Dynamic Assessment in Speech and Language Therapy

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1. Introduction

Research has shown that although static norm-referenced tests are used as the main method of assessing language skills, they do not provide valid and reliable results in preschool children (Gray et al., 1999) as well as in culturally linguistically diverse (CLD) children (De Lamo White and Jin, 2011). An explanation of this could be that children's performance in static tests is highly influenced by environmental factors such as child's life experiences, socio-economic status and cultural background (Lidz and Peña, 2009). Therefore, this results in preschool and CLD children being at risk of misdiagnosis since they are often over- and under-identified in speech and language therapists' (SLTs) caseloads in the UK (Winter, 2001).

The inadequacy of static tests to determine children's language abilities has led to the development of dynamic assessment in the field of speech and language therapy (SLT) over the past three decades (Law and Camilleri, 2007). Dynamic Assessment (DA) has been considered as an alternative and/or supplemental method of assessment which is thought to be less culturally and linguistically biased than the static standardized tests (Peña, Iglesias and Lidz, 2001). Unlike conventional tests, DA is a child-centered process which aims to determine the child's potential for learning. It is based upon Vygotsky's (1978) socio-cultural theory who advocated that children's early development is achieved through interaction with a more knowledgeable person. So, an interactive relationship occurs between the assessor and the child where the former support latter's performance by providing learning opportunities (Hasson and Joffe, 2007). The discrepancy between the level of child's independent performance and his/her level after having received assistance by an adult or a more capable peer, demonstrates the child's learning potential termed by Vygotsky (1978) as 'the zone of proximal development' (ZPD). The primary goal of DA is to define the child's maximal performance and thus, the extent of the ZPD.
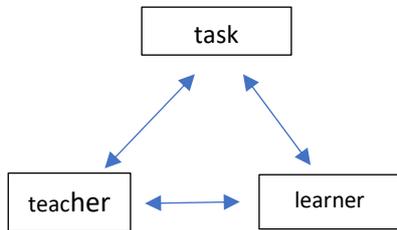
Figure 1. The tripartite model (adapted from Feurstein, 2001).
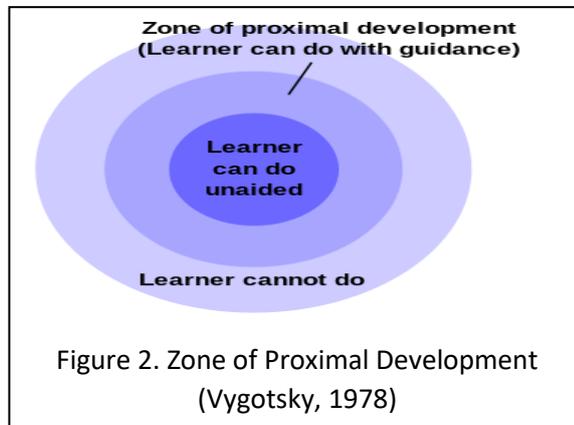
Figure 2. Zone of Proximal Development (Vygotsky, 1978)

2. Approaches to Dynamic Assessment

DA arose from a recognition of the inadequacy of static assessment methods to establish an individual's intelligence regardless cognitive, cultural, linguistic and/or environmental differences. In SLT, DA can be accomplished through various ways since different approaches have been developed by proponents of its application. The most frequently used methods are the Mediated Learning Experience (MLE) and the Graduated Prompting (GP). The former is embedded in Feuerstein's theory of 'Structural Cognitive Modifiability' (SCM) which depicted the natural tendency of human beings to adapt to each situation's demands by modifying the structure of their cognitive functioning. Similarities with Vygotsky's theory exist because Feuerstein emphasized the important role of child's caregivers and he claimed that the sufficient interaction, or otherwise the MLE, between a child and an individual can cause a permanent and generalizable cognitive change. In DA, the MLE is included in the teaching phase within a test-teach-retest process where the mediator is responsible for constructing learner's experiences of the world. That means, he enables the learner to pay attention to meaningful aspects of the stimulus, to process it efficiently, to relate it with past experiences and to generalize learnt skills to other circumstances (Haywood, 1993). According to Feuerstein, the mediational interaction should be characterized by some vital components, namely Intentionality – an intentional purpose to enhance learner's skills and knowledge; Reciprocity – a situation in which the learner is aware that the assessor is going to help him; Meaning – the learner should realize the reason

for what he is learning; Transcendence – learner's ability to transfer skills learnt to other situations. The responsiveness and performance of the child to the MLE define his potential for learning (Lidz, 1991; Deutsch and Reynolds, 2000).

