Ratunku! or Just *Tunku!* Evidence for the Reliability and Concurrent Validity of the Language Use Inventory–Polish

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Purpose: To date, there is no tool for assessing early pragmatic development of Polish-speaking children. This study aimed to adapt to Polish a standardized parent report measure, the Language Use Inventory (LUI; O'Neill, 2009, in order to enable cross-cultural comparisons and to use the LUI-Polish to screen for pragmatic development in children 18–47 months of age. We concentrated on the sociocultural and functional adaptation of LUI and aimed to demonstrate its reliability, developmental sensitivity, and concurrent validity.
Method: Parents completed an online version of LUI-Polish, longitudinally at 3 time points (when the child was 20, 32, and 44 months old). In addition, parents completed the Polish adaptations of the Questionnaire for Communication and Early Language at 22 months and the Language Development Survey at 24 months. Children's spontaneous speech was assessed at 24 months, and their expressive and receptive vocabulary was assessed at 36 months.
Results: All 3 parts of the LUI-Polish (Gestures, Words, and Sentences) showed very good levels of internal consistency

at each time point. Significant correlations were observed between all parts of the LUI-Polish at all 3 measurement time points. The expected developmental trajectory was observed for boys and girls providing evidence of its developmental sensitivity for children between the ages of 2 and 4 years: an increase with age in the total score (due to an increase in Words and Sentences) and a decrease in Gestures. Supporting concurrent validity, significant correlations were found between children's performance on (a) the LUI-Polish at 20 months and the Questionnaire for Communication and Early Language at 22 months as well as the Language Development Survey and spontaneous speech measures at 24 months and (b) the LUI-Polish at 32 months and the 2 measures of vocabulary comprehension and production at 36 months.
Conclusion: The Polish adaptation of the LUI demonstrated good psychometric properties that provide a sound basis for cross-cultural comparisons and further research toward norming of the LUI-Polish. Moreover, the expected developmental trajectory in the pragmatic development of Polish children was observed.

There are at least three reasons for conducting research aimed at providing valid adaptations of measures of language development in children whose first and/or only language is not English. First, from a purely scientific point of view, cross-cultural comparisons, as well as studies aimed at explaining language universals or language-related specificity in other areas of development, necessitate the use of comparable/similar tools. Most researchers agree that the adaptations of tools should meet the cultural and contextual needs of the population evaluated (cultural sensitivity) while retaining a firm basis for cross-cultural comparisons (Alegria et al., 2004; Matías-Carrelo et al., 2003). Second, there is an urgent need to provide practitioners and clinicians outside English-speaking societies with reliable and valid techniques to diagnose language impairments/delays as early as possible (Uyanik & Kandir, 2014). Third, in modern multilanguage societies, there is a strong necessity to prepare tools valid for the growing populations of bilingual children, such as

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the Polish–English migrant population in the United Kingdom (Haman et al., 2017; see also Petersen, Chanthongthip, Ukrainetz, Spencer, & Steeve, 2017; Pua, Lee, & Rickard Liow, 2017). Therefore, in our study, we aimed to adapt to Polish a measure of pragmatic development, the Language Use Inventory (LUI; O'Neill, 2009; Pesco & O'Neill, 2012), and to describe the pragmatic development of Polish 2- to 4-year-olds.

Early Pragmatic Milestones and Language Use

The first milestones of pragmatic development are achieved between 9 and 18 months of life (Mumme & Fernald, 2003; Woodward, 2003). From 9 months of age, infants begin to understand communicative intentions (Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998), to initiate and respond to joint attention (Mundy et al., 2007), and to use gaze as predictive of others' future behaviors or intentions (Stephens & Matthews, 2014). At around the same age, they start to use gestures and vocalizations for different pragmatic functions, such as requesting, labeling, answering, greeting, and protesting (Bates, Camaioni, & Volterra, 1975; Dale, 1980). One-year-olds are already able to track whether or not they have shared experience with a given person and to communicate intentions combining gaze, vocalization, and gesture and repair communication (Golinkoff, 1993; Guidetti & Nicoladis, 2008). One study of 9- to 15-month-olds (Carpenter et al., 1998) showed that children progressed from sharing to following to directing others' attention and behavior. Many of these skills show cross-cultural similarity (Callaghan et al., 2011); however, there are few studies regarding their development in Polish children. So far, it is known that Polish 12-month-olds are able to react to adults initiating interaction and respond to their initiative, to use pointing gestures to request and share attention, and to initiate and respond to joint attention, although—compared to American children—they initiate joint attention less often (Białecka-Pikul, Białek, Stępień-Nycz, & Karwala, 2014; Białek, Białecka-Pikul, & Stępień-Nycz, 2014).

Gestures and early gaze following ability are also predictive of linguistic skills (Brooks & Meltzoff, 2005; Colonnesi, Stams, Koster, & Noom, 2010). With regard to Polish children, in particular, a longitudinal study of 18-month-olds demonstrated that their selective "relevant informative pointing" for an adult predicts their language production and comprehension at 2 years of age (Białek, Białecka-Pikul, Filip, & Broda, 2018). However, when it comes to mastering language, Polish is considered to be one of the more difficult to acquire (Dąbrowska & Tomasello, 2008). For example, studies report slower vocabulary acquisition in Polish 2-year-olds as compared to English-speaking children (Rescorla, Constants, Białecka-Pikul, Stępień-Nycz, & Ochał, 2017; Smoczyńska et al., 2015). Nevertheless, large individual differences in vocabulary size and a significant gender effect have been found for Polish children, consistent with data for English-speaking children of the same age (Rescorla et al., 2017). Considering further gender differences

in the development of language, girls seem to have an advantage over boys during the first 3 years of life (Acredolo & Goodwyn, 1988; Bornstein, Cote, et al., 2004; David & Wei, 2008; Fenson et al., 2007). For example, from 8 to 30 months, girls score higher in productive vocabulary and combining words (Eriksson et al., 2012) and, at 2 and 3 years, in vocabulary production and sentence complexity: an advantage that has been confirmed in English and 10 non-English communities (e.g., Croatian, Swedish, Estonian; see Bornstein, Hahn, & Haynes, 2004). In line with these findings, an analysis of vocabulary development in Polish children has revealed that, from 13 or 14 to 36 months, boys achieve the same milestones a bit later than girls (Smoczyńska et al., 2015).

Very little is known about gender differences in early pragmatic development. Adaptations of the LUI to other languages, however, provide some insight. In the standardization study of the original English LUI, significant gender differences were found in the direction of higher performance by girls and led to different norms for girls and boys (O'Neill, 2009). However, on the LUI-Italian (Longobardi, Lonigro, Laghi, & O'Neill, 2017), girls performed higher than boys only in the younger age groups (24–29 and 30–35 months), whereas the opposite pattern was observed in the oldest age groups (42–47 months). Similarly, with the LUI-French (Pesco & O'Neill, 2016), girls outperformed boys in the age range of 24–36 months, but in the older age groups, the difference disappeared. So far, no studies have described the developmental trajectories of pragmatic abilities of Polish boys and girls during the second and third years of life.

