Phonological Awareness Tasks for French-Speaking Preschoolers

Tâches de mesure de la conscience phonologique chez les enfants d'âge préscolaire francophones

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Abstract

In this study, a new battery of phonological awareness tasks designed for French-speaking preschoolers was developed and tested. In Experiment 1, a cross-sectional design showed that a combination of seven phonological awareness tasks accurately described developmental differences in phonological awareness between 4 and 5 years-olds, but was too difficult for 3 year-olds. Four of the initial tasks (rhyme judgment, initial consonant categorization, syllable segmentation, and syllable deletion) were then selected to form the "Épreuve préscolaire de conscience phonologique" (EPCP). In Experiment 2, a pretest-posttest design including a control and an experimental group showed that the EPCP could effectively measure phonological awareness gains due to a speech-language therapy intervention in 4- to 5-year-olds. The EPCP has the potential to become a useful tool for researchers and clinicians working with French-speaking preschoolers in the area of emergent literacy.

Abrégé

La présente étude a élaboré et mis à l'épreuve une nouvelle batterie de tâches de conscience phonologique conçues pour les enfants francophones d'âge préscolaire. Pour l'expérience 1, un devis transversal a démontré qu'une combinaison de sept tâches de mesure de conscience phonologique décrivaient avec précision des différences dans le développement de la conscience phonologique entre les enfants de 4 et 5 ans, mais que ces tâches étaient trop difficiles pour les enfants de 3 ans. Quatre des sept tâches initiales (jugement de rimes, catégorisation de la consonne initiale, segmentation syllabique et omission syllabique) ont été retenues pour former l'Épreuve préscolaire de conscience phonologique (ÉPCP). Dans l'expérience 2, un design de recherche incluant des mesures en prétest et en posttest auprès d'un groupe témoin et d'un groupe expérimental a montré que l'ÉPCP peut mesurer avec efficacité l'amélioration de la conscience phonologique à la suite d'une intervention orthophonique chez les enfants de 4 et 5 ans. L'ÉPCP a ce qu'il faut pour devenir un outil utile aux chercheurs et aux cliniciens qui travaillent en éveil à l'écrit auprès des enfants francophones d'âge préscolaire.

Key words: phonological awareness, assessment, preschool, French

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Phonological awareness refers to the sensitivity to the sound units of language, such as syllables, rhymes, and phonemes, and to the ability to manipulate them (Gillon, 2004). It is one of the best predictors of reading achievement in the early school years (National Early Literacy Panel, 2007). Training children to improve their phonological awareness allows them to acquire word recognition skills

more easily (e.g. Ball & Blachman, 1988). In order to evaluate the efficacy of phonological awareness training programs and activities, researchers and practitioners in early childhood need valid and reliable assessment instruments that can measure gain accurately in young children. However, existing assessment instruments often lack sensitivity to phonological awareness growth (Troia, 1999), and many of them are not adapted to young children before they enter kindergarten. In addition, few instruments are available in languages other than English. The purpose of the research presented here was to explore the usefulness and applicability of different phonological awareness tasks designed for French-speaking preschoolers.

Phonological Awareness Assessment Methods

Performance assessments are typically made with reference to test-specific criteria (e.g., how well did a person do on a test, based on the score) or to norm values (e.g., how well did a person do in comparison to his or her age-group). In the case of phonological awareness skills, criterion-referenced tests are considered more appropriate than norm-referenced measurements for assessing the impact of interventions (Sodoro, Allinder, & Rankin-Erickson, 2002). A good test should include sets of items that address different phonological awareness skills. It should also be quick to administer.

The psychometric properties criterion-referenced experimental tasks are rarely documented, given that they are not standardized (Salvia & Ysseldyke, 1998). However, psychometric features can still be appraised. For example, the internal consistency can be measured by the Cronbach Alpha (α) coefficient, intercorrelations among tasks can be quantified to assess whether they all tap into the same underlying construct, and the concurrent validity can be assessed by correlating the test scores with another reputable and valid test (Anastasi, 1988). All this can provide information on the qualities of the tasks in a test. In order to have valid psychometric properties, the design of a criterion-referenced phonological awareness test should be based on a solid theoretical background about the language in which it is developed. In the development of such a test, developmental processes of phonological awareness, the properties of specific tasks, and the linguistic factors associated with the stimuli must all be considered.