Graduated Prompting is a widely used approach to DA in which a series of cues are provided to support child's attempt to success in the task (Campione, 1989). The presentation of prompts is organized in a hierarchical way starting from the least supportive cues, to maximal direct ones. The less 'scaffolding' a child needs, the better his prognosis for learning achievement. The number of cues required constitutes a measure of child's ZPD and thus, a strong indication of his modifiability (Campione and Brown, 1987). Despite the differences between DA methods, they share common features which are central to DA. All of them incorporate interaction between the assessor and the learner with the aim to facilitate learning and evaluate the potential for change as well as they provide useful information about child's strategies to modify (Lidz, 1991). These characteristics clearly differentiate DA from conventional static tests.

3. Literature Review

Research studies have started applying the DA on various language domains in order to approach some important issues in the SLT field which could not be addressed by static tests. One of them is the accurate differentiation between language difference and language impairment. The increasing ethnic diversity in some countries such as the UK (Baker and Eversley, 2000) and Greece (Kassimeris and Samouris, 2012) has raised significantly the necessity for accurate identifications by SLTs regarding the language abilities of the CLD children. Thus, a bulk of DA studies has examined its effectiveness to accurately distinguish between the typically developing (TD) children from CLD backgrounds and those with a real language disorder (See Table 1,2). Another examined issue in DA studies is its efficacy to determine the size of children's potential for learning or modifiability/stimulability. In this way, SLTs are able to adapt the intervention to children's cognitive and language level. Other DA studies have been conducted in order to identify which types of intervention are the most appropriate for individual children.

Study	Aim	Sample/Groups	Language Domain of DA	Reference standard
1. Peña et al. 2006	Classifying children as TD or LI	2 experimental groups: TD and LI 1 control group: TD (n=71)	Narrative	1.Parent and teacher reports 2. classroom observation 3. standardized test of language skills 4. diagnosis of an SLT
2. Peña, Gillam and Bedore (2014)	Classifying children as TD or LI	Bilingual children (n=54) 2 experimental groups: TD and LI 1 control group: TD	Narrative	1. data from language tasks 2. parent and teacher reports
3. Petersen et al. (2017)	Classifying children as TD or LI	Bilingual children (n=42) 2 experimental groups: TD and LI	Narrative	1.assessment by an English-Spanish speaking SLT 2. performance in a story retell task in both languages 3. parent or teacher affirmation of LI 4. child's inclusion in a language program
4. Peña, Quinn and Iglesias (1992)	Classifying children as TD or LI	Bilingual children (n=60) 2 experimental groups: TD and LI	Expressive Vocabulary	1. Assessment of comprehension, phonology and expressive vocabulary 2. classroom observation 3. hearing screening
5. Peña, Iglesias and Lidz (2001)	Classifying children as TD or LI	Bilingual children (n=79) 2 groups: Mediation group and no Mediation (control) group	Vocabulary/ Word Learning	1. classroom observation 2. parent and teacher report
6. Kapantzoglou, Restrepo and Thompson (2012)	Classifying children as TD or LI	Bilingual children (n=28) 2 experimental groups: LI and TD	Word Learning	1. parent and teacher report 2. SLT confirmation 3. language sample (grammatical errors
7. Hasson et al. (2013)	Classifying children as TD or LI	Bilingual children (n=26) 2 experimental groups: LI and TD	Vocabulary Syntax Phonology	1. children on an SLT caseload
8. Camilleri and Law (2007)	Classifying children as TD or LI	2 experimental groups (n=54): TD (monolingual and bilingual) Children referred to SLT (monolingual and bilingual)	Word Learning	1. children referred to SLT
9. Camilleri and Botting (2013)	Examination of validity and reliability of DA of word learning	2 experimental groups (n=15): TD and children referred to SLT	Word Learning	1. children referred to SLT 2. Receptive Vocabulary test

