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中英母语者英语语音意识训练效果对比的元分析*

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摘　要:本研究采用元分析技术,比较中英母语者英语语音意识训练效果的差异。共纳入文献 101 篇,总样本量为 9802 人。结果表明:(1)英语母语者在总体语音意识及音位意识子成分上的训练效果显著优于汉语母语者;(2)英语母语者最佳受益时间窗口为 6 岁以下,汉语母语者最佳受益时间窗口为 13 岁及以上;(3)单纯增加训练强度(时长和次数)无助于汉语母语者提升训练效果;(4)样本特征、训练内容和训练形式均影响语音意识训练效果。结果提示,相比于英语母语者,汉语母语者由于缺少早期自然习得的音 - 义连接,更少能够从语音意识训练中获益。为汉语母语者设计英语语音意识训练时,应考虑补偿其缺失的单词音 - 义连接经验,更有针对性地制定教学策略。

关键词:语音意识训练;音 - 义连接;音位意识;第二语言;元分析
分类号:G442

1　引言

英语语音意识对于汉语母语者和英语母语者的英语读写能力均起到了关键作用。大量研究表明,即使控制了年龄、智力、认知能力和词汇能力等潜在干扰因素,英语语音意识仍是预测中英母语者英语读写能力的重要指标(Chung & Lam, 2020; Jongejan et al., 2007; 管益杰 等, 2006)。因此,加强学习者的语音意识对其语言技能的发展具有重要意义。

语音意识训练在中英母语者中的应用已经取得了显著的效果。该训练主要分为三类。首先,以语音意识为核心的训练聚焦于单词的音位、音节和押韵意识层面的加工,例如徐莹(2021)针对中国大陆大一学生的 8 周训练以及 Hesketh 等人(2007)针对英国 4 岁到 4 岁半言语障碍儿童的 10 周训练,均显著提升了学习者的语音意识及单词识别能力。其次,以自然拼读法为中心的训练则系统性地教授字母或字母组合与其发音之间的对应关系(Armbruster et al., 2009),如 Price - Mohr 和 Price(2018)对英国 5 ~ 6 岁阅读能力落后儿童的研究以及 Li 和 Woore(2021)针对中国大学生的研究均揭示了拼读法训练能显著增强学习者的词汇朗读能力。最后,是结合语音意识与自然拼读法的训练,如 Li 和 Chen(2016)对 11 岁台湾儿童的研究以及 Ahmed 等人(2020)针对英国 6 至 7 岁学习困难儿童的 GraphoGame Rime 训练项目均证实了语音意识训练在提升儿童真词朗读和假词拼读能力上的有效性。

然而,汉语母语者由于缺乏单词的音 - 义连接经验,在英语语音意识训练中的获益可能会低于英语母语者。英语母语儿童在日常生活中已经积累了丰富的口语词汇,因此他们一旦通过拼读教学法掌握了单词的形 - 音对应规则,便能迅速地应用解码技巧将书面语转换成口语并理解词义(Jiang, Gai, Han, et al., 2023)。这一过程在心理词典中形成了形 - 音 - 义的关联网络,可能提升拼读法的学习效率。根据连接主义三角模型,语音、语义和字形信息在神经网络中并行激活。语音和语义通路的协同作用对于词汇的熟练朗读起着至关重要的作用(Plaut et al., 1996)。双通路瀑布式模型指出,在通过视觉路径无法直接识别单词时,语音加工能够间接激活与单词相关的语义信息,促进正字法结构的识别(Coltheart, 2005)。然而,汉语母语者可能无法受益于此,导致其语音意识习得效率不如英语母语者。

音 - 义连接经验已被证实会影响汉语母语者的

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英语语音意识训练效果。姜莹等人(2024)发现,接受前置音 - 义连接训练的汉语母语儿童在拼读法训练中受益更多,并在新词材料中表现出近迁移效应。Jiang, Gai, Üstün - Yavuz 等人(2023)的元分析也支持这一发现,表明结合语义训练的英语语音意识项目对汉语母语者更为有效。这突显了语义因素在汉语母语者语音意识训练中的重要地位。

尽管如此,当前仍缺乏中英母语者英语语音意识训练效果的直接对比证据。Vadasy 和 Sanders (2010, 2013)发现,非英语母语儿童(母语为西班牙语、越南语、索马里语、汉语和塔加路语)接受英语拼读法训练的效果低于英语母语儿童。然而,这些研究并未单独针对汉语母语群体的训练效果进行分析,因此,中英母语者在英语语音意识训练效果上的真实差异仍待明确。此外,Jiang, Gai, Üstün - Yavuz 等人(2023)对汉语母语者的英语语音意识训练进行了元分析,但该研究未纳入英语母语群体的相关文献。作为英语水平成熟的代表群体,与其进行比较有助于准确评估中英母语者语音意识训练的效果差异并深入理解潜在成因。值得注意的是,该元分析包括约半数未发表文献,其效应量显著大于已发表文献,可能暗示低质量研究对结果有所影响。为了得到更准确的结论,本研究只考虑了经同行评审的文献,旨在借助这些高质量研究更真实地反映中英母语者的训练效果差异。

对于汉语母语者,提升英语音位意识可能比首音 - 韵脚意识和音节意识面临更多挑战。英语单词由独立的音位构成(McBride - Chang & Kail, 2002),这使得英语母语者在音位加工方面具有较强的能力。相比之下,汉语书写系统不直接反映音位信息(Branum - Martin et al., 2012),使得汉语母语者在朗读汉字时较少涉及音位层面的加工(Shu et al., 2008)。这种语言结构上的差异增加了汉语母语者提升英语音位意识的难度。然而,汉字与英文在音节和韵脚方面存在共性。因此,汉语母语者在音节意识和押韵意识上的发展可能不会与英语母语者有较大差距(McBride - Chang et al., 2004)。此外,多项研究表明,语音意识训练显著提升词汇朗读水平。真词朗读和假词拼读是词汇朗读中的两个关键子成分,它们涉及不同的认知过程。特别是假词,因其缺乏语义(Zhang & Peng, 2022),在拼读时需要额外的语音加工能力,因此,应单独考察这两个子成分的训练效果。综上所述,检验中英母语者在语音意识和词汇朗读子成分上的训练效果差异,对于跨文化应用语音意识理论和指导教育实践都具有重要意义。

其他因素也可能影响中英母语者在语音意识训练中的表现。例如,缺乏音 - 义连接经验的汉语母语儿童可能在训练中受益较少。然而,随着年龄增长和英语学习经验的积累,这一影响可能减弱。相反,英语母语儿童可能因生活中积累的丰富词汇,在年龄较小时就能取得更好的训练效果。因此,本研究将考察不同年龄段的中英母语者接受语音意识教学的效果。此外,Ehri 等人(2001)的研究发现,具有普通阅读能力的拼音文字母语者在语音意识训练上的效果优于阅读障碍群体,但这一结论是否适用于非拼音文字母语者,还有待检验。关于训练内容对语音意识训练效果的影响,目前尚有争议。研究显示,对于拼音文字母语者,语音意识与字母 - 发音训练相结合时更有效,而对于英语作为第二语言的学习者,加入字母 - 发音训练并不会影响语音意识训练的效果(Jiang, Gai, Üstün - Yavuz, et al., 2023; Murphy Odo, 2021)。本研究将进一步检验这一影响因素。教学强度也是一个关键因素。Ehri 等人(2001)发现,儿童语音意识教学的最佳总时长为 5 至 18 小时。Murphy Odo(2021)的研究表明,增加英语学习者的教学时间有助于提升真词朗读能力,但教学时间过长则减缓假词拼读技能的提升。最后,有研究发现,拼音文字母语者小组训练的效果优于一对一和整班训练(Ehri et al., 2001),但这一点在汉语母语者中尚未考察。本研究将检验这些因素对不同母语背景学生英语语音意识训练效果的潜在影响。

综上,本研究收录了自 1990 年以来的相关文献,考察中英母语者英语语音意识训练效果的差异。我们提出三个研究问题:

研究问题 1:相比于英语母语者,汉语母语者是否从英语语音意识训练中获益较少?

假设 1:由于汉语母语者在单词音 - 义连接上的经验不足,他们在英语语音意识训练后的提高程度可能低于英语母语者。

研究问题 2:在英语语音意识任务(音位意识、首音 - 韵脚意识/押韵意识和音节意识)和词汇朗读任务(真词朗读和假词拼读)的多个子成分中,哪一子成分的训练效果在中英母语者间存在更显著的差异?

假设 2:相比于其它语音意识成分,由于汉字的非拼读性质,汉语母语者在英语音位意识成分上的

训练效果提升幅度会更小。

研究问题 3:哪些因素可能影响中英母语者在英语语音意识训练中的效果?

