childhood years in an era with little emphasis on early childhood policy, at a time where there was strong ideologically driven Indigenous policy as described above. Children in the third wave grew through their early childhood years in a world shaped by a very different policy context: both early childhood and Indigenous policy was strongly focused on the quality of early childhood service provision, with a strong focus on evidence-based service development. Whilst there are numerous evaluations of individual programmes arising from this policy era, there is no overall analysis of the impact of the general policy climate on Australian children. In this paper we present a comparison of outcomes for Indigenous and non-indigenous children who have grown up in these 2 different policy eras.

The data we present in this study adds to that already in existence and enables us to make different comparisons than are currently available. The Australian Early Development Index is a tool that collects population level data on children's outcomes taken as they begin their first year at school. It consists of a checklist completed by the teacher measuring physical health and wellbeing, social competence, emotional maturity, language and cognitive skills (school-based and communication skills

and general knowledge (http://www.rch.org.au/aedi/). Data collected from the AEDI on 261,000 children around Australia between 1 May and 31 July 2009 (97.5% of the estimated five-year-old population) are reported by the Centre for Community Child Health & Telethon Institute for Child Health Research (2009). Nationally, 23.4% of children are identified as developmentally vulnerable on one domain and 11.8% on two or more. Indigenous children were more likely to be developmentally vulnerable in language and cognitive skills: 47.3% of Indigenous children were identified as developmentally vulnerable on one domain and 29.5% on two or more domains.

This level of disadvantage of Indigenous children demonstrated from the AEDI data above is also reflected in data arising from the first wave of the LSAC (Leigh & Gong, 2008). In this first wave of data, Indigenous children scored 0.30 to 0.40 standard deviations lower in the two tests of cognition used, a difference somewhat lower than that found in many international studies comparing local Indigenous populations with hegemonic western groups. Leigh and Gong suggest that the gap between indigenous and non-indigenous children may start small but widen as children age. Between 33% and 66% of the difference in achievement appears to be linked to socioeconomic factors, indicating that policy initiatives focused on closing the gap need to address more than social and economic disadvantage. However, as identified above the first wave of LSAC data was collected between August 2003 and March 2004. Young children growing up in more recent times have experienced a world shaped by a very different policy agenda than those growing up prior to 2003/2004. Has that agenda had an impact? Is the performance of children aged between 4-5 years between August 2003 and March 2004 (Wave 1 of the LSAC K-cohort) any different than the performance of children who were 4-5 years old 4 years later (the LSAC B cohort measured at Wave 3 - July 2007 to April 2008)?

Thus our research questions are:

1. Do children in the B cohort achieve higher results for the PPVT and WAI tests than those in the K cohort?
2. Is there a change in the PPVT scores over the three waves of data?
3. Is there a difference in outcomes on the WAI and PPVT-III between indigenous children and non-indigenous children? If there is a difference, then what is the pattern of results for the two groups (i.e., indigenous versus non-indigenous students) and is this different for B and K cohorts?

Measures

LSAC provides data on the performance of children on two major tests, the 'Who am I?' (WAI) Test (Grossack, 1960) and the 'Peabody

Picture Vocabulary Test' (PPVT-III) (Dunn & Dunn, 1997), for Indigenous and non-indigenous children. In brief, the WAI assesses general cognitive abilities needed for beginning school, and involves children copying shapes (circle, triangle, cross, square, diamond) and writing numbers, letters, words, and sentences. The PPVT-III, in contrast, is designed to measure a child's knowledge of the meaning of spoken words and his/her receptive vocabulary for Standard American English (Australian Institute of Family Studies, 2010). As an example, a child points to (or say the number of) a picture that best represents the meaning of a word that is read out by the interviewer.

Sample

The children recruited into LSAC are a representative sample of Australian rural and urban children (http://www.growingupinaustralia.gov.au/about/index.html).

Table 1. *Sample Design*

Cohort	Wave 1	Wave 2	Wave 3	Wave 4
B Cohort	0-1 yrs.	2–3 yrs.	4–5 yrs.	6–7 yrs.
K Cohort	4–5 yrs.	6–7 yrs.	8–9 yrs.	10-11 yrs.

Data is collected on two cohorts (as described above) every two years. That used for this paper is shown in Table 1.