The LUI and Its Advantages

Because early language skills predict not only language but also general development and later school success (e.g., Glascoe, 1991; Stothard, Snowling, Bishop, Chipchase, & Kaplanet, 1998), the need for having good and reliable tools to measure them is recognized. In Poland, two such tools are available: the MacArthur–Bates Communicative Development Inventories (CDI; original: Fenson et al., 1993, 2007; Polish: Smoczyńska et al., 2015) and the Language Developmental Survey (LDS; Rescorla, 1989; Polish: Rescorla et al., 2017). Both assess language production in very young children (taken together: from 8 to 36 months), and both focus mostly on semantics and/or grammar. No tool to assess pragmatics is available in Poland. Meanwhile, it has been demonstrated that pragmatic language impairment, including difficulties with using language in context, predicts future behavioral problems (Ketelaars, Cuperus, Jansonius, & Verhoeven, 2010). Atypical pragmatic development has implications for children's later social and academic competence (Norbury, 2014), and children suffering from social pragmatic deficits co-occurring with specific language impairment display low social self-esteem, inappropriate negotiation and conflict resolution strategies, and other difficulties in social interactions (Marton, Abramoff, & Rosenzweig, 2005). These findings demonstrate the urgent

need for reliable, valid, and standardized tools to assess the emergence of the earliest pragmatic skills in addition to semantics (vocabulary) and grammar.

The "Language Use Inventory: An Assessment for Young Children's Pragmatic Language Development" (LUI; O'Neill, 2009, 2012) is a standardized parent report instrument that provides a detailed picture of the order of emergence of pragmatic language abilities in children between 18 and 47 months of age. Pragmatics is defined as the ability to use language effectively and appropriately in social interactions with others (Bates, 1976; O'Neill, 2012, 2014). The LUI aims at measuring the emergence of these skills via 14 subscales, amounting to a total of 180 questions with 95% of the items having a yes/no answer format. These subscales are organized into three parts: Part 1, "How your child communicates with gestures"; Part 2, "How your child communicates with words"; and Part 3, "Your child's longer sentences." In other words, major milestones of pragmatic development are covered by this tool. The 161 items in Parts 2 and 3 comprise the LUI total score (O'Neill, 2009). The LUI assesses a child's language use in a variety of different situations and functions, such as directing an adult's attention, sharing interest, teasing, using mental state terms, and commenting or asking about another person's behavior. The original tool was developed for English-speaking children. The LUI has shown strong internal consistency and reliability, as well as sensitivity and specificity, in distinguishing between typically developing children and children with language delay (Miller et al., 2015; O'Neill, 2007). Good predictive validity has also been demonstrated with respect to later language outcomes at the age of 5–6 years (Pesco & O'Neill, 2012). Portuguese (Guimarães, Cruz-Santos, & Almeida, 2013), Italian (Longobardi et al., 2017), and French (Pesco & O'Neill, 2016) adaptations, all with good psychometric properties, are also available. Thus, we aimed to develop the LUI-Polish and describe the pragmatic development of Polish children aged from 20 to 44 months.

Our decision to adapt the LUI for Polish children was the result of several considerations. First, the LUI is a parent report measure. It has been shown that primary caregivers are able to accurately assess their infants' and/or toddlers' development with regard to their cognitive, motor, language, and communication skills (Bricker & Squires, 1989; Bricker, Squires, Kaminski, & Mounts, 1988; Dale, 1996). Parent report measures are quick, easy to use, and less cost intensive than direct assessments (Bishop & McDonald, 2009; Gatt, O'Toole, & Haman, 2015; Guiberson, Rodríguez, & Dale, 2011; McLeod & Harrison, 2009; Pua et al., 2017; Sachse & Von Suchodoletz, 2008; Skarakis-Doyle, Campbell, & Dempsey, 2009). They may also be superior in cases where the child is shy or where the presence of an examiner may distort natural communicative and linguistic behaviors. Moreover, parental concerns about their children's development have been shown to be an accurate indicator of developmental delays, regardless of variation in parents' education and childrearing experiences (Glascoe,

2000), as well as their socioeconomic status or well-being (see Guiberson et al., 2011). Parents are considered to be a reliable source of information on the communicative–linguistic development of their children (Camaioni, Castelli, Longobardi, & Volterra, 1991; O'Toole et al., 2016), and the use of parent report measures is recognized as a valid means for identifying toddlers with low language skills or language delays (Guiberson, 2008; O'Neill, 2007; Rescorla & Alley, 2001). The critical role of parent report measures in language and communication assessment (Bishop & McDonald, 2009) also stems from their utility and accuracy in identifying potential communication and/or linguistic problems during very early verbal stages of development. Importantly, for example, in contrast to other existing measures designed for children older than 4 years of age (e.g., Children's Communication Checklist–Second Edition; Bishop, 1998, 2003), the LUI is designed for children who are 18–47 months of age. Moreover, given that the LUI is a parent report measure, it can serve as a valid screening tool before direct assessment and clinical diagnosis are possible. These merits and distinctive features of the LUI encouraged us to work on the LUI-Polish.

So far, there has been no attempt to adapt into Polish a valid tool assessing pragmatic language ability. Good, reliable adaptation can enable the development of a more complete, detailed picture of the emergence of Polish language skills, extending current findings to include the functional use of means of communication by Polish children in their everyday settings. Moreover, assessment of pragmatic language skills in children from different countries and cultures can expand ongoing debate as to whether children acquiring different languages manifest universal versus language-specific patterns of development (Evans & Levinson, 2009; Rescorla et al., 2017; Rescorla, Frigerio, Sali, Spataro, & Longobardi, 2014; Slobin, 1985). For example, using the LUI-Polish, we can determine whether there is a similar, rapid increase in the attainment of the pragmatic functions of language captured by its subscales between the ages of 2 and 4 years as observed with the LUI-English, whether children's use of gestures decreases as spoken language increases, and whether associations between pragmatic and vocabulary abilities at 3 years of age are observed. (Our specific aims and research questions in this study are presented in the Current Study section below.)

Our Approach to the Adaptation of the LUI-Polish

Cross-cultural studies and adaptations of instruments may be approached from two different perspectives, involving either the evaluation of a concept "from the inside," from within the given culture and its context, or the identification and comparison of equivalent phenomena across different cultural contexts using more "culturally neutral or objective constructs" (see Alegria et al., 2004; Matías-Carrelo et al., 2003). These perspectives, termed *emic* and *etic,* respectively, each possess advantages and disadvantages (for more details, see also Chavez, Matías-Carrelo,

Barrio, & Canino, 2007; Matsumoto & van de Vijver, 2010; Rescorla, Nyame, & Dias, 2016). Reconciling these two approaches during the adaptation of assessment tools is considered one of the major challenges in cross-cultural research. It is only by integrating and balancing the two approaches within one cross-cultural research methodology that one can avoid the problem (or dilemma) of lacking generalizability versus prioritizing the tool standardization at the expense of its validity. We decided to follow a more balanced approach to avoid placing a major emphasis on either the *emic* or *etic* perspective.