假设 3:年龄、样本特征、训练内容、训练强度和训练形式可能影响中英母语者在英语语音意识训练中的效果。

2　方法

本研究遵循系统评价和荟萃分析(PRISMA)指南(Liberati et al., 2009)。元分析方案已预注册在 PROSPERO 平台上,注册号为 CRD42023446386。

2.1　文献检索

2023 年 4 月,在 Scopus, Web of Science, Ebsco(ERIC, APA PsycInfo, Psychology and Behavioral Sciences Collection, APA PsycArticles)和中国知网进行了文献检索,检索关键词包括 phonological awareness, train, read 及其相关的替换词(详情见材料链接 https://osf.io/wk2hr?view_only=7616fe822c5541ffb8232477632fc296,后文简称补充材料)。文献筛选流程如图 1 所示。文献发表时间限定为 1990 年到 2023 年 4 月(最后一次补充更新至 2023 年 12 月)。文献类型限定为经同伴审议的期刊论文。文献发表语言限定为英语和汉语。共检索到 5260 篇文献,经过去重处理后获得 3582 篇文献。

2.2　纳入和排除标准

纳入标准:(1)研究设计。采用了前后测或对照组设计;(2)研究对象。需为汉语母语者或英语母语者。汉语母语者指以汉语为第一语言,以英语为第二语言/外语的学习者。英语母语者来自美国、英国、加拿大(排除以法语为主要语言的人)、澳大利亚和新西兰;(3)群体类型。中英母语者需为正常阅读能力群体、低阅读能力群体、阅读障碍群体、言语或语音能力缺陷群体和学习障碍群体;(4)训练内容。参照 Murphy Odo(2021)的分类标准,纳入文献中干预训练的主要内容应为语音意识训练、拼读法训练或二者相结合的训练。根据以上标准,通过阅读标题、摘要或全文后,获取文献 313 篇,其中包括汉语母语者 36 篇,英语母语者 277 篇。

排除标准:(1)训练主题。若训练内容包含除语音意识或拼读法训练之外的其他成分,且这些成分在教学中所占比例近似或高于语音意识或拼读法训练,则这些文献被排除。聚焦流畅性、理解力等训练内容的文献被排除(Murphy Odo, 2021);(2)无法计算效果量。如果研究未能提供足够的数据信息以计算效果量,则被排除;(3)其他。结果变量应至少包括:语音意识合成成绩、音节意识、音位意识、首音 - 韵脚意识、押韵意识、真词朗读或假词拼读成绩之一。不满足条件的文献被排除。仅涉及追踪研究的文献也被排除。根据以上标准,阅读全文后排除 214 篇文献。在加入了最新补充的两篇文献后,元分析最终纳入 101 篇文献,其中 16 篇来自汉语母语者,85 篇来自英语母语者。所有纳入文献均经过 JBI 质量评估工具(Aromataris & Munn, 2020)的评估,满足标准并被包括在元分析中(详情见补充材料)。

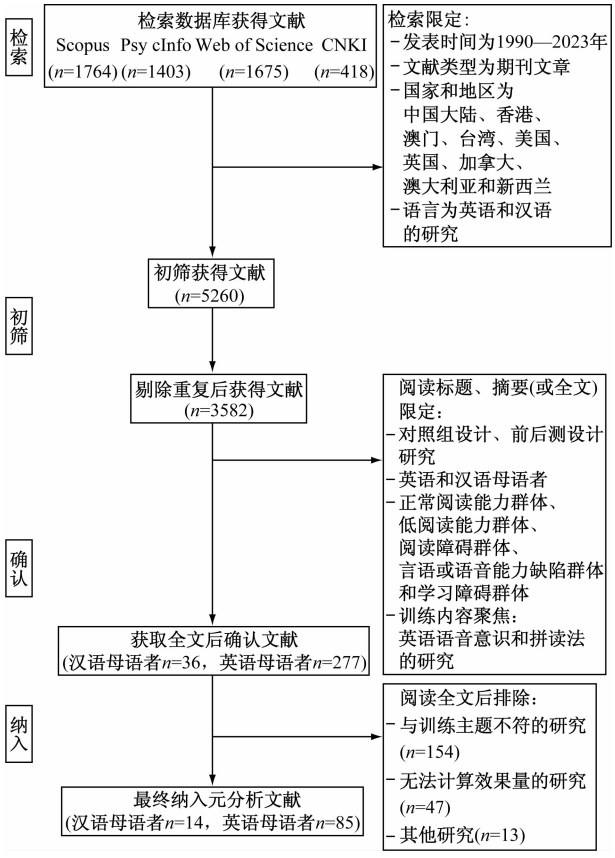

图 1　文献检索与筛选流程图

2.3　元分析过程

2.3.1　数据提取和效应量计算

对语音意识和词汇朗读的总效应分别进行了计算。语音意识的结果来源于音节意识、音位意识和押韵意识(其中首音 - 韵脚意识和押韵意识的结果合并);词汇朗读的结果来自真词朗读或假词拼读。若干预研究报告了多个结果指标,分别计算每个指标的效果量。一些研究报告了多个语音意识或词汇朗读的结果,计算每个样本的平均值,生成综合效应量 g(见补充材料)。对于有多个组别的研究,只编

码训练内容聚焦语音意识和/或自然拼读法的组别,采用多个比较组的平均值。此外,按照每个独立样本编码一个效应值,若一篇论文同时报告了多个独立样本,则分开编码。

使用元分析软件 Comprehensive Meta – analysis 3.0 进行数据分析。效应大小以标准化均数差 Hedges' g 表示。Hedges' g 是 Cohen's d 的修正量,对小样本效应量进行了校正(Borenstein et al., 2009)。根据 Sawilowsky(2009),2、1.2、0.8、0.5、0.2、0.01 的效应值分别代表巨大、非常大、大、中、小和非常小。后测的原始均值和标准差是计算效应大小的首选,但对于未报告这些值的研究,使用推论统计来计算效应大小(Card, 2015),包括 t 统计量和 p 值等。采用随机效应模型计算综合效应大小,并根据此模型报告结果。随机效应模型允许研究之间的方差超出抽样误差(Borenstein et al., 2009)。Q 统计量用于评估组合效应大小的异质性。

2.3.2　调节变量的编码

设置母语类型为亚组,比较中英母语者在语音意识和词汇朗读及其子成分上的训练效果差异。由于汉语母语者研究数量有限,为确保充足的统计功效,仅纳入至少含三个对比项的调节变量(任志洪,赖丽足, 2023)。两名编码者独立对元分析中随机选取的四分之一文献进行编码(见补充材料)。如有不一致,核对原始文献确定最终编码。编码者一致性较高(κ = 0.92),其余文献则采用一名编码员的结果。

调节变量的编码包括:(1)年龄:按年龄段划分为"6 岁以下""6 ~ 7 岁""7 ~ 12 岁"和"13 岁及以上";(2)样本特征:分为"普通被试"和"特殊被试"。特殊被试包括低阅读能力群体、阅读障碍群体、言语或语音能力缺陷群体和学习障碍群体;(3)训练内容:参照 Murphy Odo(2021)的分类标准,根据训练项目所聚焦的内容将其分为三类,分别是"语音意识训练""英语拼读法训练"和"二者相结合的训练"。语音意识训练指在语音意识层面(如音位水平、押韵水平、首音 – 韵脚水平)对语音加工能力(如声音删除技能、替换技能、合成技能)进行操控的训练。英语拼读法训练指教授字母或字母组合与其发音之间的对应关系的训练。二者相结合的训练则包含以上两种训练内容;(4)训练时长:分为"> 12 周""≤ 12 周"和"不清楚"(文献内未明确报告,也无法推算,下同);(5)训练次数:分为"> 60 次""≤ 30 次""30 ~ 60 次"和"不清楚";(6)训练形式:分为"一对一""小组"(人数 ≤ 8)"大组"(人数 > 8)和"混合两种及两种以上形式"。

2.3.3　异质性检验和发表偏差检验

使用 Q 检验来检测效应量异质性是否显著,使用 I^2(异质性可以解释总体变异的比例)进一步检测其异质的程度,I^2 = 0% 为无异质性;I^2 = 25% 为低异质性;I^2 = 50% 为中度异质性;I^2 = 75% 为高异质性(Higgins et al., 2003)。异质性显著且程度高则提示有必要进行调节效应分析。发表偏差通过漏斗图(Funnel Plot)、失安全系数(Classic Fail – safe N 值)、Egger's 线性回归法(Egger et al., 1997)和剪补法(Trim and Fill)进行检验。

3　结果

首先对中英母语者在英语语音意识训练中的整体语音意识效应量和整体词汇朗读效应量进行估计,并对这些效应的异质性和发表偏差进行检验。其次,通过调节变量分析,考察中英母语者在总体语音意识和总体词汇朗读上的训练效果差异。然后,进一步分析他们在英语音位意识、音节意识、押韵意识、真词朗读和假词拼读上的训练效果差异。最后,检验这些效果是否受年龄、训练内容和训练强度等因素的影响,并对这些因素的交互效应进行分析。