The composition of these cohorts is shown in Table 2.

Table 2. *Frequency distribution of compositions for both cohorts*

Composition	B Cohort		K Cohort	
Non-indigenous	3980	95.6%	3578	97.5%
Aboriginal	156	3.7%	83	2.3%
Torres Strait Islander	16	0.4%	6	0.2%
Both Aboriginal and Torres Strait Islander	13	0.3%	2	0.1%

The WAI was administered to the B cohort at Wave 3 (4-5 years) and to the K cohort at Wave 1 (4–5 years). The PPVT was administered to the B cohort at Wave 3 (4–5 years), and to the K cohort at Wave 1 (4–5 years), Wave 2 (6–7 years), and Wave 3 (8–9 years).

The B Cohort

The initial sample consisted of 4386 children at Wave 3[2]. Missing data in terms of children not sitting either one of the two tests, or the two tests altogether, resulted in the deletion of 221 cases. The final sample size consisted of 4165 children, with a composition as follows: 3980 non-indigenous (95.6%), 156 Aboriginal (3.7%), 16 Torres Strait Islander (0.4%), and Both Aboriginal and Torres Strait Islander (0.3%).

The K Cohort

The K cohort differed from the B cohort in terms of the administration of the inventories. The initial sample

consisted of 4983 children; however, with the administration of the WAI at Wave 1, and the PPVT at Waves 1, and 3, there were 1323 missing cases (73.45% completion rate). Our final sample for analysis was 3660.

Data Analysis

We used the statistical software package SPSS 20 to analyse the LSAC data. For clarity purposes, we have structured our multivariate analyses to correspond to the respective research questions proposed.

1. ***Do children in the B cohort achieve higher results for the PPVT and WAI tests than those in the K cohort?***

We used a one-way repeated measures ANOVA to answer this question. As a point of reiteration, the ages of the children in the K cohort were: 4–5 yrs. at Wave 1, 6–7 yrs. at Wave 2, and 8–9 yrs. at Wave 3.

The Kolmogorov-Smirnov and Fmax statistics were used to test the assumptions of normality and homogeneity of variance, respectively. The Kolmogorov-Smirnov test indicated statistical significance ($p < 0.001$), suggesting a violation of the assumption of normality. However, as we alluded previously, this violation is often observed with large samples, and should not be of concern for further analysis (F. Gravetter & Wallnau, 2000; Pallant, 2007; Stevens, 1996). The Fmax statistic (= 1.56) showed that the homogeneity of variance could be assumed (Tabachnick & Fidell, 2007). The Mauchly's test, in contrast, revealed that the sphericity assumption was violated, and hence we used the Huynh-Feldt correction method.

2. ***Is there a change in the PPVT scores over the three waves of data?***

We performed two separate independent-samples *t*-test analyses: the PPVT × Cohorts (B, K) and the WAI test × Cohorts (B, K). Given the independent-samples t-test is parametric and entails a number of important assumptions (e.g., normality, homogeneity of variance), we conducted preliminary analyses to ensure that this statistical technique is appropriate.

The WAI: The tests of normality for both cohorts, using Kolmogorov-Smirnov statistic, similar to the PPVT test, showed that the assumption of normality was violated ($p < 0.001$). However, the histograms and kurtosis and skewness values revealed a 'normal' distribution of scores. The skewness values ranged from 0.24 (B cohort) to 0.26 (K cohort), whereas the kurtosis values ranged from 0.38 (K cohort) to 0.57 (B cohort). Despite this preliminary analysis suggesting a normality of scores, the Levene's test indicated that the homogeneity of variance assumption was violated ($F = 12.71$, $p < 0.001$). Because this assumption was violated we used the Walsh t test to compare the two cohorts on the WAI test.

The PPVT: The tests of normality for

both cohorts, using Kolmogorov-Smirnov statistic, indicated that the assumption of normality was violated ($p < 0.001$). However, it is important to note that this violation of assumption of normality is quite common with large samples (Pallant, 2007). Given this statistical significance, we also observed the histograms and kurtosis and skewness values for both cohorts to gather information about the distribution of scores for the two cohorts. The skewness values ranged from -0.23 (K cohort) to -0.47 (B cohort), whereas the kurtosis values ranged from 0.90 (B cohort) to 1.27 (K cohort). To a large extent, the histograms for both cohorts showed a 'normal' bell curve distributions. Levene's test was non-significant ($F = 0.29$, $p > 0.05$) thus equal variances can be assumed.