Linguistic Differences Between French and English

Most of the research concerning phonological awareness has focused on English and cannot be directly applied to French. French is a syllable-timed language whereas English is a stressed-timed language (Abercrombie, 1967). Most of the syllables in French display an open structure with the consonant–vowel pattern while English has a greater proportion of syllables with a closed structure showing a consonant-vowel-consonant pattern (Delattre, 1966). French is mainly polysyllabic, with only a small proportion of monosyllabic words, while English has a higher proportion of monosysllabic words (Sprenger-Charolles & Colé, 2006). The stress pattern in words that are polysyllabic words is often different between the two languages: in French, stress remains constantly on the last syllable creating a weak-strong pattern, while in English, the stress position is variable with a greater preponderance of the strong-weak pattern (Delattre, 1966). The syllabic nature of the French language and its great proportion of open syllabic structures, multisyllabic words, and weak-strong stress patterns, therefore, directly influences the stimuli that can be used in phonological awareness tasks designed for French-speaking children.

Development of Phonological Awareness in French-Speaking Children

Knowledge about the development of phonological awareness provides information that must guide the design of phonological awareness tasks (Gillon, 2004). Authors who have studied English-speaking children propose that phonological awareness develops in a universal sequence in which awareness of larger units precedes awareness of smaller units (Treiman & Zukowski, 1996). However, Gombert (1992), who conducted research with French children, proposed that phonological awareness development is an environmentally-driven process influenced by the phonotactics of the language and the literacy training provided to children. A study conducted by Duncan, Colé, Seymour, and Magnan (2006) supported this hypothesis by showing that phonological awareness development in English-speaking and French-speaking children from 4 to 6 years of age followed distinctive steps, and that both sequences differed from the previously proposed universal large-to-small unit sequence. Most of the studies in French recognized that the syllable level was clearly more accessible for phonological awareness tasks prior to formal literacy instruction and that phoneme and rhyme awareness emerged with formal literacy instruction in school (Bruck, Genesee, & Caravolas, 1997; Courcy, Béland, & Pitchford, 2000). According to these findings, the precedence of syllable awareness in French-speaking preschoolers is important to take into account when choosing phonological awareness tasks for this age group.

Conversely, Lecocq (1991) found in a longitudinal study with French-speaking children that sensitivity to rhymes and initial phonemes emerged at 4 years of age, before sensitivity to syllables. Gombert's (1992) distinction between epilinguistic and metalinguistic stages of awareness could reconcile these contradictory results. Epilinguistic abilities in children, such as memorizing nursery rhymes, self-correcting speech, and syllable tapping require only a low level of abstract understanding. Such activities lack intentionality and are embedded in a rich situational context. Metalinguistic behaviours, in contrast, emerge later and require a higher degree of abstraction as well as conscious metacognition. Stanovich (1987) proposes a developmental continuum in which children move from a shallower (epilinguistic) to a deeper level of understanding (metalinguistic) of speech sound units. Thus, Lecocq's

phonological awareness categorization tasks involving rhymes and initial phonemes may have tackled a shallower epilinguistic level of phonological awareness than his metalinguistic tasks involving manipulation of syllables. Categorization tasks involve a forced choice in which the child is asked to decide if specific sound segments in two words are the same. Manipulation tasks require the child to make a cognitive operation such as deleting or moving a sound segment. In preschoolers, therefore, categorization tasks requiring a shallower level of rhyme and phoneme awareness would be appropriate to assess age-appropriate skills. Tasks involving manipulation of the rhymes and phonemes require more complex cognitive operations, which are only acquired at a later developmental stage.

Parameters of Phonological Awareness Tasks

Different types of phonological awareness tasks have been used in previous research, and it has been noted that there can be considerable variability in performance between tasks (Chabon & Prelock, 1987). Different types of tasks place different demands on abilities underlying phonological awareness, such as speech perception and discrimination, short-term verbal memory, cognitive abilities, attention span, and communication abilities (McBride-Chang, 1995). The following sections describe the parameters of the phonological awareness tasks that can influence children's performance.

Verbal instructions. The vocabulary, utterance length, grammatical elements and conceptual level of the instructions given to the children play an important role in the comprehension of the task (Chabon & Prelock, 1987). Word stimuli can be presented in pictures to minimize the demands on verbal memory. In addition, training items can be provided in order to familiarize the child with the tasks and ensure comprehension. Verbal instructions in tasks designed for preschoolers should be simple and provide them with visual support and training items.

Response requirements. Tasks that require a verbal production as a response may vary in the communication demands they impose (Chabon & Prelock, 1987). A yes / no type of response is easier than a response requiring an oral production. The latter can vary in complexity on multiple levels: repetition of one of the experimenter's words, production of a new word, or production of a non-word. The articulatory complexity of the response can influence children's ability to produce a correct answer. Usually, younger children have not acquired the full phonemic inventory of their spoken language (Sanders, 1972). In French, phonemes like /ʃ/ and /ʒ/ as well as consonant clusters with larger distances between the places of articulation (e.g., /tr/, /kl/) tend to emerge later in children's oral productions (Beauchemin, Martin, & Ménard, 2000). In order to be suitable for preschoolers, tasks should require only simple responses or oral productions with a developmentally appropriate articulatory complexity.