3.1　中英母语者语音意识训练的整体效应量估计、异质性检验和发表偏差检验

在语音意识结果指标中,根据标准化残差大于 ±3.29 的标准(Takacs & Kassai, 2019)确定了一个极端值,来自 Castle 等人(1994)的研究一。剔除该极值后,剩余的 81 篇研究中包括了 95 个独立样本的效应量。随机效应模型分析表明,总体语音意识的平均估计效应量为 g = 0.74, 95% CI [0.63, 0.85], z = 13.19, p < 0.001。语音意识的异质性检验结果显著,$Q(94)$ = 389.68, p < 0.001, I^2 = 75.88,表明效应量的大小存在较大的异质性,进一步证实了使用随机效应模型进行分析的合理性。

发表偏差的检验结果如下:漏斗图(图 2)显示,语音意识相关文献分布相对均匀。失安全系数检验表明,需要纳入超过 15980 篇研究,总效应量才可能不显著,暗示不存在发表偏差。Egger's 检验揭示了一定程度的发表偏差,b intercept = 1.41, 95% CI [0.44, 2.38], $t(93)$ = 2.89, p = 0.005。综合上述检验结果,两项结果表明针对语音意识的元分析不存在发表偏差,一项提示存在发表偏差。因此,采用 Duval 和 Tweedie(2000)的剪补法进一步评估发

表偏差的影响。剪补后,随机效应模型得到的总效应仍然显著。综上,虽然可能存在轻微发表偏差,但元分析的主要结论仍然有效。

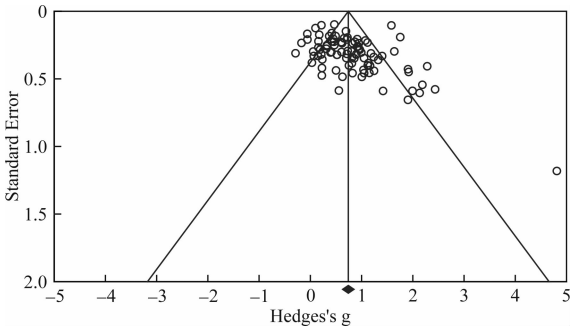

图 2　语音意识漏斗图

词汇朗读效应量分析中识别出一个极端值(Carson, 2020)。剔除后,65 篇研究包括 80 个独立样本。随机效应模型分析表明,总体词汇朗读的效应量为 $g = 0.54$, 95% CI [0.45, 0.63], $z = 11.88$, $p < 0.001$。异质性显著,$Q(79) = 212.44$, $p < 0.001$, $I^2 = 62.81$。

漏斗图(图 3)显示词汇朗读相关文献分布均匀。失安全系数检验表明,需要纳入超过 7632 篇的研究文献才可能使总效应量不显著,暗示发表偏差可能性低。Egger's 检验未发现显著偏差,b intercept = 0.81, 95% CI [−0.06, 1.68], $t(78) = 1.86$, $p = 0.070$。

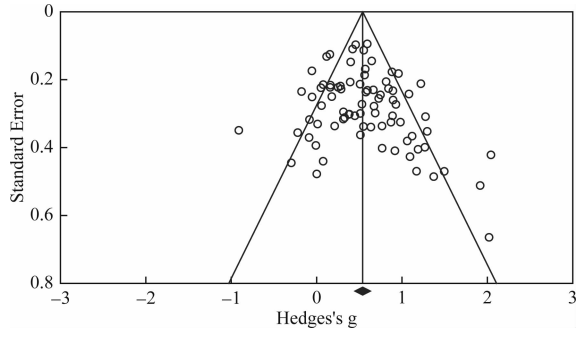

图 3　词汇朗读漏斗图

3.2　中英母语者语音意识训练效果对比分析

应用混合效应模型和分类调节变量分析,发现在整体语音意识及其子成分音位意识上,汉语母语者的训练效果显著低于英语母语者($p < 0.05$),见表 1。两者在音节意识和押韵意识上均有显著训练

表 1　分类型调节变量分析(混合效应模型)

因变量		调节变量	k	样本量	g	95% CI	Q	p
语音意识	综合	母语背景	95	7135	0.71	[0.61, 0.81]	4.45	0.035 *
		汉语	16	1117	0.56 ***	[0.38, 0.73]		
		英语	79	6018	0.79 ***	[0.66, 0.92]		
	音位意识	母语背景	74	4868	0.86 ***	[0.72, 0.99]	5.05	0.025 *
		汉语	14	1000	0.63 ***	[0.37, 0.87]		
		英语	60	3868	0.97 ***	[0.80, 1.14]		
	音节意识	母语背景	10	1043	0.59 ***	[0.39, 0.79]	0.12	0.726
		汉语	3	219	0.62 ***	[0.35, 0.89]		
		英语	7	824	0.55 **	[0.24, 0.86]		
	押韵意识	母语背景	36	2616	0.60 ***	[0.44, 0.75]	1.17	0.279
		汉语	4	257	0.77 ***	[0.42, 1.12]		
		英语	32	2359	0.56 ***	[0.38, 0.73]		
词汇朗读	综合	母语背景	80	6457	0.54 ***	[0.45, 0.63]	0.62	0.433
		汉语	13	931	0.46 ***	[0.25, 0.68]		
		英语	67	5526	0.56 ***	[0.46, 0.66]		
	真词阅读	母语背景	67	5541	0.44 ***	[0.34, 0.54]	0.86	0.353
		汉语	11	753	0.35 **	[0.15, 0.56]		
		英语	56	4788	0.46 ***	[0.35, 0.58]		
	假词阅读	母语背景	46	3530	0.74 ***	[0.60, 0.89]	0.44	0.509
		汉语	6	490	0.62 **	[0.22, 1.02]		
		英语	40	3040	0.76 ***	[0.60, 0.92]		

注:k 代表独立效果量的个数,Q 代表不同亚组水平的组间一致性检验统计量,95% CI 为结果变量对应的效果量 g 的 95% 置信区间; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$。

效果($p < 0.01$),但组间差异不显著。值得指出的是,汉语母语者在押韵意识上的效应量较高,$g = 0.77$, $p < 0.001$;在音节意识上呈现出中等的效应量,$g = 0.62$, $p < 0.001$。此外,在整体词汇朗读及其子成分(真词朗读和假词拼读)上,中英母语者的组间差异均不显著。

3.3　母语类型与其它影响因素的交互作用分析

使用混合效应模型考察调节变量对中英母语者语音意识训练效果的影响,分析了母语类型与年龄、样本特征、训练内容、训练时长、训练次数和训练形式六个交互项的影响。由于中英母语者在语音意识结果上差异显著,因此只进一步分析该指标上母语类型与其它影响因素的交互作用。

表 2 显示,年龄对语音意识的干预效果呈边缘显著,$Q(5) = 11.08$, $p = 0.050$。除 6 ~ 7 岁的汉语母语者的训练效果呈边缘显著($p = 0.084$)外,其它各年龄段中英母语者的训练效果均显著($p < 0.01$)。对于英语母语者,6 岁以下群体的训练效果量最大($g = 0.86$),且显著高于 7 ~ 12 岁群体的训练效果量,$Q(1) = 3.59$, $p = 0.058$。此外,样本特征也对干预效果有显著影响,$Q(2) = 7.15$, $p = 0.028$。英语母语普通被试的效果量显著高于特殊被试,$Q(1) = 4.68$, $p = 0.030$,也显著高于汉语母语普通被试,$Q(1) = 6.57$, $p = 0.010$。

表 2　母语类型与其它分类型变量的交互作用检验(语音意识)

调节变量	k	样本量	g	95% CI	异质性		
					Q	df	p
母语类型 × 年龄	93	6996			11.08	5	0.050 +
汉语母语者—6 岁以下	2	—	—	—	—	—	—
英语母语者—6 岁以下	54	4667	0.86 ***	[0.69, 1.02]			
汉语母语者—6 - 7 岁	5	300	0.45 +	[-0.06, 0.95]	0.91	1	0.339
英语母语者—6 - 7 岁	18	796	0.72 ***	[0.48, 0.95]			
汉语母语者—7 - 12 岁	5	334	0.47 ***	[0.27, 0.66]	0.12	1	0.729
英语母语者—7 - 12 岁	7	555	0.53 **	[0.23,0.83]			
汉语母语者—13 岁及以上	4	344	0.65 **	[0.24, 1.06]	—	—	—
英语母语者—13 岁及以上	0	—	—	—			
母语类型 × 样本特征	93	7026			7.15	2	0.028 *
汉语母语者—普通被试	14	1008	0.59 ***	[0.43, 0.75]	6.57	1	0.010 *
英语母语者—普通被试	41	3664	0.91 ***	[0.72, 1.10]			
汉语母语者—特殊被试	2	—	—	—	—	—	—
英语母语者—特殊被试	38	2354	0.64 ***	[0.49, 0.79]			
母语类型 × 训练内容	95	7135			10.48	5	0.063 +
汉语母语者—语音意识	8	684	0.62 ***	[0.37, 0.88]	3.11	1	0.078 +
英语母语者—语音意识	27	1439	0.95 ***	[0.69, 1.21]			
汉语母语者—拼读法	4	191	0.33 +	[-0.002, 0.66]	0.47	1	0.481
英语母语者—拼读法	6	319	0.50 **	[0.17, 0.83]			
汉语母语者—语音意识与拼读法	4	242	0.67 ***	[0.36, 0.99]	0.14	1	0.712
英语母语者—语音意识与拼读法	46	4260	0.74 ***	[0.59, 0.89]			
母语类型 × 训练时长	94	7089			10.03	3	0.018 *
汉语母语者—≤12 周	13	907	0.57 ***	[0.35, 0.79]	5.22	1	0.022 *
英语母语者—≤12 周	50	3342	0.91 ***	[0.72, 1.10]			
汉语母语者—>12 周	3	210	0.49 ***	[0.23, 0.75]	0.46	1	0.498