3. ***Is there a difference in outcomes on the WAI and PPVT-III between indigenous children and non-indigenous children? If there is a difference, then what is the pattern of results for the two groups (i.e., indigenous versus non-indigenous students) and is this different for B and K cohorts?***

Analysis and data testing for the K cohort analysis: We used one-way between groups ANOVAs to explore possible differences in results for the WAI at Wave 1, and the PPVT at Waves 1,2, and 3. An initial descriptive analysis indicated that the skewness values ranged from 0.29 (SE = 0.04, non-indigenous) to 0.66 (SE = 0.85, Torres Strait Islander) and the kurtosis values ranged from 0.29 (SE = 1.74, Torres Strait Islander) to 0.41 (SE = 0.08, non-indigenous) for the WAI test. The Kolmogorov-Smirnov statistics showed significance for the non-indigenous sample ($p < 0.001$), indicating a violation of the assumption of normality. However, according to some researchers (Pallant, 2007), this is quite common with larger samples. For the one-way between groups ANOVA, Leven's statistic was non-significant (F[3,3665] = 1.54, p = 0.20) suggesting that the assumption of homogeneity of variance was not violated.

Similar to that above, we performed an initial descriptive analysis for the three PPVT scores. At Wave 1, the skewness values ranged from -0.25 (SE = 0.04, non-indigenous) to 0.74 (SE = 0.26, Torres Strait Islander), and the kurtosis values ranged from -1.83 (SE = 1.74, Torres Strait Islander) to 2.38 (SE = 0.08, non-indigenous). For Wave 2, the skewness values ranged from -0.34 (SE = 0.26, Aboriginal) to 0.08 (SE = 0.85, Torres Strait islander), and the kurtosis values ranged from -0.69 (SE = 1.74, Torres Strait Islander) to 0.7 (SE = 0.8, non-indigenous). For Wave 3, the skewness values ranged from -0.7 (SE = -0.26, Aboriginal) to 1.34 (SE = .85, Torres Strait Islander), and the kurtosis valued ranged from -0.37 (SE = 0.52, Aboriginal) to 2.33 (SE = 1.74, Torres Strait Islander). As expected with big samples, The Kolmogorov-Smirnov tests showed significance for both the Aboriginal and non-indigenous

samples across the three waves ($p < 0.001$ for non Indigenous and $p < 0.05$ for Aboriginal at wave 1; $p < 0.001$ for both non-indigenous and Aboriginal at Wave 2; and $p < 0.001$ for non-indigenous and $p < 0.05$ for Aboriginal at Wave 3). For the one-way between groups ANOVAs, Levene's statistics were non-significant for the three waves (F[3,3665] = 0.10, $p = 0.96$ for Wave 1; F[3,3665] = 1.10, $p = 0.35$ for Wave 2; and F[3,3665] = 0.92, $p = 0.43$ for Wave 3). These values support our analyses in that assumptions of homogeneity of variance were not violated.

Analysis and data testing for the B cohort analysis: An initial descriptive analysis indicated that that the skewness values ranged from -1.54 (SE = 0.56, Torres Strait Islander) to 0.41 (SE = 0.20, Aboriginal), and the kurtosis values ranged from -0.16 (SE = 0.39, Aboriginal) to 3.23 (SE = 1.09, Torres Strait islander) for the WAI test. The Kolmogorov-Smirnov statistics showed significance for the non-indigenous sample (p <0.05), indicating a violation of the assumption of normality. However, as discussed above this is quite common with larger samples (Pallant, 2007). For the one-way between-groups ANOVA, Levene's statistic was non-significant (F[3, 4159] = 0.71, $p = 0.55$) suggesting that the assumption of homogeneity of variance was not violated.