Therefore, bearing in mind that children learning different languages are socialized to use language in varied ways (Küntay, Nakamura, & Ateş-Şen, 2014), we took into consideration the fact that production of an equivalent version of a tool testing early developmental stages of communication/language use would necessitate not only the tool translation but also its sociocultural, functional, and metric adaptation (see Peña, 2007). Specifically, the adapted items of the measure need to tap the same sociocultural meaning(s) for the given cultural linguistic group (sociocultural equivalence), examine the same target construct(s) (functional equivalence), and involve the same level of difficulty (metric equivalence). In the case of assessment methods used in very early screening, before a potential diagnosis, meeting such demands becomes much more important than achieving purely linguistic compatibility. Solely relying on translation and back-translation may not necessarily provide equally relevant measures (Peña, 2007), especially in case of a tool exploring the child's use of gestures, words, and sentences, in a variety of situations and functions—all socially and culturally determined phenomena (Küntay et al., 2014; Rogoff, 2003). In case of language measures, the technique of translation and back-translation is regarded as problematic or misleading and usually not sufficient to obtain cultural equivalency of the instrument (Matías-Carrelo et al., 2003; Prado et al., 2010). The most commonly used and acknowledged approaches ensure the consistency and uniformity of all items in both language versions and their correspondence in terms of sociocultural, functional, and metric equivalence and involve additional expert reviews and making use of the already existing—valid and recognized—adaptations of similar tools (e.g., other parent reports for children in the same age range; Matsumoto & van de Vijver, 2010; Peña, 2007).

Importantly, given that our goal was to adapt and not solely translate the tool, we aimed to reconcile the emic/etic approach by integrating translation of the tool with its sociocultural and functional adaptation. Our goal was to ensure the consistency and uniformity of all items between the Polish and English (Canadian) versions as much as possible. Thus, for our approach, the focus in the case of pragmatic communication is on whether a child expresses the particular meaning—not whether he or she does so, for example, with the same gesture or with a fully grammatically correct word/sentence. For example, the short English word *help* is, in Polish, the very long word *ratunku*. Thus, 2-year-olds frequently use its abbreviated form *tunku*, and

so we allowed parents to credit their children with the use of *ratunku* even when only the abbreviated form was used. The content, semantic, and syntactic modifications we ultimately introduced in the LUI-Polish reflected this focus on pragmatics (described in more detail in the Method section below and in Supplemental Material S1). Ultimately, we aimed to introduce modifications that we determined as necessary to achieve sociocultural and functional correspondence between the two linguistic versions of the LUI, as well as their compatibility in terms of assessed competencies and accuracy within the given cultural contexts—a more important goal and concern than solely linguistic correspondence and uniformity.

Current Study

We aimed to conduct a first study toward the development of a standardized Polish version of the LUI (i.e., the LUI-Polish). We took the opportunity to prepare and use the LUI-Polish in a longitudinal project with over 300 typically developing children. This allowed us to test the reliability of the LUI-Polish at three time points (20, 32, and 44 months). We also aimed to verify the validity of the LUI-Polish in three ways, which corresponded to three research questions (i.e., research hypotheses) that we sought to answer.

First, we checked for content validity and calculated the correlations among three parts of the LUI-Polish between measurement time points. The difference in LUI-Polish scores between subsequent time points was also examined to assess the developmental sensitivity of the LUI-Polish (i.e., if the growth observed in Polish is similar to that observed in English from 2 to 3 years of age). Thus, we expected negative correlations between Part 1 (Gestures) and Parts 2 and 3 (Words and Sentences) and positive correlations between Parts 2 and 3. Moreover, we hypothesized continuous growth in two scales of the LUI-Polish (Words and Sentences, as well as in the total score) between 20 and 44 months but expected a decrease in the scores of Part 1 (Gestures) between 20 and 32 months.

Second, a factor analysis was conducted at each time point in which we expected to confirm two factors, "gestures" and "words + sentences," as found in O'Neill (2007). We hypothesized that the LUI-Polish would reveal the same two-factor structure as the original LUI-English.

Third, to examine concurrent validity, we calculated the correlations between (a) children's LUI-Polish scores at 20 months and scores from two other questionnaires, the Questionnaire for Communication and Early Language (QCEL; Camaioni et al., 1991) at 22 months and the Language Development Survey (LDS; Rescorla et al., 2017) at 24 months, and also between the LUI-Polish and spontaneous speech measures at 24 months and (b) the LUI-Polish at 32 months and the two measures of vocabulary comprehension and production at 36 months. Based on previous results (see Matthews, Binney, & Abbot-Smith, 2018, for a review), we expected significant, positive

correlations between the LUI-Polish and the other language and gesture measures. In addition, based on Polish data (Smoczyńska et al., 2015), we expected differences between boys and girls in the scores of LUI-Polish, specifically that girls would outperform boys in Words and Sentences at ages 20, 32, and 44 months.

Method

Participants

Participants were parents and their children born between February and July 2011. The children were mostly from a large city environment (Krakow, Poland; 71%–75% of the group), and their parents were generally educated to a university degree level (76% of the group). Parents were invited to participate in the larger research project (The Birth and Development of Mentalizing Abilities, which took place at the Early Child Development Psychology Laboratory at the Jagiellonian University, Krakow) via regular mail or e-mail and completed an online version of the LUI-Polish at three time points, when children were 20, 32, and 44 months old. Moreover, parents were asked to complete the online Polish version of two other scales, the QCEL (Camaioni et al., 1991) and the LDS (Rescorla et al., 2017), when children were 22 and 24 months old, respectively. Because not all the parents contributed the necessary information at each time point, the number of participants examined in our analyses varied and ranged from 139 to 294. Similarly, not all the children participated in the laboratory sessions, which took place between these time points. Therefore, an exact N is provided for subsequent analyses. Detailed information regarding participants is provided in Table 1. Children participated in two lab sessions at ages 24 (Time 1, $T1_{Lab}$) and 36 (Time 2, $T2_{Lab}$) months.

Children whose parents did not complete the LUI-Polish at T2 or T3 did not differ from children whose parents provided data at these time points with respect to their LUI-Polish total score (maximum score = 161) at T1, $F(1, 242) = 0.62$, $p = 0.43$, and $F(1, 242) = 2.83$, $p = .09$,

respectively. Similarly, children who did not take part in the lab session at 24 or 36 months did not differ from children who provided data on these time points with respect to their LUI-Polish total score at T1 (for 24 months), $F(1, 242) = 1.43$, $p = 0.23$, and T3 (for 36 months), $F(1, 216) = 3.08$, $p = .08$. Children whose parents provided data on the LDS did not differ significantly from children with no LDS data with respect to their LUI-Polish total score at T2, $F(1, 254) = 0.52$, $p = 0.47$. However, children whose parents provided data on the QCEL differed significantly from children with no QCEL data with respect to their LUI-Polish total score at T1, $F(1, 242) = 8.99$, $p = .003$: Children without QCEL data had significantly higher scores on the LUI-Polish.

Procedure

Parents completed the LUI-Polish on three occasions, and children were tested in the Early Child Development Laboratory at two time points. During each lab visit, children were tested individually in a small room. The sessions lasted approximately 60 min and were video- and audio-recorded. At first, to get the children to know the experimenter, the child played a warm-up game with the experimenter for a couple of minutes. Children were tested with social–cognitive, language, and cognitive tasks not relevant to the current study and not presented here. Here, we present only the brief descriptions of the tasks used to examine the concurrent validity of the LUI-Polish.