续表 2

调节变量	k	样本量	g	95% CI	异质性		
					Q	df	p
英语母语者—>12 周	28	2630	0.59***	[0.45, 0.73]			
汉语母语者—不清楚	0	—	—	—	—	—	—
英语母语者—不清楚	1	—	—	—			—
母语类型×训练次数	91	6882			9.76	4	0.045*
汉语母语者—≤30 次	11	838	0.56***	[0.30, 0.81]	3.80	1	0.051+
英语母语者—≤30 次	40	2113	0.87***	[0.68, 1.07]			
汉语母语者—30–60 次	3	120	0.49***	[0.23, 0.75]	3.03	1	0.082+
英语母语者—30–60 次	23	2006	0.81***	[0.56, 1.07]			
汉语母语者—>60 次	1	—	—	—	—	—	—
英语母语者—>60 次	14	1805	0.55***	[0.36, 0.74]			
汉语母语者—不清楚	1	—	—	—	—	—	—
英语母语者—不清楚	2	—	—	—			
母语类型×训练形式	95	7135			10.08	5	0.073+
汉语母语者—一对一	0	—	—	—	—	—	—
英语母语者—一对一	21	1468	0.80***	[0.50, 1.10]			
汉语母语者—小组	3	234	0.37	[−0.38, 1.12]	1.75	1	0.186
英语母语者—小组	40	2674	0.89***	[0.70, 1.08]			
汉语母语者—大组	13	883	0.60***	[0.46, 0.74]	0.01	1	0.924
英语母语者—大组	9	1156	0.59***	[0.40, 0.78]			
汉语母语者—混合	0	—	—	—	—	—	—
英语母语者—混合	9	720	0.48**	[0.21, 0.76]			

注：k 代表独立效果量的个数，Q 代表不同亚组水平的组间一致性检验统计量，95% CI 为结果变量对应的效果量 g 的 95% 置信区间；当 $k < 3$ 时或存在空值时，不纳入分析，用破折号“—”标注；$^{***}p < 0.001$，$^{**}p < 0.01$，$^{*}p < 0.05$，$^{+}p < 0.1$。

训练内容的干预效果呈边缘显著，$Q(5) = 10.48$，$p = 0.063$。除了汉语母语者接受拼读法训练的效果呈边缘显著（$p = 0.052$）外，中英母语者接受其它类型的训练效果均显著（$p < 0.01$）。仅接受语音意识训练项目的英语母语者训练效果显著高于仅接受拼读法训练的英语母语者，$Q(2) = 4.48$，$p = 0.034$。无论是汉语母语者还是英语母语者，仅接受拼读法训练的效果量均为最低。

训练时长的干预效果显著，$Q(3) = 10.03$，$p = 0.018$。训练时长 ≤ 12 周时，英语母语者效果量显著高于汉语母语者，$Q(1) = 5.22$，$p = 0.022$；当训练时长 > 12 周时，二者效果量无显著差异。训练次数的干预效果也显著，$Q(4) = 9.76$，$p = 0.045$。英语母语者的训练次数 > 60 次的训练效果显著低于其接受 ≤ 30 次的训练效果，$Q(1) = 5.63$，$p = 0.018$。训练形式的干预效果呈边缘显著，$Q(4) = 9.11$，$p = 0.073$。英语母语者接受小组训练的效果显著高于大组训练，$Q(1) = 4.92$，$p = 0.026$，也显著高于混合训练，$Q(1) = 5.83$，$p = 0.016$。

4 讨论

4.1 音–义连接经验的缺乏可能限制了汉语母语者在语音意识训练中的效果

语音意识训练是提高语言学习者英语读写能力的核心环节。尽管在 150 年前英语母语者已经开始实施语音意识训练（Monroe, 1877）并证明了其有效性，但对于汉语母语者，英语语音意识训练研究仍然是一个新兴领域。近二十年来，我国英语学习者开始更广泛地采用这种训练方法。本研究综合了过去三十多年的文献，比较中英母语者的英语语音意识训练效果。结果显示，英语母语者在语音意识上的提升程度显著高于汉语母语者，原因可能在于汉语母语者缺乏单词的音–义连接经验。本研究的部分调节变量分析结果进一步支持了这一假设。

首先,所有年龄段的中英母语者在语音意识训练中均表现出显著效果。对于汉语母语者,6～7 岁群体效果量最低(g = 0.45),而 13 岁及以上群体效果量最大(g = 0.65)。这一结果支持了我们的假设:低龄汉语母语者的训练效果较差,可能是因为他们缺乏单词的音－义连接经验。然而,随着词汇量的增长,这种缺乏音－义连接经验的负面影响逐渐减弱。相反,对于英语母语者,6 岁以下群体的训练效果量最大,且显著高于 7～12 岁群体的训练效果量。这可能因为英语母语儿童在短时间内达到显著训练效果,接近其潜在的上限(或称为“天花板效应”)。而汉语母语者在各年龄段的语音意识水平普遍低于英语母语者(潘颖, 盖笑松, 2013),他们的提升空间更大,因此受益时间窗口更长。本研究结果与 Bus 和 Van Ijzendoorn(1999)和 Ehri 等人(2001)的研究结论一致,这些研究均发现拼音文字母语者的早期语音意识训练效果更佳。Murphy Odo(2021)发现,以英语为外语的中学生在英语真词朗读上的训练效果超过了小学生。Jiang, Gai, Üstün－Yavuz 等人(2023)的元分析也指出,高年级汉语母语小学生的语音意识训练效果明显优于低年级学生。值得注意的是,由于 6 岁以下汉语母语者和 13 岁以上英语母语者的研究数目不足,未能分析这些年龄群体的训练效果。在解读结果时,应将这一限制性因素考虑在内。

其次,接受不同类型训练的中英母语者在语音意识和词汇朗读上均有显著提升。英语母语者仅接受语音意识训练项目时效果最佳,汉语母语者仅接受自然拼读法训练时效果最差。这与我们的假设相符,汉语母语者缺乏音－义连接知识,即使学习了拼读法规则也难以通过语音提取语义,降低了其语音意识习得效率。

最后,英语母语普通被试的训练效果量显著高于英语母语特殊被试和汉语母语普通被试。这暗示能力较弱的群体在接受英语语音意识训练时面临更多挑战,需要更有针对性的应对策略。此外,关于汉语母语特殊群体的训练研究目前较少,提示对这一群体的关注需加强。

4.2　汉语母语者在英语音位意识方面存在最突出困难

英语母语者的音位意识训练效果显著优于汉语母语者。然而,二者在音节意识和押韵意识上无显著差异。如前文所述,这可能与中英两种文字书写系统的根本差异有关。由于汉字属于象形文字,汉语母语者在单词音位层面的加工可能更加困难。以往的研究也支持这一观点,发现汉语母语儿童和成人在音位意识上的表现与同龄的英语母语者相比明显落后(Bialystok et al., 2005; Yeong et al., 2017)。潘颖等人(2019)的元分析发现,中国英语学习者的音位意识与阅读成绩的相关性最显著。在挪威语和西班牙语等拼音文字的研究中也发现,音位意识与阅读理解的相关性超过了音节意识和首音－韵脚意识(Engen & Høien, 2002; Míguez－Álvarez et al., 2022)。这突显了音位意识在提高阅读能力中的核心作用。因此,未来针对汉语母语者的英语语音意识教学应将重点聚焦于音位意识教学。

此外,英语母语者的语音意识整体训练效果显著优于汉语母语者,但在词汇朗读上,两者无显著差异。这表明与词汇朗读相比,语音意识的发展对汉语母语者的学习构成了更大的挑战。这可能因为词汇朗读不仅依赖语音加工,还涉及正字法技能和词汇知识等复杂认知过程(Deacon, 2012)。汉语母语者在阅读汉字时较为依赖视觉和语义信息加工(Leck et al., 1995),这种经验可能有助于他们在词汇朗读中的整体表现。大量研究也证实了视觉－正字法技能在汉语母语者的英语单词朗读和阅读理解中扮演着重要角色(Ho & Bryant, 1999; Tong & McBride－Chang, 2010)。