Cognitive demands. Treiman & Zukowski (1996) and Yopp (1988) found that cognitive load may influence performance on phonological awareness tasks. Complex tasks that require multiple cognitive operations increase the demands on verbal short-term memory and working memory. Ball (1993) classified phonological awareness tasks into two categories. Simple tasks require one mental manipulation, such as rhyme judgment, segmentation or blending. Complex tasks require more than one mental manipulation such as deletion, substitution, or reversal. Phonological awareness assessment instruments designed for preschoolers should target tasks with lower cognitive demands.

Duration. Given that preschoolers have a shorter attention span, a high distractibility and a low tolerance for frustration, they tend to fatigue easily in testing situations (Nagle, 2007). Shortening the duration of the tasks or of the overall assessment session can prevent fatigue effects.

Sound unit involved. It is usually recognized that it is easier to perform a task with larger rather than smaller sound units (Gillon, 2004). In fact, it is not the size of the sound unit but rather its position in the phonological hierarchy that influences the task difficulty (Treiman & Zukowski, 1996). Tasks at the syllable level would be easier than those at the rhyme level, and those at the rhyme level would be easier than those at the phoneme level. As discussed, researchers are not unanimous about this sequence. The task difficulty may be affected by environmental linguistic influences, the level of intentionality, and mental alertness required. For the reasons described earlier, we argue that phonological awareness tasks designed for French-speaking preschoolers must involve syllables. Tasks involving rhymes and phonemes, if chosen, should tap shallower levels of phonological awareness (e.g., using categorization), rather than deeper levels (e.g., using manipulation tasks).

Linguistic Parameters of the Stimuli. The linguistic characteristics of the stimuli are another important factor that may influence children's performance in phonological awareness tasks (Chafouleas, VanAuken, & Dunham, 2001). Stahl and Murray (1994) found that linguistic complexity explained children's performance better than the nature of the tasks used. The following sections describe the parameters that may influence linguistic complexity of the stimuli in phonological awareness tasks.

Lexical status of stimuli. Both real words and non-words have been used in experimental phonological awareness tasks. With young children, high frequency words are often used instead of non-words to ensure that a clear phonological representation is available in the long-term memory (Fowler, 1991). However, these high-frequency words also have a strong semantic representation that can introduce bias in the task, as young children may have difficulty separating the sound structure of the word from its meaning (van Kleeck, 1995). Courcy and Béland (1998) found that the use of non-words was effective in phonological awareness tasks for young children. Using non-words stimuli thus seems to be more appropriate

than using real words in order to avoid possible semantic bias.

Phonemic length. Task difficulty increases with the number of phonemes in the stimuli. McBride-Chang (1995) related this length effect to limitations of the short-term verbal memory. Consequently, shorter stimuli should precede longer ones within a task to gradually increase its complexity.

Location of the sound unit involved. There is consensus in the research to date that sound units embedded in the middle of words are harder to perceive and manipulate than are those at the beginning or at the end of the stimuli (McBride-Chang, 1995; Stanovich et al., 1984). Primacy and recency effects in verbal short term memory would favor initial and final positions (Treiman, Berch, & Weathersont, 1993), and the higher level of coarticulation in the middle of the word would render units in this position less accessible (Stage & Wagner, 1992). Research has found an advantage of the initial position over the final position (Stage & Wagner, 1992; Stanovich et al., 1984; Treiman et al., 1993), although there is some disagreement (McBride-Chang, 1995). Therefore, testing sound units in the middle of the word should be avoided when designing tasks for young children. The focus should be on both the initial and the final positions.

Syllabic structure. The presence of consonant clusters in the syllabic structure of the stimuli makes phonological tasks more difficult to complete (McBride-Chang, 1995). Consonant clusters may cause confusion in speech perception. Further, phonological tasks involving closed syllables might be more difficult for younger children because the French language displays a higher frequency of open syllables in words. Therefore, in order to gradually increase task complexity, stimuli with a simple open syllabic structure should precede those with more complex syllabic structures within the task.

Nature of phonemes. McBride-Chang (1995) reported that the acoustic properties of phonemes influence phonological awareness tasks because of their impact on speech perception. Continuant consonants like liquids (e.g., /l, r/) and fricatives (e.g., /s, v/) are easier to identify and manipulate than are stops (e.g., /p, d/; McBride-Chang, 1995; Stahl & Murray, 1994). Consequently, stimuli involving continuants should precede those involving stops to gradually increase complexity within a task. Treiman, Broderick, Tincoff, and Rodriguez (1998) also found that consonants that differ only in voicing (e.g., /t/ versus /d/) were harder to compare. Thus, in tasks such as rhyme judgment or initial phoneme categorization, the comparison of stimuli with consonants differing in many parameters (e.g., voicing, placement, and manner) should precede those with consonants differing only in voicing.