Measures

Parent Report Questionnaires

LUI-Polish. We followed the standard procedures described below while preparing the LUI-Polish, after receiving the publisher's permission. Our process allowed us to discover variation attributable to linguistic and socio-cultural differences—factors necessary to consider when aiming at achieving functional or conceptual equivalence

Table 1. Number and age of participants at each time point.

				Age in months				
	N			**Boys**		**Girls**		**Total**
Phase of the study	**Boys**	**Girls**	**Total**	**M (SD)**	**Range**	**M (SD)**	**Range**	**M (SD)**
LUI-Polish T1 ($T1_{LUI}$)	141	121	262	20.24 (0.97)	18.32–22.85	20.23 (0.96)	17.83–22.81	20.24 (0.97)
Lab session T1 ($T1_{Lab}$): spontaneous speech sample	161	133	294	23.92 (0.38)	23.11–25.70	23.90 (0.35)	23.25–25.18	23.91 (0.37)
QCEL completion	77	62	139	22.15 (0.50)	21.07–23.77	22.35 (0.67)	21.08–24.37	22.24 (0.59)
LDS completion	111	90	201	24.21 (0.61)	22.03–25.70	24.22 (0.78)	21.57–25.70	24.22 (0.69)
LUI-Polish T2 ($T2_{LUI}$)	146	110	256	32.10 (0.97)	30.71–41.42	32.21 (0.86)	30.68–36.05	32.15 (0.93)
Lab session T2 ($T2_{Lab}$): PVT-C and Picture Naming Task	151	127	278	35.44 (0.49)	34.85–38.98	35.47 (0.41)	34.46–36.95	35.46 (0.45)
LUI-Polish T3 ($T3_{LUI}$)	121	97	218	44.40 (0.71)	41.77–47.47	44.39 (0.72)	42.71–46.74	44.40 (0.71)

Note. LUI = Language Use Inventory; T1 = Time 1; QCEL = Questionnaire for Communication and Early Language; LDS = Language Developmental Survey; T2 = Time 2; PVT-C = Picture Vocabulary Test–Comprehension; T3 = Time 3.

(Sidani, Guruge, Miranda, Ford-Gilboe, & Varcoe, 2010). For a number of reasons, we are convinced that our approach allowed us to remain as close as possible to the original LUI, while still achieving consistency with the Polish language and culture.

First, because of sociocultural differences between Canada and Poland, after the initial translation by Białecka-Pikul, Duda, and Kuś (2011), the tool (both the instructions and items) was reviewed simultaneously by three experts in linguistics and child development, including the author of the original LUI-English, who consulted on the necessary content, semantic, and syntactic modifications.

Second, during these consultations, some important properties of the Polish language and Polish parents' practices or attitudes regarding their communication with children were taken into account. That led us to supplement the main instructions for parents in the LUI-Polish given that instructions are also an aspect of a measure that must be considered in an adaptation (Prado et al., 2010). For instance, given the morphological richness of Polish (Dąbrowska & Tomasello, 2008; Smoczyńska, 1985), when Polish children start using words, they often tend to truncate parts of words as they pronounce them—a process that can result in partial/distorted articulation (e.g., "ratunku" [*help*] articulated as "tunku" [*elp*]). Moreover, as Polish parents may be less lenient than parents in other countries when judging what to credit as a word (see Rescorla et al., 2017), such "truncated" word forms could be overlooked while judging their children's capability—a risk that we prevented by introducing some supplementary instructions in the LUI-Polish in comparison to the LUI-English. We also introduced linguistic changes within items and the examples provided along with items (see Supplemental Material S1).

Third, when we encountered difficulty with the direct translation of items/words, we used the Polish CDI (Smoczyńska et al., 2015) as a reference point and chose the word used in this questionnaire given its careful adherence to the adaptation guidelines of the CDI's advisory board (Dale, 2015; Dale & Penfold, 2011).

The main changes to the LUI-Polish compared to the original LUI-English were composed of only the few elements listed in Supplemental Material S1, and these changes pertained ultimately only to presenting the instructions, supplementing items with examples more typical in Polish, and changing items when the direct translation is misleading (e.g., We used "spinach fe" instead of "yucky broccoli" as, in Poland, children are more frequently encouraged to eat spinach and "fe" is a semantic equivalent of "yucky."). That is, the overall number of items in the questionnaire and the number of items comprising the LUI total score remained unchanged in the LUI-Polish. Part 1 of the LUI-Polish consists of two subscales (a total of 13 items), Part 2 consists of three subscales (one subscale not scored; two subscales with a total of 28 scored items), and Part 3 consists of nine subscales (one subscale not scored; eight subscales with a total of 133 scored items). Consistent with the original LUI-English, the LUI-Polish total score is derived from the 10 scored subscales in Parts 2 and 3 and results in a total maximum score of 161 points. Some examples of Polish items from each subscale are shown in Supplemental Material S2.

QCEL. The QCEL (Camaioni et al., 1991; translation of the original Italian version; see Supplemental Material S3 for a full description) is designed to assess the development of children's verbal and nonverbal communicative abilities, especially use of gestures and words (see Dromi, 2003; Longobardi, Rossi-Arnaud, & Spataro, 2011, 2012). We used only Form II of QCEL. It is composed of two main parts ("Contexts" and "Lists") covering three sections of communicative behaviors. The first part ("Contexts") consists of questions that concern child's motor, gestural, vocal, and linguistic behaviors in six different routine or play occasions. Parents indicate whether the child produces a given type of behavior and, if so, how frequently, according to a 3-point scale: *never* (0), *sometimes* (1), and *often* (2). The second part of the QCEL ("Lists") includes two lists of referential gestures ("Gestures") and of words ("Words"), and parents indicate which gestures and words the child employs. All three sections ("Contexts," "Gestures," and "Words") of the Polish version of QCEL were completed by parents using an online platform when children were 22 months old. For the "Contexts" section, the mean frequency of using a pointing gesture was used as our variable in the analyses, whereas for the remaining two sections, our variable was the total number of gestures and words used.

LDS. The LDS (Achenbach & Rescorla, 2000; Rescorla, 1989) is a parent report measure of a child's expressive vocabulary and beginning word combinations designed for parents of children from 18 to 35 months of age. The LDS has been successfully used in several different languages (e.g., Rescorla, Lee, Oh, & Kim, 2013; Rescorla et al., 2016), including Polish (Rescorla et al., 2017). It consists of 310 words organized within 14 semantic categories (e.g., toys, body parts, food, animals, people), and parents are asked to tick the words a child spontaneously uses. The number of words spontaneously used by the child is an index of vocabulary and was the variable used in our analyses. The LDS was completed when children were 24 months old, using an online platform (see Table 1 and Supplemental Material S3 for a full description).