4.3　单纯增加训练强度无助于训练效果的提升

一方面,对于英语母语者,短期和低频次的训练效果更佳。这可能是因为英语母语者已经具备较高的基础,短期的集中训练能激发其学习兴趣和动力,但过多的重复可能会导致学习动机下降。另一方面,对于汉语母语者,训练时长和次数对训练效果没有显著影响。这表明,汉语母语者在英语语音意识上可能面临更多挑战,仅仅增加训练时长和次数并不能有效地解决问题。为了提高他们的学习效果,更为关键的是提高训练的质量和针对性。可以考虑采用更符合他们学习背景和经验的教学策略,例如实施前置词汇音－义连接训练。

最后,训练形式的干预效果也显著。英语母语者在小组训练中的表现优于大组训练。这可能源于小组环境提供更多讨论、实践机会和个性化指导,有利于语言技能的提升。但多数汉语母语者采用大组教学,针对其它训练形式的研究仍有限。因此,为了确定英语母语者的研究结果是否适用于汉语母语者,需进行更多实证研究。

4.4 理论和实践意义

本研究对第二语言教学理论和实践具有重要意义。首先,它提供了有力证据,表明汉语母语者的英语语音意识训练效果显著低于英语母语者。这一发现揭示了汉语母语者在外语语音教学中面临挑战。其次,研究发现,低龄汉语母语者在英语语音意识训练中效果较弱,且单纯接受自然拼读教学或仅增加训练强度对于提升其语音意识水平的作用有限。这可能与汉语母语者缺乏音 - 义连接经验有关。这些结果为理解语言习得的复杂性提供了新视角,并强调考虑学习者特定语言背景和学习经验的重要性。此外,本研究扩展了 Jiang, Gai, Üstün - Yavuz 等人(2023)的元分析,通过增加英语母语群体样本并纳入经过同行评审的研究,加强了研究的代表性和可靠性。最后,研究揭示了现有理论框架下的局限,并指出未来理论发展需要关注的领域,如增加针对汉语母语特殊被试的研究、关注 6 岁以下儿童的训练、探索小组教学形式,以及增加对长期效果的检验。

本研究提出了针对第二语言教学的具体实践建议,包括加强英语音位意识教学。研究提示中国英语教师和研究者在推广英语语音意识训练时,不能简单模仿西方策略。相反,他们应结合汉语母语者的特殊语言背景,对训练方法进行本土化调整,例如在训练初期加强音 - 义连接的建立。这一建议为缩小中英母语者的语音意识差距提供了重要指导,对优化第二语言教学途径具有实际意义。

4.5 不足与展望

本研究存在几个局限,为未来研究提供了改进的方向:(1)样本不均衡:中英母语者文献数量的不均衡可能影响调节效应的稳健性,这揭示了需扩大汉语母语者样本的必要性;(2)亚组数量不足:特定亚组的数量有限,限制了对潜在调节变量的充分检验和分析。例如,6 岁以下汉语母语者的研究仅有两项,而 13 岁及以上英语母语者的研究则完全缺失。这导致了年龄组别划分的不均衡,可能影响某些年龄段结果的代表性。因此,目前结论需谨慎解释。未来应增加特定年龄组的研究以提高结果的准确性和广泛性;(3)“音 - 义”联结的考察限制:关于汉语母语者英语语音意识训练中涉及语义教学的研究数目不足,因此本研究未能直接评估语义因素的影响,未来需要更多的实证研究来验证音 - 义连接的作用;(4)长期效果未检验:只有一项针对汉语母语者的长期效果研究,因此没有比较中英母语者语音意识训练的持续效果。未来研究应考虑长期效果的评估,以全面了解训练的持久影响;(5)发表偏差的风险:本研究没有纳入未发表的灰色文献,可能存在发表偏差。虽然发表偏差检验表明这一偏差并未显著影响研究结果,但在解释结果时应保持谨慎;(6)效应量的观察:本元分析中,部分研究的效应量高于常规水平。根据 Cohen(1988),效应量大小可用 0.8、0.5 和 0.2 来表示大、中和小效应。然而,根据 Sawilowsky(2009)提出的新规则(见上文),高效应量的出现是可接受的。在解释研究结果时,应考虑其潜在影响。建议未来研究进一步探究高效应量产生的原因及其背后的教学机制,以深入地理解影响训练效果的因素,并据此优化教学策略。

5 结论

(1)在总体语音意识及音位意识子成分上,英语母语者的训练效果显著优于汉语母语者,但在音节意识、押韵意识和词汇朗读上,两者无显著差异。

(2)英语母语者最佳受益时间窗口为 6 岁以下,汉语母语者最佳受益时间窗口为 13 岁及以上。

(3)单纯增加训练强度无助于汉语母语者语音意识训练效果的提升。

(4)样本特征、训练内容和训练形式均影响中英母语者语音意识训练效果。

参考文献:

* 为纳入元分析的文献

* Ahmed, H., Wilson, A., Mead, N., Noble, H., Richardson, U., Wolpert, M. A., & Goswami, U. (2020). An evaluation of the efficacy of GraphoGame rime for promoting English phonics knowledge in poor readers. *Frontiers in Education*, *5*, 132. https://doi.org/10.3389/feduc.2020.00132

* Allor, J. H., Fuchs, D., & Mathes, P. G. (2001). Do students with and without lexical retrieval weaknesses respond differently to instruction? *Journal of Learning Disabilities*, *34*(3), 264 - 275.

Armbruster, B. B., Lehr, F., Osborn, J., & Adler, C. R. (2009). *Put reading first: The research building blocks of reading instruction: Kindergarten through grade 3* (3rd ed.). Washington, DC: National Institute for Literacy.

Aromataris, E., & Munn, Z. (2020). *JBI Manual for Evidence Synthesis.* Retrieved May 16, 2023, from https://synthesismanual.jbi.global

* Bailet, L. L., Repper, K., Murphy, S., Piasta, S., & Zettler - Greeley, C. (2013). Emergent literacy intervention for prekindergarteners at risk for reading failure. *Journal of Learning Disabilities*, *64*(2), 133 - 153.

* Ball, E. W., & Blachman, B. A. (1991). Does phoneme aware-

ness training in kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly*, *26*(1), 49 – 66.

* Barker, T. A., & Torgesen, J. K. (1995). An evaluation of computer – assisted instruction in phonological awareness with below average readers. *Journal of Educational Computing Research*, *13*(1), 89 – 103.

* Barron, R. W., Golden, J. O., Seldon, D. M., Tait, C. F., Marmurek, H. H. C., & Haines, L. P. (1992). Teaching prereading skills with a talking computer. *Reading and Writing*, *4*(2), 107 – 144.

* Bhat, P., Griffin, C. C., & Sindelar, P. T. (2003). Phonological awareness instruction for middle school students with learning disabilities. *Learning Disability Quarterly*, *26*(2), 73 – 87.

* Bhide, A., Power, A., & Goswami, U. (2013). A rhythmic musical intervention for poor readers: A comparison of efficacy with a letter – based intervention. *Mind, Brain, and Education*, *7*(2), 113 – 123.

Bialystok, E., McBride – Chang, C., & Luk, G. (2005). Bilingualism, language proficiency, and learning to read in two writing systems. *Journal of Educational Psychology*, *97*(4), 580 – 590.

* Blachman, B. A., Tangel, D. M., Ball, E. W., Black, R., & McGraw, C. K. (1999). Developing phonological awareness and word recognition skills: A two – year intervention with low – income, inner – city children. *Reading and Writing*, *11*(3), 239 – 273.

* Bond, C. L., Ross, S. M., Smith, L. J., & Nunnery, J. A. (1995). The effects of the sing, spell, read and write program on reading achievement of beginning readers. *Reading Research and Instruction*, *35*(2), 122 – 141.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). When does it make sense to perform a meta – analysis? In M. Borenstein, L. V. Hedges, J. P. T. Higgins, & H. R. Rothstein (Eds.), *Introduction to meta – analysis* (pp. 357 – 364). Hoboken, NJ: Wiley.

* Boyer, N., & Ehri, L. C. (2011). Contribution of phonemic segmentation instruction with letters and articulation pictures to word reading and spelling in beginners. *Scientific Studies of Reading*, *15*(5), 440 – 470.

* Brady, S., Fowler, A., Stone, B., & Winbury, N. (1994). Training phonological awareness: A study with inner – city kindergarten children. *Annals of Dyslexia*, *44*(1), 26 – 59.

Branum – Martin, L., Tao, S., Garnaat, S., Bunta, F., & Francis, D. J. (2012). Meta – analysis of bilingual phonological awareness: Language, age, and psycholinguistic grain size. *Journal of Educational Psychology*, *104*(4), 932 – 944.

* Brennan, F., & Ireson, J. (1997). Training phonological awareness: A study to evaluate the effects of a program of metalinguistic games in kindergarten. *Reading and Writing*, *9*(4), 241 – 263.

Bus, A. G., & Van Ijzendoorn, M. H. (1999). Phonological awareness and early reading: A meta – analysis of experimental training studies. *Journal of Educational Psychology*, *91*(3), 403 – 414.