Phonological Awareness Tasks for Preschoolers in French. Most of the phonological awareness tasks currently available in French are embedded in more general norm-referenced tests and are not designed specifically to measure intervention effects. In addition, most tests for children were constructed for kindergarteners and school-aged children. The same is true with criterion-referenced tasks used in studies conducted in French (e.g., Duncan et al., 2006; Courcy et al., 2000; Boudreau, Giasson, & Saint-Laurent, 1999; Lecocq, 1991).

The goal of the current study was to develop a battery of criterion-referenced phonological awareness tasks that would be appropriate to measure developmental growth as well as therapy effects. Three research questions were addressed:

(a) What combination of phonological awareness tasks is suitable for preschoolers and sensitive to development and growth?

(b) Can this combination of tasks be used to quantitatively appraise intervention effects?

(c) What are the main psychometric properties of these tasks?

Two experiments were conducted to answer these questions.

Experiment 1

Method

Study design. The goal of the first experiment was to develop a battery of phonological awareness tasks that would take into account the characteristics of the French language, the developmental stage of the phonological awareness, the task parameters, and the linguistic parameters of the stimuli. It examined which combination of these tasks was both suitable for preschoolers and sensitive to developmental growth. A cross-sectional design was used to measure phonological awareness across three age groups of preschoolers: 3, 4 and 5 year-olds.

Participants. The children were recruited in ten publicly subsidized childcare centres of Québec City and of Montréal, Québec, Canada. The participants met the following inclusion criteria: French as their first language (i.e., exposed to French 90% of the time), normal language development and hearing (as reported by the parents), and pre-literate (as reported by the parents). The children's age fell in one of the three age groups at testing: from 32 to 40 months (3 year-old group), from 44 to 52 months (4 year-old group), and from 56 to 64 months (5 year-old group). Thirty-four children were included: 12 in the 3-year-old group, 12 in the 4-year-old group, and 10 in the 5-year-old group.

Table 1 summarizes the characteristics of the children in the three groups. No difference was found in the sex distribution across the three groups, $\chi 2(2, N = 34) = 0.22$, $p = .90$, nor in receptive vocabulary score, $F(2, 31) = 1.53$, $p = .23$.

Materials. Seven tasks were developed, largely inspired by the metaphonological tasks used by Courcy et al. (2000) in their research with French-speaking kindergarteners and 1st graders in Québec, Canada, and those used by Lonigan et al. (1998) with 3- to 5-year-old English-speaking pre-

Table 1
Characteristics of the Participants in Experiment 1

Variables	Group		
	3 year-olds (*n* = 12)	4 year-olds (*n* = 12)	5 year-olds (*n* = 10)
Gender			
Number of males	6	7	5
Number of females	6	5	5
Mean age in months (SD)	36.7 (2.0)	48.4 (2.2)	61.4 (1.4)
Mean vocabulary score [a] (SD)	110.0 (18.0)	119.5 (19.3)	123.3 (18.4)

Note. [a] Standardized receptive vocabulary score on "Échelle de vocabulaire en images Peabody" (EVIP; Dunn, Thériault-Whalen, & Dunn, 1993)

schoolers. The seven tasks were administered in this order: (a) rhyme judgment, (b) initial syllable categorization, (c) syllable blending, (d) syllable segmentation, (e) syllable deletion, (f) syllable inversion, and (g) initial consonant categorization. These tasks were chosen because it was expected that they would be developmentally appropriate for the participants. Based on the findings from the literature discussed in the previous section, the tasks were ordered following an increasing level of difficulty.

The tasks for rhyme judgment, initial syllable categorization and initial consonant categorization involved a comparison of only two stimuli at a time to avoid overloading of the children's verbal short-term memory. Taken together, the tasks involved the levels of rhyme, syllable, and phoneme in order to cover all of the sound units in which phonological awareness develops. A greater proportion of tasks involved the syllable level because of the syllable-timed nature of the French language. Each task included three practice items and 10 assessment items. Ten was considered a reasonable minimum number of items for reliably and efficiently measuring phonological awareness while not exhausting the children's attention (Chafouleas & Martens, 2002; Stanovich, Cunningham, & Cramer, 1984). Verbal instructions to the children were given in simple vocabulary and short sentences. The words "rhyme", "syllable" and "sound" were used but they were explained (e.g., a syllable is a small chunk of a word) and visually represented by wooden blocks. Manipulation of the blocks made the task instruction more concrete (e.g., two blocks were separated to illustrate syllable segmentation). The first two and the last task required a yes / no response. The correct answers (yes vs. no) were arranged in a quasi-random order. The five other tasks required verbal answers. Every effort was made to reduce the articulatory complexity of the requested answers by avoiding phonemes that emerge later in children's oral production (e.g. /ʃ/ and /ʒ/) and consonant clusters with larger distances between the places of articulation (e.g. /tr/ or /kl/).