Lab Measures

Spontaneous speech sample. During the first lab session ($T1_{Lab}$, 24 months; see Table 1), each child performed tasks relevant to the larger study. The tasks used for coding the speech sample included (a) snack delay (see Białecka-Pikul, Byczewska-Konieczny, Kosno, Białek, & Stępień-Nycz, 2018, for a detailed description of the procedure), (b) frustration task, and (c) self-conscious emotion task (Lewis, Sullivan, Stanger, & Weiss, 1989). During all three tasks, the parent and/or an experimenter were present in the room. In the snack delay, children were seated on their parent's lap in front of their favorite snack, hidden under a transparent cup, and they were asked not to eat the snack until the researcher returned to the room (which lasted

90 s). In the frustration task, children were given stickers closed in a small transparent ziplock bag, and they were observed by the parent and the experimenter for 2 min while trying to open the bag. In the self-conscious emotion task, children were completing puzzles alone but while sitting on the parent's lap. These tasks were chosen because, after the initial instruction provided by the experimenter, no other prompts or questions were asked, and thus, this allowed us to observe children's spontaneous, and not elicited, words/utterances directed to the parent and/or experimenter. Moreover, parents were directly asked to accept all the children's behaviors or comments but not to help the children, talk to them, encourage them to talk, or engage them in verbal exchange. For 5 min of the session, which involved these three tasks described above, the observers counted the number of spontaneous single- or two-word or longer utterances that the child used communicatively and produced in a full or partially intelligible manner. Interrater reliability for these words and utterances counted on the basis of double coding of 20% of the videos was $r = .83$ ($p < .001$), ICC(2,1) = 0.57 [.01, .81].

Picture Vocabulary Test–Comprehension. Developed by Haman and Fronczyk (2012), the Picture Vocabulary Test–Comprehension (PVT-C) was designed to assess word comprehension in children aged 2–5 years. It is a Polish analog of a measure like the Peabody Picture Vocabulary Test–Third Edition (Dunn & Dunn, 1997). For each word, the child selects one of four pictures that depicts the referent. Of the 88 target words, 51 were nouns, 25 were verbs, and 12 were adjectives. The ceiling was four consecutive errors. Children were assessed with the PVT-C at 36 months (see $T2_{Lab}$ in Table 1 and Supplemental Material S3 for details). Raw scores were used for analyses.

Picture Naming Task. The tool (Haman & Smoczyńska, 2010) consists of 22 single pictures of objects (people, animals, things) and activities that the child is supposed to name with one word. The children were tested with this task at 36 months (see $T2_{Lab}$ in Table 1 and Supplemental Material S3 for details). Raw scores were used for analyses.

Analytical Strategy

First, descriptive statistics for all measures of language were calculated. To assess reliability of the LUI-Polish, the internal consistency coefficient or Cronbach's alpha was calculated, following O'Neill (2007). Second, correlations between all parts of the LUI-Polish were analyzed using Pearson correlation coefficients, both at the same measurement time points and between points, to assess the content validity of the LUI-Polish and to measure if it is sensitive to developmental changes. A repeated-measures analysis of variance (ANOVA) was also conducted to examine differences between LUI scores at the three time points. To analyze the structure of the LUI-Polish, the hypothesized two-factor solution was analyzed with confirmatory factor analysis (CFA). As the CFA did not yield satisfactory results, an exploratory factor analysis was then conducted, following the same procedure as

used in O'Neill. Finally, the concurrent validity of the LUI-Polish was assessed by calculating correlations between scores on the LUI-Polish and the other gesture and language measures. As the LUI-Polish and other gesture and language measures were not administered at the same time points (see Table 1), only results for the closest time points were analyzed. All analyses were conducted using SPSS and Amos software (v.24).

Results

Descriptive Data

Table 2 presents the raw data for LUI-Polish at all three time points (20, 32, and 44 months). Supplemental Material S4 presents descriptive statistics for the QCEL, LDS, speech sample measure, PVT-C, and Picture Naming Task.

Reliability of the LUI-Polish

In order to verify the internal consistency, Cronbach's alpha coefficients for the parts and subscales of the LUI-Polish were calculated. The values obtained at each of the three time points (20, 32, and 44 months) are presented in Table 3.

Because the Subscales E and L contain open questions and are not numerically scored, they are not included in the LUI-Polish total score. The three parts of the LUI-Polish and the total score showed acceptable to very good levels of internal consistency at each time point. Subscale B has only two items, and this can explain the lower alpha at T1. Part 1 of the LUI-Polish (i.e., Gestures) was not used at T3 because children were already 44 months old and communicated mainly with words and sentences.

Content Validity of the LUI-Polish

At both T1 and T2, negative correlations were found between Part 1 (Gestures) of the LUI-Polish and Part 2 (Words; T1: $r = -.19$, $p = .003$; T2: $r = -.15$, $p = .013$) and Part 3 (Sentences; T1: $r = -.19$, $p = .002$; T2: $r = -.18$, $p = .004$). These negative correlations correspond with an age-expected decrease in gestures and increase in words and sentences.

Moreover, significant positive correlations for all parts of the LUI-Polish between measurement time points were observed. For Part 1 (Gestures), there was a significant correlation between T1 (20 months) and T2 (32 months; $r = .32$, $p < .001$). For Part 2 (Words), T1 and T2 scores were correlated ($r = .35$, $p < .001$), as were T2 and T3 scores ($r = .15$, $p = .034$). For Part 3 (Communication With Sentences), scores were correlated at T1 and T2 ($r = .56$, $p < .001$), as well as at T1 and T3 ($r = .37$, $p < .001$) and at T2 and T3 ($r = .64$, $p < .001$).

To assess developmental changes between the three time points for Part 2 (Words), Part 3 (Sentences), and the total score of the LUI-Polish, a 3×2 repeated-measures ANOVA was conducted with three times of assessment

Table 2. Descriptive statistics for the Polish version of Language Use Inventory (LUI-Polish) scores at three time points: means (standard deviations).