* Callcott, D., Hammond, L., & Hill, S. (2015). The synergistic effect of teaching a combined explicit movement and phonological awareness program to preschool aged students. *Early Childhood Education Journal*, *43*(3), 201 – 211.

Card, N. A. (2015). *Applied meta – analysis for social science research*. New York: Guilford Publications.

* Carson, K. L. (2020). Can an app a day keep illiteracy away? Piloting the efficacy of Reading Doctor apps for preschoolers with developmental language disorder. *International Journal of Speech – Language Pathology*, *22*(4), 454 – 465.

* Carson, K. L., Bayetto, A. E., & Roberts, A. F. B. (2019). Effectiveness of preschool – wide teacher – implemented phoneme awareness and letter – sound knowledge instruction on code – based school – entry reading readiness. *Communication Disorders Quarterly*, *41*(1), 42 – 53.

* Carson, K. L., Gillon, G. T., & Boustead, T. M. (2013). Classroom phonological awareness instruction and literacy outcomes in the first year of school. *Language, Speech, and Hearing Services in Schools*, *44*(2), 147 – 160.

* Castle, J. M., Riach, J., & Nicholson, T. (1994). Getting off to a better start in reading and spelling: The effects of phonemic awareness instruction within a whole language program. *Journal of Educational Psychology*, *86*(3), 350 – 359.

* Chera, P., & Wood, C. (2003). Animated multimedia "talking books" can promote phonological awareness in children beginning to read. *Learning and Instruction*, *13*(1), 33 – 52.

* Cheung, H. (1999). Improving phonological awareness and word reading in a later learned alphabetic script. *Cognition*, *70*(1), 1 – 26.

* Christensen, C. A., & Bowey, J. A. (2005). The efficacy of orthographic rime, grapheme – phoneme correspondence, and implicit phonics approaches to teaching decoding skills. *Scientific Studies of Reading*, *9*(4), 327 – 349.

Chung, K. K. H., & Lam, C. B. (2020). Cognitive – linguistic skills underlying word reading and spelling difficulties in Chinese adolescents with dyslexia. *Journal of Learning Disabilities*, *53*(1), 48 – 59.

Cohen, J. (1988). Statistical power analysis for the behavioural science. *Technometrics*, *31*(4), 499 – 500.

Coltheart, M. (2005). Modelling reading: The dual route approach. In M. Snowling & C. Hulme (Eds.), *The science of reading: A handbook* (pp. 6 – 23). Oxford: Blackwell.

* Connelly, V., Johnston, R., & Thompson, G. B. (2001). The effect of phonics instruction on the reading comprehension of beginning readers. *Reading and Writing*, *14*, 423 – 457.

* Cunningham, A. E. (1990). Explicit versus implicit instruction in phonemic awareness. *Journal of Experimental Child Psychology*, *50*(3), 429 – 444.

* Davidson, M., & Jenkins, J. R. (1994). Effects of phonemic processes on word reading and spelling. *Journal of Educational Research*, *87*(3), 148 – 157.

Deacon, S. H. (2012). Sounds, letters and meanings: The independent influences of phonological, morphological and orthographic skills on

early word reading accuracy. *Journal of Research in Reading*, *35*(4), 456 – 475.

* Deavers, R., Solity, J., & Kerfoot, S. (2000). The effect of instruction on early nonword reading strategies. *Journal of Research in Reading*, *23*(3), 267 – 286.

* Denne, M., Langdown, N., Pring, T., & Roy, P. (2005). Treating children with expressive phonological disorders: Does phonological awareness therapy work in the clinic? *International Journal of Language and Communication Disorders*, *40*(4), 493 – 504.

* Dussling, T. M. (2020). The impact of an early reading intervention with English language learners and native – English – speaking children. *Reading Psychology*, *41*(4), 241 – 263.

Duval, S., & Tweedie, R. (2000). Trim and fill: A simple funnel – plot – based method of testing and adjusting for publication bias in meta – analysis. *Biometrics*, *56*(2), 455 – 463.

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta – analysis detected by a simple, graphical test. *British Medical Journal*, *315*(7109), 629 – 634.

Ehri, L. C., Nunes, S. R., Willows, D. M., Schuster, B. V., Yaghoub – Zadeh, Z., & Shanahan, T. (2001). Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's meta – analysis. *Reading Research Quarterly*, *36*(3), 250 – 287.

* Elliott, J., Arthurs, J., & Williams, R. (2000). Volunteer support in the primary classroom: The long – term impact of one initiative upon children's reading performance. *British Educational Research Journal*, *34*(3), 227 – 244.

Engen, L., & Høien, T. (2002). Phonological skills and reading comprehension. *Reading and Writing*, *15*(7 – 8), 613 – 631.

* Fuchs, D., Fuchs, L. S., Thompson, A., Otaiba, S. A., Yen, L., Yang, N. J., … O'Connor, R. E. (2002). Exploring the importance of reading programs for kindergartners with disabilities in mainstream classrooms. *Exceptional Children*, *68*(3), 295 – 311.

* Gettinger, M., & Stoiber, K. C. (2018). Effects of shared book reading focusing on letters and sounds versus vocabulary for low – income prekindergarten children. *Preventing School Failure: Alternative Education for Children and Youth*, *62*(3), 149 – 160.

* Gillon, G. T. (2000). The efficacy of phonological awareness intervention for children with spoken language impairment. *Language, Speech, and Hearing Services in Schools*, *31*(2), 126 – 141.

* Grawburg, M., & Rvachew, S. (2007). Phonological awareness intervention for preschoolers with speech and sound disorders. *Canadian Journal of Speech – Language Pathology and Audiology*, *31*(1), 19 – 26.

* Harrison, E., Wood, C., Holliman, A. J., & Vousden, J. I. (2018). The immediate and longer – term effectiveness of a speech – rhythm – based reading intervention for beginning readers. *Journal of Research in Reading*, *41*(1), 220 – 241.

* Hatcher, P. J., Hulme, C., & Snowling, M. J. (2004). Explicit phoneme training combined with phonic reading instruction helps young children at risk of reading failure. *Journal of Child Psychology and Psychiatry*, *45*(2), 338 – 358.

* Hesketh, A., Dima, E., & Nelson, V. (2007). Teaching phoneme awareness to pre – literate children with speech disorder: A randomized controlled trial. *International Journal of Language and Communication Disorders*, *42*(3), 251 – 271.

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta – analyses. *BMJ: British Medical Journal*, *327*(7414), 557 – 560.

* Hindson, B., Byrne, B., Fielding – Barnsley, R., Newman, C., Hine, D. W., & Shankweiler, D. (2005). Assessment and early instruction of preschool children at risk for reading disability. *Journal of Educational Psychology*, *97*(4), 687 – 704.

Ho, C. S. – H., & Bryant, P. (1999). Different visual skills are important in learning to read English and Chinese. *Educational and Child Psychology*, *16*(3), 4 – 14.

* Jeffes, B. (2016). Raising the reading skills of secondary – age students with severe and persistent reading difficulties: Evaluation of the efficacy and implementation of a phonics – based intervention programme. *Educational Psychology in Practice*, *32*(1), 73 – 84.

* Jenkins, J. R., Peyton, J. A., Sanders, E. A., & Vadasy, P. F. (2004). Effects of reading decodable texts in supplemental first – grade tutoring. *Scientific Studies of Reading*, *8*(1), 53 – 85.

Jiang, Y., Gai, X., Han, X., & Cui, Y. (2023). English phonics instruction for native Chinese speakers: Limiting factors and tailoring strategies. *Irish Educational Studies*, *42*(4), 901 – 910.

Jiang, Y., Gai, X., Üstün – Yavuz, M. S., Zhang, M., & Thomson, J. M. (2023). A meta – analysis of training effects on English phonological awareness and reading in native Chinese speakers. *PsyCh Journal*, *12*(5), 599 – 617.

* Johnston, R. S., & Watson, J. E. (2004). Accelerating the development of reading, spelling and phonemic awareness skills in initial readers. *Reading and Writing*, *17*(4), 327 – 357.

Jongejan, W., Verhoeven, L., & Siegel, L. S. (2007). Predictors of reading and spelling abilities in first – and second – language learners. *Journal of Educational Psychology*, *99*(4), 835 – 851.

* Joseph, L. M. (1999). Developing first graders' phonemic awareness, word identification and spelling: A comparison of two contemporary phonic instructional approaches. *Reading Research and Instruction*, *39*(2), 160 – 169.

* Kelly, C., Leitão, S., Smith – Lock, K., & Heritage, B. (2019). The effectiveness of a classroom – based phonological awareness program for 4 – 5 – year – olds. *International Journal of Speech – Language Pathology*, *21*(1), 101 – 113.

* Kerins, M. R., Trotter, D., & Schoenbrodt, L. (2010). Effects of a Tier 2 intervention on literacy measures: Lessons learned. *Child Language Teaching and Therapy*, *26*(3), 287 – 302.