The tasks used multisyllabic non-words as stimuli to reflect the multisyllabic nature of words in French and to control for possible lexical and semantic biases. The phonemic length, the location of the target sound unit, the syllabic structure and the nature of the phonemes in the non-words were manipulated in order to increase the difficulty level within each task. For the categorization tasks (rhyme judgment, initial syllable categorization, and initial consonant categorization), the following rules were applied:

(a) phonemic length: from 4 to 5 phonemes;
(b) syllabic structure of target unit: from simple consonant - vowel (CV) structure to complex CVC and CCV structures.
(c) nature of the consonant: for different pairs, from high contrast (voiced fricative vs. voiceless stop to low contrast (voiceless stop vs. voiceless stop) and for similar pairs, from voiced fricative to voiceless stop.

For the manipulation tasks (syllable blending, segmentation, deletion and inversion), the following rules were applied:

(a) phonemic length: from 4 to 6 phonemes and from 2 to 3 syllables in the segmentation task;
(b) syllabic structure: from simple CV$CV ($ indicates syllable boundary) to complex CV$CCV, CVC$CV, CCVCCV, CVCCVC and CVCVCV (for blending and segmentation only);
(c) type of consonant: different place of articulation but similar voicing in each syllable to facilitate the response;
(d) location of the sound unit to delete for syllable deletion task only: from initial to final.

The tasks and the stimuli are listed in the appendix. To provide information about the concurrent validity of the tasks, the receptive vocabulary test "Échelle de vocabulaire en images Peabody" (EVIP; Dunn, Thériault-Whalen, & Dunn, 1993) was chosen. The reliability and validity of the EVIP have been established. This test was also considered useful because of the strong relationship between

vocabulary and phonological awareness development (Metsala & Walley, 1998). It was expected that the scores from the EVIP and the phonological awareness tasks would be positively correlated.

Procedures. First, the EVIP was administered to the children. The phonological awareness tasks were then administered through a puzzle game in order to secure the children's participation. After the completion of each task, the child received a different box containing pieces of a puzzle. The completion of all tasks was required to complete the puzzle. For scoring purposes, each response was worth 1 point for a maximum of 10 points per task, and a total test score of 70 points. Positive verbal reinforcement was given regardless of the correctness of the child's response during the test. Feedback on correctness was provided for the three practice items only. No repetition of any stimuli was permitted. After five consecutive incorrect responses or two refusals from the child within a task, the experimenter gave the gift box to the child and went on to the next task. The test administration was stopped after three consecutives tasks in which the child scored 0. The assessments were conducted in the children's childcare centers, in a separate room where visual and auditory distracters were reduced. The second and third authors each administered half of the assessments. They were trained by the first author to systematically use the verbal instructions with the non-verbal cues that were described on the phonological awareness tasks form. The examiners filled in the response forms on site. The assessments were recorded on audiotape to assess the inter-rater reliability of the manipulation tasks (which required verbal responses). Inter-rater reliability was established based on 70% of the tasks involving production by the child. The two experimenters listened to the recordings that had been performed by their colleagues. A 97% agreement rate on item scoring was obtained.

Results

Differentiation of age groups. Table 2 shows the mean scores and standard deviations on the tasks across the three age groups. Non-parametric tests were used (Kruskal-Wallis H and Mann-Whitney U) for comparison analyses based on an inspection of the data distributions and the equality of the variances across the groups. A significant main effect was found among the three groups in total score, $H(2) = 16.82$, $p < .01$. The post hoc comparisons were made with the alpha level set at .017 (Bonferroni correction). The total scores were higher for the 5 year-olds than those for the 4 year-olds (U = 20.5, $p < .01$), and the 3 year-olds ($U = 0.5$, $p < .01$). No significant difference was found between the total scores of the 3 and 4 year-olds ($U = 42.5$, $p = .08$). A floor effect was observed in the 3 year-olds' overall score. Children in this age group responded at chance level on the categorization tasks (rhyme judgment, initial syllable categorization and initial consonant categorization) and did not succeed in any of the manipulation tasks (syllable blending, segmentation, deletion, and inversion). In general, none of the groups scored well (from 15.2 to 31.6 out of a maximum score of 70).

Significant differences across the groups were found for the following specific tasks: (a) rhyme judgment, H (2) = 7.4, $p = .03$; (b) syllable blending, H (2) = 11.0, $p < .01$; (c) syllable segmentation, H (2) = 17.3, $p < .01$; (d) syllable deletion, H (2) = 11.2, $p = .01$; and (e) initial consonant categorization, H (2) = 16.0, $p < .01$. The initial syllable categorization and syllable inversion tasks did not discriminate between the age groups. The post hoc comparisons revealed that the 4 year-olds performed better than the 3 year-olds on the syllable segmentation task ($p < .01$). The 5 year-olds performed better than the 4 year-olds only on the initial consonant categorization task ($p < .01$). The 4 year-olds performed at chance level of performance on this task. The 5 year-olds performed better than the 3 year-olds on all tasks ($ps < .01$).