LUI-Polish subscales and parts	Max possible score	T1			T2			T3		
		Girls	Boys	Total	Girls	Boys	Total	Girls	Boys	Total
A	11	9.65 (1.72)	9.67 (1.70)	9.66 (1.07)	6.87 (3.28)	7.32 (3.02)	7.13 (3.13)	—	—	—
B	2	1.95 (0.22)	1.98 (0.15)	1.97 (0.18)	1.85 (0.43)	1.88 (0.38)	1.87 (0.40)	—	—	—
C	21	13.14 (4.34)	10.97 (4.88)	11.98 (4.75)	18.55 (1.24)	17.88 (2.43)	18.17 (2.03)	18.89 (0.56)	18.92 (0.36)	18.90 (0.46)
D	7	5.54 (1.64)	4.96 (2.03)	5.23 (1.88)	6.65 (0.79)	6.63 (0.85)	6.64 (0.82)	6.51 (0.88)	6.50 (1.13)	6.50 (1.02)
F	6	3.52 (1.57)	3.05 (1.66)	3.27 (1.63)	5.61 (0.85)	5.34 (1.01)	5.46 (0.95)	5.85 (0.39)	5.89 (0.31)	5.87 (0.35)
G	9	2.92 (2.39)	2.23 (2.29)	2.55 (2.36)	8.03 (1.83)	7.68 (2.01)	7.83 (1.94)	8.89 (0.41)	8.76 (0.68)	8.82 (0.58)
H	36	9.46 (8.45)	6.68 (6.37)	7.98 (7.53)	30.05 (7.05)	27.08 (8.48)	28.36 (8.02)	35.04 (2.14)	34.09 (3.30)	34.51 (2.88)
I	14	4.81 (3.53)	4.09 (3.42)	4.43 (3.48)	11.73 (2.65)	10.82 (3.13)	11.21 (2.96)	13.25 (1.18)	12.99 (1.65)	13.11 (1.46)
J	5	0.41 (0.66)	0.44 (0.68)	0.42 (0.67)	1.82 (1.40)	1.61 (1.25)	1.70 (1.32)	2.61 (1.43)	2.87 (1.28)	2.75 (1.35)
K	12	3.26 (2.19)	2.77 (2.10)	3.00 (2.15)	8.33 (2.31)	7.73 (2.68)	7.98 (2.54)	10.37 (1.49)	9.83 (1.71)	10.07 (1.64)
M	15	2.54 (3.07)	2.33 (2.73)	2.43 (2.89)	11.05 (3.31)	10.07 (3.62)	10.49 (3.52)	13.39 (2.10)	12.85 (2.50)	13.09 (2.34)
N	36	2.49 (4.02)	1.69 (3.23)	2.06 (3.64)	23.38 (9.64)	19.51 (11.09)	21.18 (10.65)	32.10 (5.36)	30.54 (6.28)	31.23 (5.93)
Part 1: Gestures	13	11.60 (1.76)	11.65 (1.69)	11.63 (1.72)	8.72 (3.45)	9.20 (3.14)	8.99 (3.27)	—	—	—
Part 2: Words	28	18.58 (5.69)	15.85 (6.45)	17.12 (6.24)	25.20 (1.81)	24.51 (2.98)	24.80 (2.57)	25.39 (1.17)	25.42 (1.20)	25.41 (1.19)
Part 3: Sentences	133	29.41 (22.45)	23.23 (19.02)	26.12 (20.89)	99.99 (25.56)	88.84 (29.78)	94.20 (28.44)	121.49 (11.26)	117.83 (14.27)	119.46 (13.12)
LUI-Polish total score	161	48.29 (26.71)	39.59 (24.46)	43.69 (25.86)	125.19 (26.70)	114.34 (31.89)	119.00 (30.20)	146.89 (11.82)	143.25 (14.63)	144.87 (13.54)

Note. Em dashes indicate the subscale/part was not completed at a given time point. Max = maximum; T1 = Time 1; T2 = Time 2; T3 = Time 3; A = Gestures/requests; B = Gestures/directing attention; C = Words/types of words; D = Words/requests for help; F = Sentences/directing attention; G = Sentences/comments about things; H = Sentences/comments about self and others; I = Sentences/activities with others; J = Sentences/teasing and sense of humor; K = Sentences/interest in words and language; M = Sentences/adapting conversation; N = Sentences/longer sentences and stories; Gestures = sum of A and B; Words = sum of C and D (Scale E is not scored); Sentences = sum of F through N (Scale L is not scored).

Table 3. Cronbach's alpha coefficients for the parts and subscales of the Polish version of Language Use Inventory at three time points.

Parts and subscales[a]	T1: 20 mos α	T2: 32 mos α	T3: 44 mos α
Part 1: Gestures	.66	.83	X
A	.67	.84	X
B	−.02	.49	X
Part 2: Words	.91	.89	.63
C	.89	.88	.57
D	.76	.64	.66
E	n/a	n/a	n/a
Part 3: Sentences	.97	.98	.95
F	.73	.69	.004
G	.80	.85	.52
H	.94	.95	.86
I	.85	.85	.68
J	.33	.59	.53
K	.72	.78	.60
L	n/a	n/a	n/a
M	.84	.85	.76
N	.90	.96	.92
Total score	.89	.85	.76

Note. "X" indicates did not administer at this age. T1 = Time 1; mos = months; T2 = Time 2; T3 = Time 3; n/a = not applicable.

[a]For the proper names of parts and subscales, see Supplemental Material S2.

as a repeated measure and gender as a between-subjects factor (for Part 1 [Gestures], a 2 × 2 repeated-measures ANOVA was conducted as parents did not complete this part of the LUI-Polish at T3). For all three parts of the LUI-Polish, as well as for the total score, a main effect of time of assessment was observed: a decrease in communicating with gestures between 20 and 32 months, $F(1, 218) = 161.90$, $p < .001$, $\eta_p^2 = .43$, and an increase in the total score, $F(2, 164) = 1771.07$, $p < .001$, $\eta_p^2 = .96$, and in communicating with words, $F(2, 332) = 310.53$, $p < .001$, $\eta_p^2 = .65$, and sentences, $F(2, 334) = 2067.11$, $p < .001$, $\eta_p^2 = .93$. This increase was significant between 20 and 32 months for the total score, $F(1, 165) = 1914.85$, $p < .001$, $\eta_p^2 = .92$, and for both Part 2 (Words), $F(1, 166) = 342.70$, $p < .001$, $\eta_p^2 = .67$, and Part 3 (Sentences), $F(1, 167) = 1835.59$, $p < .001$, $\eta_p^2 = .92$, but between 32 and 44 months, it was significant only for the total score, $F(1, 165) = 244.61$, $p < .001$, $\eta_p^2 = .60$, and Part 3 (Sentences), $F(1, 167) = 267.03$, $p < .001$, $\eta_p^2 = .62$. For Part 2 (Words), the result was not significant, $F(1, 166) = 3.76$, $p = .054$, $\eta_p^2 = .02$.

CFA

Based on the structure described in O'Neill (2007), a CFA was conducted separately with the data from each time point. For the assessments at T1 (20 months) and T2 (32 months), a two-factor structure was analyzed (with factor of gestures, based on Scales A and B, and verbal factor, based on Scales C through N). For assessment at T3 (44 months), only a one-factor structure was analyzed

(verbal factor only), as Part 1 (Gestures) was not administered given that children of this age were using mainly words to communicate.

None of the three models revealed satisfactory goodness of fit to data (see Supplemental Material S5 for goodness-of-fit indicators). Moreover, at T1 and T2, Scale B was not significantly related to gesture factor (ps > .05). Therefore, we followed an exploratory factor analysis, using principal component analysis as a method for extraction, Horn's parallel analysis as a criterion for the number of factors, and varimax rotation. At 20 months, only one factor was extracted, with loadings from all the scales of the LUI-Polish (see Table 4), explaining 52.46% of variance. At 32 months, the two-factor solution was obtained, with loadings from scales of Parts 2 and 3 on one factor and loadings from scales of Part 1 on the second factor (see Table 4), explaining together 64.78% of the variance (53.40% for the first factor and 11.38% for the second factor). At 44 months, again, the one-factor solution was obtained, with loadings from all but one verbal scale (see Table 4), explaining 45.10% of the variance in results.

Only for the 32-month-old Polish children did the results obtained with the LUI-Polish replicate exactly the two-factor structure of the original version of the LUI. This result is reasonable given that, at 20 months, Part 1 correlated negatively with Parts 2 and 3 and, at 44 months, only Parts 2 and 3 were administered.

Concurrent Validity

LUI-Polish and QCEL and LDS Parent Report Questionnaires

We examined concurrent validity via computing the correlation between children's LUI-Polish scores (LUI total and three main parts) at 20 months and children's

Table 4. Results of the principal component analysis with the primarily loading factors at 20, 32, and 44 months of assessment with the Polish version of Language Use Inventory (LUI-Polish).