* Lai, Y., Tsai, H., & Yu, P. (2009). A multimedia English learning system using HMMs to improve phonemic awareness for English learning. *Educational Technology & Society*, *12*(3), 266 – 281.

* Laing, S. P., & Espeland, W. (2005). Low intensity phonological awareness training in a preschool classroom for children with communi-

cation impairments. *Journal of Communication Disorders*, *38*(1), 65 – 82.

Leck, K. J., Weekes, B. S., & Chen, M. J. (1995). Visual and phonological pathways to the lexicon: Evidence from Chinese readers. *Memory and Cognition*, *23*(4), 468 – 476.

* Lennon, J. E., & Slesinski, C. (1999). Early intervention in reading: Results of a screening and intervention program for kindergarten students. *School Psychology Review*, *28*(3), 353 – 364.

* Li, S., & Woore, R. (2021). The effects of phonics instruction on L2 phonological decoding and vocabulary learning: An experimental study of Chinese EFL learners. *System*, *103*(11), 102677. https://doi.org/10.1016/j.system.2021.102677

* Li, Y.S., & Chen, S. H. (2016). Relative effectiveness of phonological and morphological awareness training on L2 word reading in EFL children. *System*, *60*, 93 – 104.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., … Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta – analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine*, *6*(7), e1000100. https://doi.org/10.1371/journal.pmed.1000100

* Loeb, D. F., Gillam, R. B., Hoffman, L., Brandel, J., & Marquis, J. (2009). The effects of Fast ForWord language on the phonemic awareness and reading skills of school – age children with language impairments and poor reading skills. *American Journal of Speech – Language Pathology*, *18*(4), 376 – 387.

* Lovett, M. W., Borden, S. L., Lacerenza, L., Frijters, J. C., Steinbach, K. A., & De Palma, M. (2000). Components of effective remediation for developmental reading disabilities: Combining phonological and strategy – based instruction to improve outcomes. *Journal of Educational Psychology*, *92*(2), 263 – 283.

* Lovett, M. W., Warren – Chaplin, P. M., Ransby, M. J., & Borden, S. L. (1990). Training the word recognition skills of reading disabled children: Treatment and transfer effects. *Journal of Educational Psychology*, *82*(4), 769 – 780.

* Macaruso, P., & Rodman, A. (2011). Efficacy of computer – assisted instruction for the development of early literacy skills in young children. *Reading Psychology*, *32*(2), 172 – 196.

* Marchand – Martella, N. E., Martella, R. C., Nelson, J. R., Waterbury, L., Shelley, S. A., Cleanthous, C., & Hatfield, D. (2002). Implementation of the sound partners reading program. *Journal of Behavioral Education*, *11*(2), 117 – 130.

* Martin, M. E., & Byrne, B. (2002). Teaching children to recognise rhyme does not directly promote phonemic awareness. *British Journal of Educational Psychology*, *72*(4), 561 – 572.

McBride – Chang, C., Bialystok, E., Chong, K. K. Y., & Li, Y. (2004). Levels of phonological awareness in three cultures. *Journal of Experimental Child Psychology*, *89*(2), 93 – 111.

McBride – Chang, C., & Kail, R. V. (2002). Cross – cultural similarities in the predictors of reading acquisition. *Child Development*, *73*(5), 1392 – 1407.

* McIntyre, E., Rightmyer, E. C., & Petrosko, J. P. (2008). Scripted and non – scripted reading instructional models: Effects on the phonics and reading achievement of first – grade struggling readers. *Reading and Writing Quarterly*, *19*(4), 377 – 407.

* Mckenna, G. S., & Violato, C. (2003). A combined phonological awareness, whole language, and metacognitive approach to teach reading to reading resistors. *Canadian Journal of School Psychology*, *18*(1 – 2), 115 – 128.

* Messer, D., & Nash, G. (2018). An evaluation of the effectiveness of a computer – assisted reading intervention. *Journal of Research in Reading*, *41*(1), 140 – 158.

Míguez – Álvarez, C., Cuevas – Alonso, M., & Saavedra, Á. (2022). Relationshipsbetween phonological awareness and reading in Spanish: A meta – analysis. *Language Learning*, *72*(1), 113 – 157.

* Mitchell, M. J., & Fox, B. J. (2001). The effects of computer software for developing phonological awareness in low – progress readers. *Reading Research and Instruction*, *17*(4), 315 – 332.

Monroe, L. B. (1877). *The chart – primer, or, first steps in reading*. Philadelphia: Cowperthwait & Company.

* Munro, N., Lee, K., & Baker, E. (2008). Building vocabulary knowledge and phonological awareness skills in children with specific language impairment through hybrid language intervention: A feasibility study. *International Journal of Language and Communication Disorders*, *43*(6), 662 – 682.

Murphy Odo, D. (2021). A meta – analysis of the effect of phonological awareness and/or phonics instruction on word and pseudo word reading of English as an L2. *SAGE Open*, *11*(4), 21582440211059168. https://doi.org/10.1177/21582440211059168

* Nicholson, T., & Tiru, S. (2019). Preventing a summer slide in reading – the effects of a summer school. *Australian Journal of Learning Difficulties*, *54*(2), 109 – 130.

* Peterson, M. E., & Haines, L. P. (1992). Orthographic analogy training with kindergarten children: Effects on analogy use, phonemic segmentation, and letter – sound knowledge. *Journal of Literacy Research*, *24*(1), 109 – 127.

* Piasta, S., & Wagner, R. (2010). Learning letter names and sounds: Effects of instruction, letter type, and phonological processing skill. *Journal of Experimental Child Psychology*, *105*(4), 324 – 344.

Plaut, D. C., McClelland, J. L., Seidenberg, M. S., & Patterson, K. (1996). Understanding normal and impaired word reading: Computational principles in quasi – regular domains. *Psychological Review*, *103*(1), 56 – 115.

* Price – Mohr, R. M., & Price, C. B. (2018). Synthetic phonics and decodable instructional reading texts: How far do these support poor readers? *Dyslexia*, *24*(2), 190 – 196.

* Rachmani, R. (2020). The effects of a phonological awareness and alphabet knowledge intervention on four – year – old children in an early childhood setting. *Australasian Journal of Early Childhood*, *45*(3), 254 – 265.

* Ritter, M. J., Park, J., Saxon, T. F., & Colson, K. A. (2013). A phonologically based intervention for school – age children with lan-

guage impairment. *Journal of Literacy Research*, *45*(4), 356 – 385.

* Roth, F. P., Troia, G. A., Worthington, C. K., & Handy, D. (2006). Promoting awareness of sounds in speech (PASS): The effects of intervention and stimulus characteristics on the blending performance of preschool children with communication impairments. *Learning Disability Quarterly*, *29*(2), 67 – 88.

* Ryder, J. F., Tunmer, W. E., & Greaney, K. T. (2008). Explicit instruction in phonemic awareness and phonemically based decoding skills as an intervention strategy for struggling readers in whole language classrooms. *Reading and Writing*, *21*(4), 349 – 369.

* Savage, R., & Carless, S. (2005). Learning support assistants can deliver effective reading interventions for "at – risk" children. *Educational Research*, *47*(1), 45 – 61.

Sawilowsky, S. S. (2009). New Effect Size Rules of Thumb. *Journal of Modern Applied Statistical Methods*, *8*(2), 597 – 599.

* Schmitt, K. L., Hurwitz, L. B., Sheridan Duel, L., & Nichols Linebarger, D. L. (2018). Learning through play: The impact of web – based games on early literacy development. *Computers in Human Behavior*, *81*, 378 – 389.

* Schuele, C. M., Justice, L. M., Cabell, S. Q., Knighton, K., Kingery, B., & Lee, M. W. (2008). Field – based evaluation of two – tiered instruction for enhancing kindergarten phonological awareness. *Early Education and Development*, *19*(5), 726 – 752.

* Sénéchal, M., Ouellette, G., Pagan, S., & Lever, R. (2012). The role of invented spelling on learning to read in low – phoneme awareness kindergartners: A randomized – control – trial study. *Reading and Writing*, *25*(4), 917 – 934.

* Shapiro, L., & Solity, J. (2008). Delivering phonological and phonics training within whole – class teaching. *British Journal of Educational Psychology*, *78*(4), 597 – 620.

* Shifflet, R., Mattoon, C., & Bates, A. (2020). Using tablets in a prekindergarten classroom to foster phonological awareness. *International Research in Early Childhood Education*, *10*(1), 1 – 20.

Shu, H., Peng, H., & McBride – Chang, C. (2008). Phonological awareness in young Chinese children. *Developmental Science*, *11*(1), 171 – 181.

* Solity, J., Deavers, R., Kerfoot, S., Crane, G., & Cannon, K. (1999). Raising literacy attainments in the early years: The impact of instructional psychology. *International Journal of Phytoremediation*, *19*(4), 373 – 397.

* Storey, C., McDowell, C., & Leslie, J. C. (2020). Headsprout early reading for specific literacy difficulty: A comparison study. *Journal of Behavioral Education*, *29*(3), 619 – 633.