Intercorrelations among the tasks. To verify if all tasks tapped into the same underlying construct, Kendall's tau (τ) non-parametric correlations were calculated (see Table 3). All tasks correlated with each other except the syllable segmentation and syllable

Table 2
Mean Score (SD) on the Phonological Awareness Tasks Across Groups

Task (max = 10)	Group		
	3 year-olds	4 year-olds	5 year-olds
Rhyme judgment	5.0 (1.1)	5.5 (2.4)	7.4 (2.1)
Initial syllable categorization	5.2 (1.5)	5.9 (1.6)	6.2 (2.4)
Syllable blending	0.0 (0.0)	0.6 (1.7)	2.5 (2.5)
Syllable segmentation	0.0 (0.0)	3.0 (4.0)	7.1 (2.9)
Syllable deletion	0.0 (0.0)	1.3 (3.0)	1.9 (2.6)
Syllable inversion	0.0 (0.0)	0.5 (1.7)	0.1 (0.3)
Initial consonant categorization	5.0 (0.0)	5.2 (0.6)	6.4 (1.5)
Total score (max = 70)	15.2 (2.4)	22.0 (12.3)	31.6 (8.7)

Table 3
Non parametric Intercorrelations Among Phonological Awareness Tasks

Task	1	2	3	4	5	6	7	8
1. Rhyme judgment	-	.40**	.63**	.37*	.54**	.33*	.53**	.64**
2. Initial syllable categorization		-	.39**	.36*	.40**	.37*	.41**	.52**
3. Syllable blending			-	.43**	.53**	.52**	.66**	.55**
4. Syllable segmentation				-	.66**	.31	.56**	.70**
5. Syllable deletion					-	.44**	.79**	.64**
6. Syllable inversion						-	.46**	.35*
7. Initial consonant categorization							-	.59**
8. Total score								-

* $p < .05$. ** $p < .01$.

inversion tasks, respectively the easiest and the hardest task. The correlations were moderate to strong according to Cohen's (1988) criteria.

Internal consistency and concurrent validity. Internal consistency of the whole group of phonological awareness tasks was calculated using the Cronbach's α coefficient. The value reached .92, suggesting a satisfactory level of internal consistency (Hills, 1981). Using Kendall's tau (τ), a weak but significant non-parametric correlation was found between the total phonological awareness score and the EVIP raw score, $\tau = .42$, $p < .01$.

Discussion of the results of Experiment 1

Taken together, the phonological awareness tasks differentiated well between the developmental stages of the 4 and 5 year-olds. Taken separately, only the initial consonant categorization task differentiated between these two groups. The 4 years-olds performed at chance level on this task. All tasks were too difficult for the 3 year-olds. The moderate to strong intercorrelations suggest that all tasks tapped into a common underlying construct. The analyses revealed a satisfactory internal consistency and concurrent validity with the EVIP. The weak but significant correlation between the phonological awareness tasks and the EVIP could be taken to suggest that the two tests measured different constructs: phonological awareness versus receptive vocabulary.

Based on the overall poor performance of the children in Experiment 1, it was decided to remove some tasks from the phonological awareness assessment. It was also desirable to shorten the assessment in order to reduce possible fatigue effects, since the administration time for the complete protocol was as long as 45 minutes. The syllable inversion task was eliminated because only two children passed at least one item in this task. The initial syllable categorization task was also eliminated because it was not discriminative between children from different age groups. In order to reflect phonological awareness at all sound unit levels, the rhyming judgment and the initial consonant categorization tasks were retained. Of the other three tasks on the syllable level, only segmentation and deletion were retained. Segmentation and blending are similar tasks, but segmentation was more discriminative than blending across the age groups.

Four tasks were chosen to form the "Épreuve préscolaire de conscience phonologique" (EPCP): (a) rhyme judgment, (b) initial consonant categorization, (c) syllable segmentation, and (d) syllable deletion. Since some children struggled with the shift from categorization tasks to manipulation tasks, it was decided that the rhyme judgment and initial consonant categorization tasks should preceed the syllable segmentation and deletion tasks. In addition, some non-word stimuli were modified because they resembled real words (/diru/ was changed

to /dimu/ because it sounded like "dix roues" which is a Quebec French term equivalent of "ten-wheeler"). Finally, modifications were made to the instructions: redundancy in the explanations was reduced and the three practice items were changed to two training items and four practice items. In the training items, the experimenter gives examples of correct answers. In the practice items, the child is asked to give an answer and corrective feedback is provided by the experimenter. The child has to give two correct answers in the practice items before being presented with the 10 items of the task. If he or she does not give two correct answers, the task is skipped.