LUI-Polish subscales	20 months Factor 1	32 months Factor 1	32 months Factor 2	44 months Factor 1
H[a]	.92	.94		.82
I	.90	.90		.72
G	.88	.87		.70
C	.82	.79		.64
M	.82	.87		.83
F	.80	.82		.52
K	.80	.80		.72
N	.76	.85		.87
D	.69	.52		.20
J	.38	.52		.39
A	−.23		.78	—
B	−.01		.80	—

Note. Em dashes indicate the subscale/part was not completed at a given time point.

[a]For names of parts and subscales, see Supplemental Material S2 or Table 2 note.

scores on two other parent report questionnaires assessing early gestures and vocabulary, namely, the QCEL (Pointing, Symbolic Gestures, and Words) completed by parents at 22 months and the LDS (Global) completed at 24 months. Table 5 presents the Pearson correlation coefficients between all the scores of these measures.

The LUI-Polish total score and its associated verbal Part 2 (Words) and Part 3 (Sentences) scores at 20 months correlated positively and strongly with the numbers of words used by children (i.e., Global score) on the LDS at the age of 24 months. Moreover, a negative correlation was found between Part 1 (Gestures) of the LUI-Polish and the LDS Global score. Regarding the QCEL, symbolic and pointing gesture scores on the QCEL at the age of 22 months were positively correlated with Part 1 scores of the LUI-Polish at 20 months. In addition, significant correlations were observed between Part 2 (Words) and Part 3 (Sentences) LUI-Polish scores and the use of words as measured with the QCEL.

LUI and Lab Measures

Children's scores on all three parts and total score of the LUI-Polish completed at 20 months were also found to be significantly correlated with measures of spontaneous speech (single words and longer utterances) obtained during a lab session at 24 months (see Table 6).

Finally, the relations between children's scores on the three parts and the total score of the LUI-Polish at 32 months and two other tasks used during the lab session at the age of 36 years—the PVT-C and Picture Naming Task—were examined. The Pearson correlation coefficients are presented in Table 7. The use of gestures, as measured by Part 1 of the LUI-Polish, correlated negatively with children's vocabulary (both receptive and expressive), whereas use of words and longer sentences (as measured with Parts 2 and 3 of the LUI-Polish), as well as the total score, correlated positively with children's receptive and expressive vocabulary.

Gender Differences in the LUI-Polish

Repeated-measures ANOVA with contrast analysis revealed that girls outperformed boys in Part 2 of the LUI-Polish (Words) at T1, $F(1, 166) = 4.58$, $p = .034$, $\eta_p^2 = .03$, and T2, $F(1, 166) = 4.90$, $p = .028$, $\eta_p^2 = .03$; in Part 3 of the LUI-Polish (Sentences) at T2, $F(1, 167) = 6.13$,

$p = .014$, $\eta_p^2 = .04$, and T3, $F(1, 167) = 4.35$, $p = .038$, $\eta_p^2 = .03$; and in the total score of the LUI-Polish at T2, $F(1, 165) = 6.14$, $p = .014$, $\eta_p^2 = .04$, and T3, $F(1, 165) = 4.19$, $p = .042$, $\eta_p^2 = .03$. Moreover, no significant interaction of gender and time of assessment was observed for Part 2, $F(2, 332) = 3.51$, $p = .055$, $\eta_p^2 = .02$, but between T2 and T3, the significant growth in using words was observed only for boys, $F(1, 166) = 4.07$, $p = .045$, $\eta_p^2 = .02$. The Time × Gender interaction was observed also for Part 3 (Sentences), $F(2, 334) = 3.20$, $p = .042$, $\eta_p^2 = .02$, as more rapid growth of using sentences between ages 20 and 32 months was observed for girls than for boys, $F(1, 167) = 5.06$, $p = .026$, $\eta_p^2 = .03$.

Discussion

The main aims of our study were to describe the psychometric properties of the LUI-Polish, including its reliability and validity, both content and concurrent, along with assessing its developmental sensitivity longitudinally at 20, 32, and 44 months of age. We have demonstrated good psychometric properties of the LUI-Polish. The reliability of the three main parts of the LUI-Polish was satisfactory (.66 for Part 1 [Gestures] at the age of 20 months) to excellent (.98 for Part 3 [Sentences] at the age of 44 months). The reliability of the total score at each of the three measurement time points ranged from acceptable at 44 months (.76) to good at 22 months (.89). Lower reliability was observed among subscales with few items (e.g., B or J) or when children's scores were at ceiling (e.g., Subscale F at 44 months). The alpha values of the LUI-Polish and its total score were the highest and most similar to the original LUI (O'Neill, 2007), at 20 and 32 months, and this may be due to ceiling effects by 44 months, as also observed in the original LUI. Further research with a broader age range of children, especially between 24 and 36 months, would provide a more detailed picture of its reliability during this period when scores were observed to rise significantly among children.

Our study also explored validity in depth. We expected positive correlations for each part of the LUI between time points, as well as positive correlations between Part 2 (Words) and Part 3 (Sentences), but negative correlations between Part 1 (Gestures) and the other parts of the LUI-Polish. Our results confirm the developmental

Table 5. Pearson correlation coefficients between scores on the three main parts of the Polish version of Language Use Inventory (LUI-Polish) and the total score at Time 1 (20 months) and scores on the Questionnaire for Communication and Early Language (QCEL; 22 months) and Language Developmental Survey (LDS; 24 months).

LUI-Polish	QCEL pointing gestures (M)	QCEL symbolic gestures (sum)	QCEL words (sum)	LDS Global score
Part 1: Gestures	.29** (n = 129)	.22* (n = 125)	−.08 (n = 125)	−.35*** (n = 182)
Part 2: Words	−.01 (n = 125)	.20* (n = 121)	.65*** (n = 121)	.75*** (n = 178)
Part 3: Sentences	.04 (n = 123)	.20* (n = 120)	.51*** (n = 120)	.73*** (n = 178)
Total score	−.001 (n = 120)	.19* (n = 117)	.57*** (n = 117)	.76*** (n = 175)

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Table 6. Pearson correlation coefficients between scores on the three parts of the Polish version of Language Use Inventory (LUI-Polish) and the total score at Time 1 (20 months) and two spontaneous speech measures at 24 months.

Spontaneous speech samples	LUI-Polish, 20 months			
	Part 1: Gestures	Part 2: Words	Part 3: Sentences	Total score
Single words, 24 months	−.07 (*n* = 249)	.18** (*n* = 244)	.11 (*n* = 237)	.13 (*n* = 233)
Longer utterances, 24 months	−.23** (*n* = 249)	.38*** (*n* = 244)	.36*** (*n* = 237)	.38*** (*n* = 233)

**p ≤ .01. ***p ≤ .001.

sensitivity of the LUI-Polish. First, it was observed that all three parts of the LUI-Polish correlated significantly and positively between the ages of 20, 32, and 44 months. The only exception was a low correlation found between Part 2 (Words) of the LUI-Polish at 32 and 44 months, when developmental changes related mainly to the use of longer sentences (Part 3 of the LUI-Polish) and the use of words was already at ceiling. Second, negative correlations were observed between the use of gestures (Part 1) and both the use of words (Part 2) and longer sentences (Part 3) at 20 and 32 months, corresponding with an age-expected decrease in gestures accompanied by an increase in words and sentences. Third, our ANOVA confirmed that the observed developmental changes were in the expected direction, as there were a significant increase in communicating with words and sentences (total scores in Parts 2 and 3), as well as in the total score (the sum of these two parts), and a corresponding decrease in communicating with gestures (Part 1). In other words, we observed a main effect of time of assessment for all three parts of the LUI-Polish, and this speaks to the developmental sensitivity and good validity of the LUI-Polish, similar to the original English version (O'Neill, 2007).