*TD: typical development, LI: language impairment

Table 1. Characteristics of DA studies

Study	Type of DA	Index Measure	Result
1. Peña et al. 2006	MLE	1. Story Scores 2. Productivity measures 3. Modifiability Score	Sensitivity 78.6% Specificity 88%
2. Peña, Gillam and Bedore (2014)	MLE	1. Modifiability Score 2. Story Scores 3. Productivity measures 4. Complexity measures	Sensitivity 88.9% Specificity 88.9%
3. Petersen et al. (2017)	Graduated Prompting	1. Narrative Retell 2. Modifiability Score	Sensitivity 100% Specificity 94%
4. Peña, Quinn and Iglesias (1992)	MLE	1. Expressive Vocabulary (pretest to posttest change)	Accurate identification of LI NR sensitivity and specificity
5. Peña, Iglesias and Lidz (2001)	MLE	1. Expressive vocabulary (pretest to posttest change) 2. Modifiability Score	Sensitivity 78% Specificity 95%
6. Kapantzoglou, Restrepo and Thompson (2012)	MLE	1. Word production 2. Word identification 3. Modifiability Score 4. Learning Strategies Checklist	Sensitivity 76.9 Specificity 80%
7. Hasson et al. (2013)	Graduated Prompting	1. expressive vocabulary 2. Sentence structure 3.Phonology	Accurate identification of LI NR sensitivity and specificity
8. Camilleri and Law (2007)	Graduated Prompting	1. Receptive and expressive measures 2. Dynamic Weighted Score	Accurate identification of LI NR sensitivity and specificity
9. Camilleri and Botting (2013)	Graduated Prompting	1. Receptive and expressive measures 2.Mean Weighted Generalized Score 3.Mean Weighted Dynamic Score 4. Mean Weighted Generalized Post-test score 5. Mean Weighted Dynamic Post-test Score	Accurate identification of LI NR sensitivity and specificity

*NR: not reported

Table 2. Characteristics of DA studies (continued)

The findings of DA studies included in the literature review are very promising regarding its diagnostic accuracy, or alternatively screening accuracy, and helpfulness to inform the intervention. This fact can have a considerable clinical impact on the field of speech and language therapy regarding the more effective management of CLD populations. However, there are often methodological limitations in DA studies in terms of the sample size (small number, lack of representative ratio), information about participants' characteristics, the reference standard, the blinded and independent testing. Moreover, the variation of DA procedure among studies regarding the language task, outcome measures and the type of mediation impedes the generalization of findings. These are verified by Poehner (2008) who claimed that the infrequent use of DA is due to its invalid psychometric properties.

The inferences of this literature review are verified by a meta-analysis conducted by Orellana, Wada and Gillam (2019) which included 7 DA studies. The values of sensitivity, specificity and likelihood ratios (LRs) for each study's DA procedure were presented since these rates highly reflect the diagnostic accuracy of a test. All studies showed sensitivity rates which met or approximately met the criteria of 0.8. This was also reflected by the pooled sensitivity value (0.84). Specificity values were also over 0.8 with a pooled rate of 0.89. The pooled values of both positive LR (LR+) and negative LR (LR-) were in the range of clinical informativeness (7.34 and 0.24, respectively) despite not reaching the cutoffs, 10.0 and 0.1, respectively.

The results of this meta-analysis should be also interpreted carefully since there was a methodological variation among the studies regarding the language tasks, the outcome measures and the reference standard used in each of them. The high inconsistency (I^2) value in the pooled LR+ and specificity reflects the heterogeneity of the outcome measures among studies. Moreover, the presence of wide-ranged confidence intervals implies that it is likely the values to be clinically uninformative if the measures were applied again. Consequently, although the findings about the diagnostic accuracy of DA are promising, the limited number of studies and their methodological variation need to be considered when drawing conclusions.

4. Other Elements of Evidence Based Practice (EBP)

Apart from the available evidence, two additional factors should be considered when evaluating an intervention or an assessment method. Firstly, the patient preferences and values should be taken into consideration (Sackett et al., 1996). As mentioned before, there is no "gold standard" for assessing bilingual children. According to the evidence, DA is regarded as a nondiscriminatory assessment method (Sewell, 1987) which respects children's cultural background. Moreover, the rationale of DA is based upon Vygotsky's sociocultural theory (1978) which advocates that child's learning development is achieved through social interaction with a more knowledgeable person. For that reason, during DA there is an interactive relationship where the assessor provides a graduated mediation inducing learner's participation (Lidz, 1991). Within this context, the child feels secure and has the opportunity to show her actual learning potential.