Table 4
Characteristics of Participants in Experiment 2

Variables	Group	
	Experimental (*n* = 10)	Control (*n* = 13)
Gender		
Number of males	6	8
Number of females	4	5
Number with language delay	4	7
Mean age in months (SD)	57.1 (4.3)	57.5 (3.6)
Vocabulary score [a] (SD)	99.5 (14.3)	100.9 (18.5)

[a] Standardized receptive vocabulary score on EVIP.

In order to assess whether the EPCP can detect changes in phonological awareness due to intervention, a subset of data were analyzed from a larger study on the efficacy of an intervention program for at-risk French-speaking preschoolers (Lefebvre, Trudeau, & Sutton, 2008).

Experiment 2

Method

Study design. The second experiment used a control-group pretest-posttest design. Children were recruited from four childcare centers. Each of two sites was randomly assigned to either an experimental or a control group. The control group received an evidence-based shared storybook reading program fostering oral language and print awareness skills. The experimental group received an enhanced version of the shared storybook reading program, which targeted phonological awareness in addition to oral language and print awareness skills. Both programs lasted 10 weeks.

Participants. The children were recruited in publicly subsidized childcare centers of Québec City, Québec, Canada. Participants met the following inclusion criteria: French as first language (i.e., exposed to French 90% of the time), preliterate according to the parents, normal nonverbal cognitive skills on the Leiter International Performance Scale-Revised (Roid & Miller, 1997), and normal hearing status according to an audiometric screening test. Twenty-three children were recruited: 10 in the experimental group and 13 in the control group. Their characteristics are shown in Table 4. There were no differences on the variables age, $t(21) = 0.22$, $p = .83$; sex distribution, $\chi^2(1, N = 23) = 0.01$, $p = .94$; distribution of children with language delay, $\chi^2(1,N = 23) = 0.43$, $p = .51$; and child vocabulary scores, $t(21) = 0.20$, $p = .84$.

Procedure. Before and after the 10-week intervention program, all children were seen for an individual assessment of their oral language and emergent literacy skills, which included the administration of the EPCP. The EVIP was also administered as a pretest only. The EPCP was again administered through a puzzle game. Each answer was worth 1 point for a maximum of 10 points per task, for a total test score of 40 points. Positive verbal reinforcement was given, but no repetition of the stimuli was permitted. After five consecutive incorrect answers or two refusals from the child, the task was skipped. Trained graduate students and the first author administered the assessments in the children's child care centers, in a separate room where visual and auditory distracters were reduced. The post-intervention assessments were performed by one trained graduate student who was blind to the interventions. The response forms were completed on site. The assessments were recorded on audiotape for the subsequent inter-rater reliability measures. A 96% agreement rate was obtained between the experimenter and a graduate student who scored the assessment sessions independently based on the audiotapes.

Results

Sensitivity. A *t*-test confirmed that the groups obtained equivalent scores on the EPCP before intervention, $t(21) = 0.46$, $p = .65$. A series of paired t-tests were used to verify whether the EPCP could detect improvement in phonological awareness measures due to intervention. The experimental group had a mean score of 15.2 out of a maximum of 40 ($SD = 5.9$) before intervention, and improved to 29.5 ($SD = 5.6$) on the EPCP after the intervention. This improvement was statistically significant, $t(9) = 8.98$, $p < .01$, $d = 2.33$. The control group obtained a mean score of 13.9 ($SD = 7.8$) before and 17.8 ($SD = 8.1$) on the EPCP after the intervention. This improvement was significant, but with a smaller effect size, $t(12) = 2.19$,

$p = .049$, $d = 0.37$. After the intervention, the scores of the experimental group were higher than those of the control group, $t(21) = 3.91$, $p < .01$. No floor effects were observed in the overall scores of any of the groups.

Internal consistency and concurrent validity. The assessment instrument provided satisfactory Cronbach's αs before and after the intervention (.86 and .91 respectively). The correlation between the EPCP scores before the intervention and the EVIP raw scores was similar to that obtained in Experiment 1 ($\tau = .40$, $p = .01$).

Discussion of Experiment 2

The EPCP quantified the intervention effects in preschoolers even when the analyses included a small number of children. A larger effect size was found when the interventions in the shared reading program explicitly addressed phonological awareness. Internal consistency and concurrent validity remained good despite the modifications of the tasks following Experiment 1.

General discussion

This study describes the development of a new instrument for the specific assessment of phonological awareness, in French-speaking preschoolers. In the development of the EPCP, the specific characteristics of the French language, the developmental stage of the phonological awareness, the complexity of the tasks, and the linguistic features of the stimuli were all considered. The results indicated that the final version of the EPCP could measure the improvement in phonological awareness due to natural development or therapeutic intervention, even when the groups analyzed were small (*n* from 10 to 13 per group).