Similarly, our descriptive analysis for the PPVT-III showed that the skewness values ranged from -0.50 (SE = 0.04, non-indigenous) to -0.11 (SE = 0.56, Torres Strait Islander), and the kurtosis values ranged from -1.17 (SE = 1.09, Torres Strait Islander) to 0.88 (SE = 0.08, non-indigenous). The Kolmogorov-Smirnov statistics showed significance for both the non-indigenous and Aboriginal samples ($p < 0.05$), suggesting a violation of the assumption of normality. However, we alluded previously that large samples often result in this statistical significance (Pallant, 2007). For the one-way between-groups ANOVA, Levene's statistic was non-significant (F[3, 4159] = 1.95, $p = 0.12$) supporting our analysis that the assumption of homogeneity of variance was no violated.

Results

1. *Do children in the B cohort achieve higher results for the PPVT and WAI tests than those in the K cohort?*

WAI: Welch's t test was statistically significant, with the B cohort (M = 65.57, SD = 8.48) reporting 1.15 higher (95% CI = ± 0.36) than the K cohort (M = 64.42, SD = 7.89, t[7830] = 6.24, $p < 0.001$, two-tailed, d = 0.14).

PPVT: The t test was statistically significant, with the B cohort (M = 65.16, SD = 5.97) reporting a 1.13 higher (95% CI = ± 0.27) than the K cohort (M = 64.03, SD = 6.08, t[7830] = 8.30, $p < 0.001$, two-tailed, d = 0.19).

The above results indicate that, in general, the B cohort outperformed the K cohort in both the PPVT and WAI test scores.

2. *Is there a change in the PPVT scores over the three waves of data?*

The PPVT across time: The repeated measures *ANOVA* indicated that the scores for the PPVT changed significantly over time (F[1.95, 7153.82] = 6803.42, p < 0.001, η^2_L = 0.55[3]). A series of pair-wise comparisons showed that the average score of the PPVT at Wave 1 (M = 64.03, SD = 6.08) was significantly lower than the average scores at Wave 2 (M = 73.91, SD = 5.05) and Wave 3 (M = 78.29, SD = 4.86). There was also a statistical significant difference between the average scores at Wave 2 and at Wave 3. This result suggests that the PPVT test scores improved over time.

3. *Is there a difference in outcomes on the WAI and PPVT-III between indigenous children and non-indigenous children? If there is a difference, then what is the pattern of results for the two groups (i.e., indigenous versus non-indigenous students) and is this different for B and K cohorts?*

K cohort results WAI test: The ANOVA was statistically significant (F[3,3665] = 7.93, p = 0.000, η^2 = 0.01. Post hoc analyses with Turkey's HSD (using an α of 0.05) revealed that non-indigenous children (M = 64.52, SD = 7.89) scored higher on the WAI test than Aboriginal children (M = 60.87, SD = 7.04) at Time 1. No other differences were statistically significant. Overall scores for the four groups are shown in Figure 1.

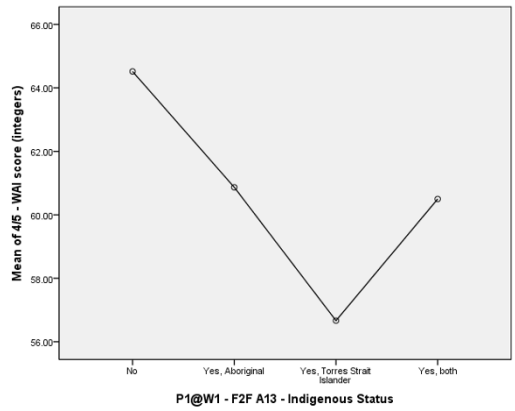

Figure 1. Mean Scores for the K Cohort and WAI

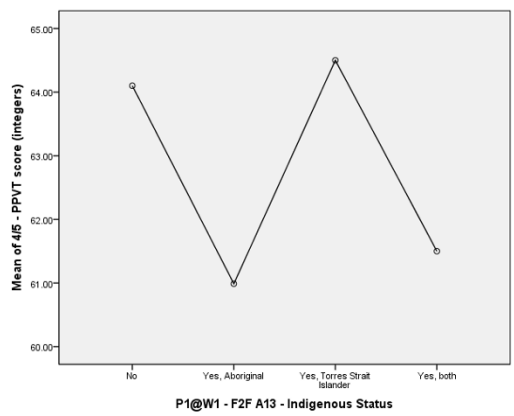

Figure 2. Mean Scores for the K Cohort and PPVT Wave 1

K cohort results PPVT: For the 3 waves, significant differences in scores were only demonstrated for Wave 1 (F[3,3665] = 7.25, p = 0.000, η^2 = 0.01). Post hoc analyses with Turkeys HSD (using an α of 0.05) revealed that non-indigenous children (M = 64.10, SD = 6.07) scored higher on the PPVT at Wave 1 than Aboriginal children (M = 60.99, SD = 5.61). No other differences were statistically significant. The PPVT scores for Waves 1 to 3 for the four groups are shown in Figures 2, 3 and 4.