The other critical element of EBP is the clinical expertise which concerns clinicians' ability to use their clinical skills and experience in order to consider patients' potential risks and benefits of an intervention according to their health situation, as well as patients' personal conditions and expectations (Straus et al., 2005). The unconventional nature of DA as an assessment method might prevent SLTs to use it in practice (Caesar and Kohler, 2007). SLTs might not be adequately informed about DA and its clinical utility on CLD populations. Such issues could be resolved through training sessions that would equip SLTs with essential knowledge and skills. Additionally, further research is needed to resolve the limitations in the existing studies and strengthen the evidence for each DA language task.

Regarding the development of DA in Greece, given the fact that only static standardized assessments are currently used, Greek SLTs should be trained through specialized informative sessions on its rationale, principles, test-teach-test procedure and measures, as well as they should be exposed to the existing evidence. Research should be also conducted replicating previous studies and using Greek standardized static tests as pretest measures along with valid reference standard in order to examine the diagnostic accuracy of DA in the cultural diversity of Greece and the possible adaptations that might need. All these will urge its clinical application in Greece.
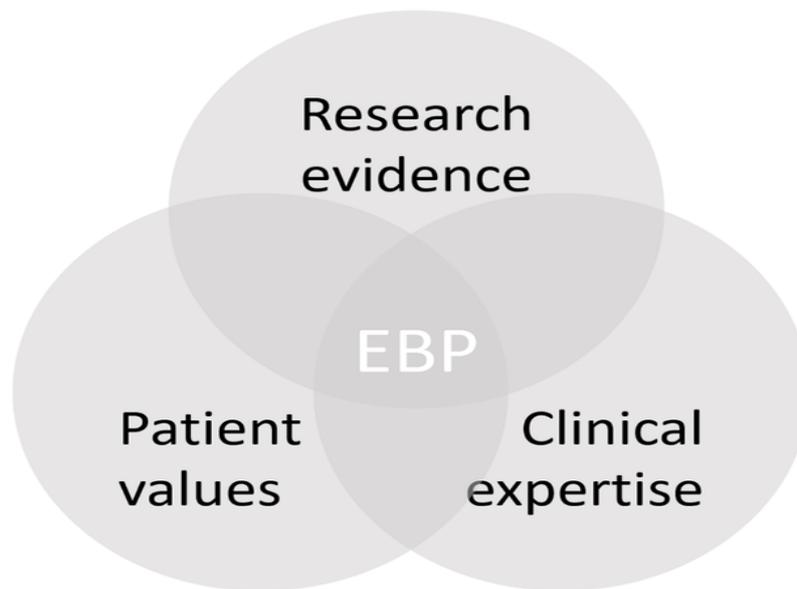
Figure 3. The EBM triad

5. Conclusion

This literature review indicates that DA can efficiently differentiate children with LI from TD children regardless their linguistic background. Due to the fact that the number of bilingual children on SLTs' caseloads is increasing in Greece over the past years, it might be advantageous for Greek SLTs to use DA in practice since there is not a "gold standard" for evaluating the language abilities of bilingual children (Hasson et al., 2013). However, SLTs should be careful when interpreting the results because the studies did not include a representative ratio of participants to population nor they reported participants' language experience or severity of their LI. The use of DA combined with standardized static tests, parent and teacher reports is highly likely to provide an accurate classification of children though. Additionally, although the different outcome measures used in the studies provided useful information about the effectiveness of various DA language tasks, it was difficult to make generalizations. The field of DA needs further research with improved methodology in order to provide more evidence for the different DA language tasks. Although potential costs are not discussed in the review, it could be regarded as a cost-effective assessment method due to its practical and clinical advantages. DA has the potential to be implemented in various educational settings (e.g. school, private setting) lasting for a short time and without requiring any expensive equipment. Moreover, the use of DA will reduce the

over-identification of CLD children and thus, it will prevent the depletion of SLT resources and it will reduce the waiting lists for speech and language therapy.

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