The different tasks of the EPCP were moderately to highly correlated, which suggest that they tap into the same underlying construct. The correlations between the tasks match the results obtained in other studies (McBride-Chang, 1995; Stanovich et al., 1984; Yopp, 1988). The internal consistency and concurrent validity of the EPCP were good in both experiments.

The EPCP assesses phonological awareness on multiple conceptual levels, which may be advantageous. The combination of tasks involving different sound units and mental operations in the final version of the EPCP may make the assessment more suitable for young children. In contrast, single task instruments such as the initial phoneme oddity task developed by Boudreau et al. (1999) are not sensitive in younger children. Overall, the current study indicates that the EPCP may be a valuable addition to our assesment inventory.

Limitations

The EPCP was too difficult for 3 year-olds. Modifications would be needed in order to use this instrument with children of this age. The concurrent validity was established with a vocabulary test. It would have been desirable to use another phonological awareness test if one had been available. Lacking such an opportunity for a direct comparison, future research should compare the EPCP to skills such as short-term verbal memory, as these are more directly linked to phonological awareness. Further research on other psychometric characteristics such as predictive validity or test-retest reliability would provide more evidence of the reliability and validity of the EPCP. Finally, further research with larger samples of children and from more geographically diverse participant groups is needed in order to provide normalization data useful for detecting children who experience delay in their phonological awareness development.

Clinical implications

The EPCP shows promise as an instrument that is sensitive to the phonological awareness in 4- and 5 year-old French-speaking preschoolers and that provides good psychometric properties. It shows some potential to be used in research or in clinical settings to measure phonological awareness training efficacy before kindergarten. The EPCP also has a potential utility in older children because no ceiling effects were obtained in the current study. However, more research is needed with larger sample of children to confirm the clinical value of the EPCP.

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Appendix

Phonological Awareness Tasks and Stimuli

Task	Stimuli in International Phonetic Alphabet	
Rhyme judgment	1. /moʁi/ & /leti/	6. /takɔv/ & /niʒɔv/
	2. /voke/ & /diʁu/	7. /pofas/ & /luʒas/
	3. /ʃemi/ & /loti/	8. /nevug/ & /fidug/
	4. /sedo/ & /ʃibɑ/	9. /mezɔt/ & /fotab/
	5. /levuʒ/ & /ʁofip/	10. /pevat/ & /ʒunik/
Initial syllable categorization	1. /vali/ & /turo/	6. /kotu/ & /kovɑ/
	2. /ziku/ & /zipɑ/,	7. /vʁidu/ & /vʁinɑ/
	3. /ʃubi/ & /ʃudɑ/,	8. //plute/ & /tʁaki/
	4. /fope/ & /ʃifu/	9. /zilʃe/ & /zilmo/
	5. /bezi/ & /bekɑ/	10. /tirlo/ & /tirvɑ/
Syllable blending	1. /zi/ & /go/	6. /gʁa/ & /blo/
	2. /bi/ & /vɑ/	7. /bil/ & /daz/
	3. /fe/ & /pa/	8. /ta/ & /pi/ & /ko/
	4. /da/ & /gʁo/	9. /de/ & /bu/ & /gɑ/
	5. /bal/ & /do/	10. /ki/ & /va/ & /le/
Syllable segmentation	1. /duve/	6. /gʁubli/
	2. /fetu/	7. /dalgiz/
	3. /bɔzɑ/	8. /patoki/
	4. /bigʁu/	9. /bedagu/
	5. /dulbe/	10. /zulate/
Syllable deletion	1. /si/ from /pasi/,	6. /ze/ from /zebo/,
	2. /fal/ from /tofal/,	7. /zi/ from /zidul/,
	3. /ʒi/ from /dɔlʒi/,	8. /vɔl/ from /vɔlde/,
	4. /flu/ from /kʁeflu/,	9. /fʁi/ from /fʁiplo/,
	5. /zav/ from /bɔlzav/,	10. /ʃis/ from /ʃistal/
Syllable inversion	1. /vidu/	6. /bazil/
	2. /zudi/	7. /gʁoza/
	3. /tefa/	8. /vulbe/
	4. /pofe/	9. /flikʁa/
	5. /vogʁi/	10. /dazvil/
Initial consonant categorization	1. /tulo/ & /vaki/	6. /dimo/ & /pubɑ/
	2. /pofɑ/ & /seli/	7. /flumɑ/ & /fʁibe/
	3. /fopi/ & /zegu/	8. /fʁemo/ & /plafi/
	4. /zuʁi/ & /zake/	9. /bʁazi/ & /kledo/
	5. /ʃetu/ & /ʃali/	10. /kʁizo/ & /klume/