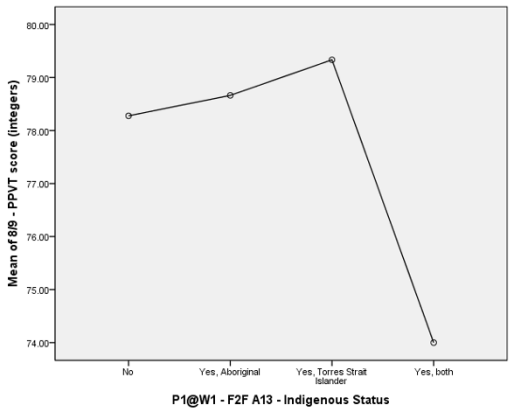

Figure 3. Mean Scores for the K Cohort and PPVT Wave 2

The ANOVA results were not statistically significant for Wave 2 (F[3,3665]= 5.26, p = 0.67, η^2 = 0.00) and Wave 3 (F[3,3665] = 0.78, p = 0.51, η^2 = 0.00). This lack of statistical significance between the four groups is reflected by the minute differences shown in Figures 3 and 4.

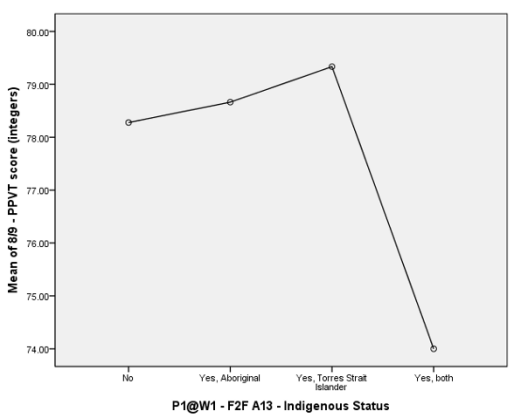

Figure 4. Mean Scores for the K Cohort and PPVT Wave 3

B cohort results WAI: The ANOVA was non-statistically significant, F(3, 4159) = 1.53, p = 0.20, η^2 = 0.001. Overall, this lack of statistical significance between the four groups of children in the WAI test at Wave 3 (non-indigenous, Aboriginal, Torres Strait Islander, and both Aboriginal and Torres Strait Islander) is reflected by the minute differences shown in Figure 5.

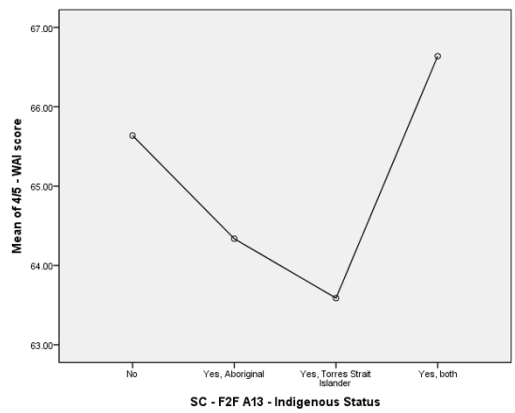

Figure 5. Mean Scores for B Cohort and WAI

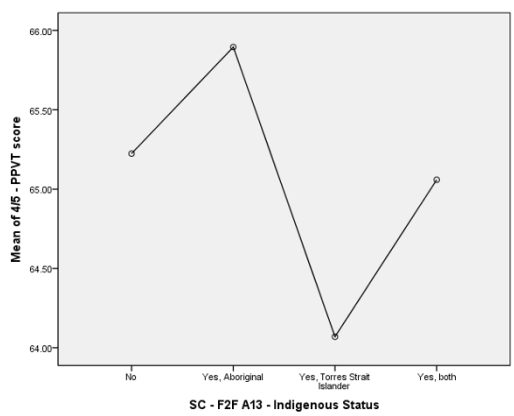

Figure 6. Mean Scores for B Cohort and PPVT

B cohort results PPVT: The ANOVA was not statistically significant (F[3, 4159] = 0.82, p = 0.48, η^2 = 0.01). Overall, similar to the results for the WAI test, this lack of statistical significance between the four groups of children for

the PPVT at Wave 3 (non-indigenous, Aboriginal, Torres Strait Islander, and both Aboriginal and Torres Strait Islander) is reflected by the minute differences shown in Figure 6.