* Sun, B., Zhu, B., Chen, J., & Zhou, H. (2015). The effects of phonological awareness training on the reading performance by child EFL learners in China. *Chinese Journal of Applied Linguistics*, *38*(3), 339 – 354.

Takacs, Z. K., & Kassai, R. (2019). The efficacy of different interventions to foster children's executive function skills: A series of meta – analyses. *Psychological Bulletin*, *145*(7), 653 – 697.

* Tangel, D. M., & Blachman, B. A. (1992). Effect of phoneme awareness instruction on kindergarten children's invented spelling. *Journal of Literacy Research*, *24*(2), 233 – 261.

Tong, X., & McBride – Chang, C. (2010). Chinese – English biscriptal reading: Cognitive component skills across orthographies. *Reading and Writing*, *23*(3), 293 – 310.

* Torgesen, J. K., & Davis, C. (1996). Individual difference variables that predict response to training in phonological awareness. *Reading and Writing*, *62*(2), 197 – 219.

* Torgesen, J. K., Morgan, S. T., & Davis, C. (1992). Effects of two types of phonological awareness training on word learning in kindergarten children. *Journal of Educational Psychology*, *84*(3), 364 – 370.

* Torgesen, J. K., Wagner, R. K., Rashotte, C. A., Herron, J., & Lindamood, P. (2010). Computer – assisted instruction to prevent early reading difficulties in students at risk for dyslexia: Outcomes from two instructional approaches. *Annals of Dyslexia*, *60*(1), 40 – 56.

* Ukrainetz, T. A., Cooney, M. H., Dyer, S. K., Kysar, A. J., & Harris, T. J. (2000). An investigation into teaching phonemic awareness through shared reading and writing. *Early Childhood Research Quarterly*, *15*(3), 331 – 355.

* Vadasy, P. F., Jenkins, J. R., & Pool, K. (2000). Effects of tutoring in phonological and early reading skills on students at risk for reading disabilities. *Journal of Learning Disabilities*, *33*(6), 579 – 590.

* Vadasy, P. F., & Sanders, E. A. (2010). Efficacy of supplemental phonics – based instruction for low – skilled kindergarteners in the context of language minority status and classroom phonics instruction. *Journal of Educational Psychology*, *102*(4), 786 – 803.

* Vadasy, P. F., & Sanders, E. A. (2011). Efficacy of supplemental phonics – based instruction for low – skilled first graders: How language minority status and pretest characteristics moderate treatment response. *Scientific Studies of Reading*, *15*(6), 471 – 497.

* Vadasy, P. F., & Sanders, E. A. (2013). Two – year follow – up of a code – oriented intervention for lower – skilled first – graders: The influence of language status and word reading skills on third – grade literacy outcomes. *Reading and Writing*, *26*(6), 821 – 843.

* Vadasy, P. F., Sanders, E. A., & Tudor, S. (2007). Effectiveness of paraeducator – supplemented individual instruction: Beyond basic decoding skills. *Journal of Learning Disabilities*, *40*(6), 508 – 525.

* Wang, C. W. (2019). Can raising phonological awareness enhance the English reading comprehension of Taiwanese primary school – aged children? *Asian EFL Journal*, *23*, 4 – 27.

* Warnick, K., & Caldarella, P. (2016). Using multisensory phonics to foster reading skills of adolescent delinquents. *Reading & Writing Quarterly*, *32*(4), 317 – 335.

* Warrick, N., Rubin, H., & Rowe – Walsh, S. (1993). Phoneme awareness in language – delayed children: Comparative studies and intervention. *Annals of Dyslexia*, *43*(1), 153 – 173.

* Weiner, S. (1994). Effects of phonemic awareness training on low – and middle – achieving first graders' phonemic awareness and reading

ability. *Journal of Reading Behavior*, *26*(3), 277 – 300.

* Weiss, Y., Yeatman, J. D., Ender, S., Gijbels, L., Loop, H., Mizrahi, J. C., … Kuhl, P. K. (2022). Can an online Reading Camp teach 5 – year – old children to read? *Frontiers in Human Neuroscience*, *16*, 793213. https://doi.org/10.3389/fnhum.2022.793213

* Wise, B. W., Ring, J., & Olson, R. K. (1999). Training phonological awareness with and without explicit attention to articulation. *Journal of Experimental Child Psychology*, *72*(4), 271 – 304.

* Wright, J., & Jacobs, B. (2003). Teaching phonological awareness and metacognitive strategies to children with reading difficulties: A comparison of two instructional methods. *Educational Psychology*, *23*(1), 17 – 47.

Yeong, S. H. M., Fletcher, J., & Bayliss, D. M. (2017). Impact of early home language exposure on phonological and orthographic skills and their contributions to English literacy abilities in English monolingual and Chinese – English bilingual adults. *Applied Psycholinguistics*, *38*(1), 181 – 210.

* Yeung, K. K. Y., Chan, R. T. C., Chan, H. Y., Shum, K. K. M., & Tso, R. V. Y. (2023). Word reading transfer in two distinct languages in reading interventions: How Chinese – English bilingual children with reading difficulties learn to read. *Research in Developmental Disabilities*, *137*, 104501. https://doi.org/10.1016/j.ridd.2023.104501

* Yeung, S. S., & Savage, R. (2020). Teaching grapheme – phoneme correspondences using a direct mapping approach for at – risk second language learners: A randomized controlled trial. *Journal of Learning Disabilities*, *53*(2), 131 – 144.

* Yeung, S. S. S., Siegel, L. S., & Chan, C. K. K. (2013). Effects of a phonological awareness program on English reading and spelling among Hong Kong Chinese ESL children. *Reading and Writing*, *26*(5), 681 – 704.

Zhang, Z., & Peng, P. (2022). Reading real words versus pseudowords: A meta – analysis of research in developmental dyslexia. *Developmental Psychology*, *58*(6), 1035 – 1050.

管益杰, 李燕芳, 董奇. (2006). 学前儿童英语语音意识、字母知识及口语词汇之间关系的研究. *心理发展与教育*, *22*(2), 7 – 11.

* 姜莹, 盖笑松, Thomson, J. (2024). 音 – 义连接经验对自然拼读教学法效果的影响. *心理发展与教育*, *41*(3), 368 – 376.

* 李光泽, 董燕萍. (2012). 语音意识训练对英语学习者词汇认读影响的实验研究. *解放军外国语学院学报*, (1), 59 – 63.

* 李庆安, 许莹, 林崇德, 张萌, 姚峰. (2007). 语音意识 1 + 1 训练模式对英文单词朗读的作用——小学三年级干预组与对照组的比较. *教育研究与实验*, (1), 62 – 67.

* 李庆安, 许莹, 林崇德, 张萌, 姚峰, 林依. (2006). 音标 – 语音意识的整合训练对英文准朗读的作用. *心理发展与教育*, *22*(4), 68 – 76.

潘颖, 邓小平, 林正军, 刘岩. (2019). 中国学生英语语音意识与英语阅读成绩关系的元分析. *心理与行为研究*, *17*(2), 229 – 239.

潘颖, 盖笑松. (2013). 汉语母语与英语母语学生英语语音意识发展趋势的比较研究. *心理与行为研究*, *11*(1), 73 – 77.

任志洪, 赖丽足. (2023). *心理学元分析方法:理论、案例与操作*. 北京:中国人民大学出版社.

* 徐莹. (2021). 学生结构化英语语音意识干预的有效性. *外语教学理论与实践*, (1), 101 – 108.

* 姚小珊, 黄斐然. (2018). 自然拼读法与高频词在小学生英语认读能力培养中的应用研究. *基础外语教育*, *20*(6), 43 – 49.

* 郑小蓓, 王正科, 刘冬梅, 许婕, 李文玲, 孟祥芝. (2009). 语音训练对幼儿英语语音意识和字母知识的促进. *心理发展与教育*, *25*(1), 66 – 71.

A Meta-analysis Comparing the Training Effects of English Phonological Awareness between Native Chinese Speakers and Native English Speakers

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Abstract: This study utilizes meta-analysis techniques to compare the effects of English phonological awareness training between native Chinese and native English speakers. Including 101 studies with a total sample size of 9, 802, the findings are as follows: (1) Native English speakers significantly outperformed native Chinese speakers in overall English phonological awareness and its subcomponent, phoneme awareness ability; (2) For native English speakers, the optimal time window for training was below the age of six, whereas for native Chinese speakers, it was at the age of thirteen and above; (3) Merely increasing training intensity (duration and frequency) did not enhance training effects for native Chinese speakers; (4) Sample characteristics, training content, and training format all significantly influenced the training effects on phonological awareness. The results suggest that compared with native English speakers, native Chinese speakers benefit less from phonological awareness training due to their lack of early natural acquisition of phonological-semantic relations. When designing such training for them, it is crucial to compensate for their lack of experience in word phonological-semantic relations and to develop more targeted teaching strategies.

Key words: phonological awareness training; phonological-semantic relations; phoneme awareness; second language; meta-analysis