The results of our examination of construct validity, however, were not exactly in line with the results obtained in the original study (O'Neill, 2007), which led us to hypothesize a two-factor structure of the LUI-Polish. Using confirmatory analysis, we did not fully confirm the same two-factor (gesture + verbal) structure as in the original LUI (O'Neill, 2007). Rather, our exploratory factor analysis revealed a one-factor solution at 20 and 44 months and a two-factor solution only at the second time point (32 months). Part of the reason for our different results

may be the wider age range of the original O'Neill (2007) study. That is, the one-factor solutions observed for the LUI-Polish may have stemmed from the narrow age range at each of our time points, resulting in small variances. Especially at the very beginning of the development of pragmatic ability (20 months of age in our sample) and at the end of this process (44 months of age in our sample), individual differences were the smallest. Scores at the age of 32 months (T2) were the most differentiated. Nevertheless, one should note that, at each time point, the scales comprising the total score loaded onto the same factor, thus confirming uniformity of the total score. Moreover, the French adaptation also failed to replicate exactly the original factor structure even with a more age-differentiated sample than in our study (Pesco & O'Neill, 2016).

The concurrent validity of the LUI-Polish was supported across five different measures: two parent report questionnaires and three laboratory measures. We expected significant positive correlations between the LUI-Polish and other language and gesture measures including both parent report (QCEL and LDS) and laboratory (spontaneous speech, word production, and word comprehension) measures. We found significant correlations of the LUI-Polish scores at 20 months for all three parts and the total score with measures assessing the child's vocabulary (the QCEL at 22 months and the LDS at 24 months). Interestingly, we found stronger correlations between the parts of these tools that measured similar abilities (e.g., communicating with words as assessed by the LUI-Polish and number of words used by a child as assessed by the LDS). More importantly, we found that the LUI-Polish scores on Part 2 (Words) and Part 3 (Sentences) were positively correlated with children's spontaneous speech production during lab sessions. In addition, the negative correlations between Part 1 (Gestures) of the LUI-Polish and scores with respect to words used on the QCEL and LDS and from our spontaneous speech samples further supported the validity of the LUI-Polish. Moreover, at the second time point (32 months), significant positive correlations between Parts 2 and 3 of the LUI-Polish (Words and Sentences) and lab-administered tests that measured language production and comprehension were found (e.g., .46 for picture naming and Part 3 of the LUI-Polish [Sentences]). In summary, we claim that our results have demonstrated very good concurrent validity of the LUI-Polish. Our study is also one of the first studies using the LUI to explore and include several measures of concurrent validity.

Table 7. Pearson correlation coefficients between scores on the three main parts of the Polish version of Language Use Inventory (LUI-Polish) at 32 months and the global score of the Picture Vocabulary Test–Comprehension (PVT-C) and Picture Naming Task (36 months).

LUI-Polish	PVT-C	Picture Naming Task
Part 1: Gestures	−.22*** (*n* = 209)	−.16* (*n* = 237)
Part 2: Words	.26*** (*n* = 209)	.37*** (*n* = 237)
Part 3: Sentences	.38*** (*n* = 209)	.46*** (*n* = 237)
Total score	.38*** (*n* = 209)	.47*** (*n* = 237)

*p ≤ .05. ***p ≤ .001.

Finally, the expected gender differences were observed, as girls outperformed boys in using words at T1 and T2 (20 and 32 months) and in using sentences at T2 and T3 (32 and 44 months). In addition, using ANOVA, an interaction between age and gender was found for Part 2 (Words) and Part 3 (Sentences), as an increase on Part 2 (Words) was observed only between T2 and T3 (32 and 44 months) among boys. The girls at T2 (32 months) scored at ceiling at Part 2 (Words). In addition, a more rapid growth in Part 3 (Sentences) was observed for girls in comparison to boys between T1 and T2 (20 and 32 months). Thus, the expected pattern of results, with boys developing pragmatic ability later than girls, was observed.

Limitations

As it often happens in the case of preparing tool adaptations (see Guimarães et al., 2013; Rescorla et al., 2017), our study also demonstrates some potential limitations. A few factors could have influenced the results and the properties of the LUI-Polish reported in our analysis. Three quarters of the children in our sample lived in a large city and had parents educated to a university degree level. Future research should be aimed at extending the findings with a more diversified sample.

Possibly also problematic was the narrow age range at the time of each administration of the questionnaire and the fact that the first and last time points were quite far apart (20 and 44 months) and were indeed near the beginning and end of the age range for which the LUI in English was designed. Children's scores at this first and last time points were characterized by the lowest variance. Greater individual differences between children were revealed at the second time point at 32 months (and this actually corresponds with the general developmental trend on the LUI-English; O'Neill, 2009). The differences in the variance at each time point may explain why we were unable to replicate the overall original factor structure of the LUI at Times 1 and 3, and the low reliability coefficients for some scales of the LUI-Polish (actually, some items had null variances, especially at the age of 44 months). Because of this feature of our data, it was not possible to calculate measurement invariance (see Putnick & Bornstein, 2016). Both these limitations should be addressed in the future by comparing our results to studies examining LUI-Polish questionnaire administration among a wider age range of Polish children.

Conclusions

To conclude, we emphasize that our procedure of LUI adaptation turned out to be successful. We took into account the existence of language-specific and universal linguistic features (see Rescorla et al., 2017; Slobin, 1985; Smoczyńska et al., 2015) and tried to balance the specific sociocultural context and the important characteristics of the original instrument (O'Neill, 2009). Good psychometric properties of the LUI-Polish allow us to argue

that this tool, if used in further studies, can broaden our knowledge resulting from cross-linguistic comparisons. Similar to the LUI-English, the availability of the LUI-Polish may be helpful to those working with Polish children in the identification of early pragmatic impairments (cf. Miller et al., 2015) and social communicative disorder (cf. Fujiki & Brinton, 2015) or the provision of a benchmark for assessing early spoken language, after intervention (cf. Tager-Flusberg et al., 2009). The LUI-Polish may also be of potential use among Poland's growing population of Polish–English (first and second languages, respectively) bilingual children (Haman et al., 2017) for whom there exists no current measure to assess their pragmatic abilities in Polish. Furthermore, given the satisfactory main psychometric properties of the LUI-Polish, especially the strong concurrent validity confirmed in our study via the use of many different tools and the clinical utility of the original LUI version (O'Neill, 2009), there is a strong basis for further analyses and research needed in order to undertake a full standardization (norming) study of the LUI-Polish.

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