In summary, the K cohort showed significant differences between Indigenous and non-indigenous children in the WAI but not the B cohort. There were significant differences in PPVT scores between Indigenous and non-indigenous children at Wave 1 but these differences were not evident as these children were re-assessed at Waves 2 and 3. There were no significant differences in PPVT scores for the B cohort.

Discussion

The focus of this study, entailing an empirical examination of two cohorts of children, addressed three major questions: (i) is there a statistical significant difference between the two cohorts (B *versus* K) in the PPVT and WAI tests?, (ii) is there a change in the PPVT, in particular, over the course of time for the K cohort?, and (iii) do indigenous and non-indigenous children differ in the PPVT and WAI test scores?

Differences between the Two Cohorts

Analyses of the data indicate, in part, some expected patterns in findings for the difference in the cognitive tests between the two cohorts. The B cohort, for example, outperformed the K cohort in both the PPVT and WAI test scores.. This finding, from our point of view, does come as a surprise, especially when we consider existing theoretical tenets (e.g., motivation in sociocultural contexts) and research studies in the areas of cognition, motivation, and learning. There is clear and consistent evidence, yielded from both quantitative and qualitative studies, to explain and account for disparities pertaining to children's cognitive development. One notable tenet, in this case, entails the potency of personal self-efficacy (Bandura, 1977, 1997), defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Personal self-efficacy, in this sense, differs from other forms of self-beliefs (e.g., self-esteem) for its contextual nature and task and domain specificity (Bandura, 1997; Pajares, 1996). This type of self-beliefs, according to Bandura (1986, 1997), features prominently in human agency for its influences on individuals' effort expenditure, resilience, and the mobilization of affective responses (e.g., anxiety). There is a plethora of research (e.g., Britner & Pajares, 2006; Pajares & Valiante, 1997; Phan, 2012b; Usher & Pajares, 2006), utilizing Likert-scale questionnaires to indicate that a heightened sense of self-efficacy for academic learning enhances achievement outcomes (e.g., mathematics). The contention, from our point of view, which requires continuing development, is whether and to what extent personal

self-efficacy beliefs account for differences in cognitive scores between the two cohorts. The inclusion of this noncognitive construct, of course, is ad hoc, and there may well be other psychosocial facets involved.

Another key tenet, which arises from social cognitive theory (Bandura, 1986, 1997) is the importance of enactive learning experiences, embedded in personal and sociocultural contexts (Phan, 2012d; Phan, Maebuta, & Dorovolomo, 2010; Walker, Pressick-Kilborn, Arnold, & Sainsbury, 2004). Enactive learning experiences, according to Bandura (1986, 1997), may entail both positive (e.g., repeated successes) and negative learning experiences, subject to mastery and/or normative evaluative criteria. Ongoing successes in a specific domain of functioning, in this case, may heighten personal self-efficacy beliefs (Britner & Pajares, 2006; Lent, Lopez, & Bieschke, 1991; Liem, Lau, & Nie, 2008; Phan, 2012c) and inform learners of their capabilities.

Children in the B cohort, in this analysis, would have had at least two-to-three years of mastery and learning experiences for improvement. In a similar vein, considering the potency of social cognitive theory (Bandura, 1986, 1997), we also contend that vicarious experiences (e.g., observing a capable peer) and/or verbal discourse (e.g., receiving attributional feedback) could contribute to the prediction of children's learning and performance outcomes in both cognitive tests. There is research to show that these two informational sources make a significant impact on children's self-efficacy beliefs and academic learning in achievement contexts (Schunk, 1983, 1987; Schunk & Hanson, 1985, 1989).

