Auditory Discrimination of Monolingual and Bilingual Children in Different Listening Conditions
INTRODUCTION

Auditory Discrimination and Bilinguals

Auditory Processing History

Central Auditory Processing (AP) is defined as the “efficiency and effectiveness by which the central nervous system (CNS) utilizes auditory information” (ASHA, 2005, p. 1). CAP is the perceptual processing of auditory information in the CNS. In 2005, the American Speech-Language-Hearing Association (ASHA) Working Group on Auditory Processing Disorders (2005) stated that CAP:

Include the auditory mechanisms that underlie the following abilities or skills: sound localization and lateralization; auditory discrimination; auditory pattern recognition; temporal aspects of audition, including temporal integration, temporal discrimination (e.g., temporal gap detection), temporal ordering, and temporal masking; auditory performance in competing acoustic signals (including dichotic listening); and auditory performance with degraded acoustic signals. (ASHA, 2005; p. 2).

Criticism has emerged because the definition of CAP has been based on diagnostic measures rather than on general constructs (McFarland & Cacace, 2006). Furthermore, the Working Group did not provide a glossary of terms to define the different terminology, which may cause confusion among professionals and researchers.
In 2007, the Ad Hoc Committee on the role of Speech-Language-Pathologist was formed to determine the responsibility of SLPs when identifying and treating children with CAP Disorders. The committee conducted a systematic review to determine auditory interventions for children with CAPD to determine the role of SLPs (Fey et al., 2011). Previous attempts have been made to address this topic but there is still ambiguity on the function SLPs play in assessing and treating children with CAPD (ASHA, 1992, 1996; DeBonis & Moncrieff, 2008; Geffner & Ross-Swain, 2007). The debate that surged from the systematic review that included the lack of evidence based research investigators presented. The challenge is that CAPD is often related to other disorders. This makes it difficult for clinicians to isolate the CAPD as a clinical entity (Richard, 2011). For example, DeBonis & Moncrieff (2008) revealed that children with CAPD had normal hearing, but exhibited deficits of auditory processing.

Khami (2011) argues that CAPD is not a “distinct clinical entity because it lacks definite diagnostic criteria (Richard, 2011, p. 244).” Khami (2011) also explained that there is no clear definition of CAP. Wallach (2011) agrees with Khami’s position in that CAP does not indicate that there are functional intervention strategies, and that identification and treatment of this disorder should focus on language based concepts (Wallach, 2011). Wallach (2011) explains that CAP may be “the result rather than the cause of language-learning difficulties (Richard, p. 244).”

Hypotheses & Models of CAP
There are two hypotheses that describe whether processing difficulties are auditory or specific speech perception. These hypotheses are the rapid temporal processing hypothesis and the speech specific hypothesis. The rapid temporal processing hypothesis proposes that there is impairment in the processing of acoustic information in the nervous system in rapid sequences (Tallar, Miller, & Fitch, 1993; Tallar & Piercy, 1973). Studies supporting this hypothesis revealed that children with specific language impairment (SLI) can be identified by having severe deficits in auditory processing that include rapid higher order sequences (Tallal, Miller, Jenkins, & Merzenich, 1997). Additionally, researchers argued that children with SLI that exhibit temporal processing deficits are unable to integrate sensory information in multiple modalities (Tallal et al., 1993).

Another aspect of this hypothesis is that children with language impairment have trouble discriminating and sequencing rapid auditory information, specifically when the stimuli presented are short vowels, short tones, or short transitional consonants (Tallal, 1980, 1981; Tallal & Piercy, 1973, 1974, 1975). These difficulties were reported for deficits of speech and non-speech stimuli. Tallal et al. (1997) used positron emission tomography (PET) to determine which neurological mechanisms are involved when processing speech at the phonemic level (Feiz et al., 1995; Fitch, Miller, & Tallal, 1997). The study revealed that “the data overwhelmingly fail to provide support for separate or uniquely human neural-processing systems for speech (Fitch et al., 1997, p. 349).” Tallal et al. (1997) revealed that neurological mechanisms for linguistic and non-speech stimuli are the same, and the processing of information is the same.
Statement of the problem

The relationship between two languages has been discussed in bilingual education and second language acquisition under the term cross-linguistic transfer, which is the influence of one language over the other (Odlin, 1989). Transfer can have a positive effect in that it can enable bilingual children to learn things in the other language. Transfer can likewise have a negative effect in that language acquisition can be delayed or slowed down and may require more effort from the learners to meet environmental requirements (MacWhinney, 2005; Odlin, 1989). The relationship between the first language and the second language can also be dependent on whether the child has subtractive or additive bilingualism. When a speech-language pathologist is given the information to evaluate a bilingual child, he or she may not have this knowledge of the child’s language development at hand and misdiagnose the child as having an auditory impairment. In addition, there is a lack of research in APD in children. Most of the studies have been researched in adults, or children who are 8 years of age or older.

Significance of the study

Auditory processing has been linked to the development of language and reading. Studies have shown that children with auditory difficulties lead to speech perception problems, which has effects on phonological representation (Dawes & Bishop, 2008).

Auditory processing is the foundation for the synthesis and function of language based abilities. Bailey & Snowling (2002) explained that
auditory discrimination enables listeners to make differences between minute modules in acoustic amplitude and frequency that represent different phonemes. Children who show difficulties processing acoustic information in noisy environments are prone to have more difficulty with language development and comprehension, and it is often presented as a general learning impairment (Jergen & Musiek, 2000; Heine & Slone, 2008; Keith, 2004).

**Purpose of the study**

Auditory processing is the foundation for the synthesis and function of language-based abilities. Studies have shown that children with auditory processing difficulties have speech perception problems which affect phonological representation (Dawes & Bishop, 2008).

There is a lack of research on auditory processing in very young children. Most of the studies have been researched on adults or children who are 8 years of age or older. Additionally, there is very limited research on the auditory processing/auditory phonemic awareness and discrimination abilities of children who are bilingual. Most of the research with bilinguals has been conducted with Mexican American Spanish speakers and Catalan speakers. Besides that, other studies have not evaluated auditory discrimination in children with language impairment who are bilingual. As a result, the present study proposes to compare auditory discrimination of monolingual and bilingual children in quiet and different noise conditions.
Research questions:

1. Is there a difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented in quiet?

**Null Hypothesis:** There is no difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented in quiet.

2. Is there a difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented with cafeteria noise?

**Null hypothesis:** There is no difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented with cafeteria noise.

3. Is there a difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented with competing story?

**Null hypothesis:** There is no difference between bilingual and monolingual children in their discrimination of minimally pair listening task presented with competing story.

4. Is there a difference between bilingual and monolingual children in their discrimination of minimally pair listening tasks between the two different noise conditions?
Null hypothesis: There is no difference between bilingual and monolingual children in their discrimination of minimally pair listening tasks between the two different noise conditions.

6. Is there a difference between the types of discrimination errors made between children who are bilingual proficient and bilingual language learners in quiet, in cafeteria noise, and competing story?

Null Hypothesis: There is no difference between the types of discrimination errors made between children who are bilingual proficient and bilingual language learners in quiet, in cafeteria noise, and competing story.