It is interesting to note that our results Leigh and Gong's (2008) study, which also indicated differences in the WAI and PPVT performances for children who were 4–5 years old between August 2003 and March 2004. In a comparative point of view, we also recognise that past research has identified significant differences in the performance of Indigenous and non-indigenous students (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009; Leigh & Gong, 2008).

A Change in Cognition over Time

The results indicate there is an increase in the PPVT cognitive test scores over the three occasions for the K cohort (i.e., Wave 1 to Wave 3). This pattern in findings, which details changes in cognitive scores may be explained by two major facets: (i) children's ongoing enactive learning experiences, as discussed in the preceding section, and (ii) the ease of 'memorization'. Bandura's (1986, 1997) social cognitive theory, as detailed previously, may in this instance explain the increase and improvement in cognitive scores. If we take consider the 'average' ages of the three waves, then the ages would be 4.5 (Wave 1), 6.5 (Wave 2), and 8.5 (Wave 3). This time span of two years between the

averaged ages between the three waves, and the range of four years between Wave 1 and Wave 3 indicates the increases in personal and learning experiences of cognitive subject matters. We contend that, in this analysis, children progressing from Wave 1 to Wave 3 would develop, cognitively, consequently resulting in enriched experiences and knowledge. It is more than likely, that children's social interactions with their parents, caregivers, peers and community, in general, would instil and strengthen favourable enactive experiences (Bandura, 1997). Integrating this myriad of personal and social experiences would, in turn, enable children to engage and solve increasingly complex daily tasks and problems. It is not perplexing to recognise that, in this instance, schooling experiences at Wave 3 (compared to preschool at Wave 1) would contribute positively to children's repertoire of knowledge and cognitive processes (e.g., reading comprehension).

A change in cognition, defined by the same cognitive and learning tasks on multiple occasions, may also be explained by the ease at which children memorize and engage in habitual action (Kember et al., 2000). Repeated exposures to the same learning tasks (e.g., PPVT items) may, for example, create and facilitate automated actions and behaviours in children.

This theoretical querying, of course, is merely speculative and requires further empirical examination and research investigations. By the same token, we also contend that cognitive complexities pertaining to the PPVT may stipulate and 'benchmark' at the upper ages (e.g., 7, 8, etc.). Is it possible, for example, that children at age 7 or 8 would find this cognitive test more easy to comprehend and understand than the younger cohorts? Consequently, as a result of their cognitive maturity, older children could be more well-versed to interpret and solve the items posed. One methodological possibility for future longitudinal research is the design and use of parallel items in cognitive testing for children. The study of cognitive, motivational, and social changes may include a number of innovative methodological approaches. One notable methodology entails the use of latent variable techniques to analyze data that are collected on multiple occasions. Researchers have detailed, in particular, the sophisticated, stringent approach of latent growth modelling (LGM)(Bollen & Curran, 2006; MacCallum, Kim, Malarkey, & Kiecolt-Glaser, 1997; McArdle & Nesselroade, 2003), enabling the study of changes in cognition and motivational processes in educational contexts. In the area of personal self-efficacy, for example, researchers (e.g., Caprara et al., 2008; Kim & Cicchetti, 2006; Phan, 2012a) have used LGM procedures to explore and delve into trajectories of cognitive and motivational processes of academic learning and other non-achievement outcomes. We note this methodological innovation, and contend

that its application could serve as a basis to advance the focus on children's changes in cognitive scores. Extraneous psychosocial facets (e.g., caregiver's attitude) and their potential influences on children's cognitive development may, in this sense, be validated by LGM procedures.

Comparative Examination: Indigenous Versus Non-indigenous Children

In a comparative sense, the significance of our examination of the data lies in the identification of differences in both the PPVT and WAI tests between Indigenous and non-indigenous children. In this analysis, the evidence indicates that Indigenous children performed lower on the WAI and the PPVT than the non-indigenous at Wave 1. However, similar differences were not evident in the B cohort when they were assessed between July 2007 to April 2008 at the same age as were the K cohort when previously assessed.

There are a number of possible factors that may contribute to understanding our results. The B cohort children spent their early years of life in a time of significant investment in early years and early years Indigenous programmes in Australia. The policy agenda over these years resulted in the provision of a range of services as follows. Some of these services, such as child care, focused on working with children. Between 2005 and 2009 there was a 15% increase in the number of Australian families using long day care programmes but out-of-pocket costs for parents associated with this decreased from 13% of disposable income to 7% (Office of Early Childhood Education and Child Care, 2010). More children from disadvantaged backgrounds (including Indigenous children) were able to access child care over this period, and the quality of the service they received continued to improve in response to the Government's quality improvement agenda (Office of Early Childhood Education and Child Care, 2010).

Services were also developed to support families and thus a number of families in the B cohort would have accessed these services. The ultimate aim of these services is to improve child outcomes by intervening in the home environment in various ways; usually supporting parents in their parenting role (parent education and support) and addressing key parental stressors (such as income management, employment, mental health concerns, violence, social isolation). Services such as Multifunctional Aboriginal Children's Services offer intensive family support (aimed at preventing child removal for abuse/neglect), playgroups, parent advice, child care (occasional and long day care) and community outreach (Hytten, 2010; Sims, 2011a; Sims et al., 2008). The Stronger Families and Communities Strategy[4] was the umbrella for a range of initiatives that included Communities for Children (CfC), Invest to Grow (ItG), Local Answers (LA), and Choice and Flexibility in Child Care. Overall these programmes were

responsible for an increased awareness of the importance of early intervention and the value of a co-ordinated approach to early years services (Muir et al., 2009). Children in CfC sites showed better receptive vocabulary achievement and verbal abilities and the range of programmes operating under SFSC went some way towards successfully engaging Indigenous families (Muir et al., 2009). The strategy required programmes to engage with Indigenous families and children, and a number specifically targeted Indigenous communities. Many were established in areas of significant disadvantage where there were a large number of Indigenous families.

Edwards et al (2009, p. x) argued:

> *The fact that the effect sizes of CfC were comparable to, if not greater than, many alternative early childhood interventions, and that these effects were evident irrespective of whether parents and children in the CfC communities had actually received services, seems to point towards an additional effect over and above the provision of new, stand-alone services, possibly as the result of a better coordinated local system of early childhood services and/or other enhancements to the community context in which children develop.*

Edwards and colleagues identify a key point, which goes towards our results. We cannot claim our participants were engaged in some of the programmes we have identified; we do not have access to that information. Despite this, however, we have demonstrated that children in our study, who were between 4-5 years in 2007/2008, and whose crucial early years were spent at a time of increased attention in early childhood and Indigenous policy, demonstrate better outcomes than older children whose early years were spent in a different policy environment.

The results of this study, as discussed in the preceding sections, have provided fruitful information into the methodological nature and interpretation of the LSAC data between indigenous and non-indigenous children in cognitive performances. We also need to consider, in our interpretations of the evidence, psychosocial issues and other policy development and instructional practices. One notable aspect for contemplation, for example, is the benchmarking of equality and consistency for all children in different social strata.

It is well established that there is a strong link between early childhood care and education programmes and the reduction of long term social inequality (Meyers & Gornick, 2003):

> *... the extent to which ECEC reduces inequality on these outcomes depends largely on the extent to which care for young children is socialized, that is, shifted from a private to a public responsibility" (p381).*

And

> *... by increasing the availability and affordability of care, ECEC policies may reduce in-country inequality in employment and income outcomes (p403)*

It appears that Australia, with a growing focus on early years policy, and the intersection of this with a new focus on Indigenous "Closing the Gap" initiatives, may at last be taking steps that will make a difference in the long term.

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Notes

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[2] A breakup in terms of gender is not available.

[3] Tabachnick and Fidell (2007) indicate against using partial η2 (as reported in the Tests of Within-Subjects Effects table) as a measure of effect size when the sphericity assumption has been violated. Instead, the authors advise calculating a lower-bound estimate of η2, using the following formula:

$$\eta^2_L = \frac{SS_A}{SS_A + SS_S + SS_{AS}}$$

where SSA is the sum of squares attributable to the IV, SSS is the sum of squares attributable to the cases, and SSAS is the sum of squares attributable to error.

[4] A federal government initiative that allocated funding to a range of programmes aimed at strengthening families and communities (http://www.fahcsia.gov.au/about-fahcsia/publications-articles/corporate-publications/budget-and-additional-estimates-statements/2000-01-budget-and-additional-estimates/a-stronger-families-and-communities-strategy).