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Assessing language engageability and exploration – the development of a questionnaire for young children

Abstract

Several authors have argued that the early emotional interchange taking place between very young children and their caregivers prepares the child for her entry into language (Greenspan and Shanker, 2004) and that word learning is intimately related to a child's emotional life (Bloom and Tinker, 2001). The present scale was developed in response to a perceived lack of instruments focusing on children's language engageability and engagement. A main question explored in the present paper is whether engageability predicts language acquisition or vice versa in children more than 12 months of age. Questionnaire data from preschol children in the ages 1 to 6, using structural equation modeling, indicated that language performance had a boosting effect on engageability and engagement. The direction of this causality is interpreted as a boosting

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effect of language on the child's emotional life rather than the other way around for children who have passed the preverbal stage. Moreover, it is suggested that a child's engageability may be taken as a proxy of language development.

INTRODUCTION

The purpose of the present paper is to present a short questionnaire focusing on young children's language engageability and engagement in the interpersonal world, and to use data from the questionnaire to explore the relation between engageability and language acquisition. The main motivation for developing a questionnaire focusing on engageability has its background in literature focusing on the relation between emotions and language acquisition, and was developed in response to a perceived lack of suitable instruments for exploring this relation.

Early language development has been characterized as continuous transactions between the child and the parents. In general, the child's early speech production invites the parents to respond, and these responses are associated with speech and language learning (see Camarata and Nelson, 2006, for an overview). Moreover, the metaphor "to invite the child to dance" has been used by several authors (Pinker, 1994) to point out that the importance of fine-tuned interactions between young children and their parents in early language and communication development. It follows from this view that the child's early language initiatives are extremely important because they trigger the parents to respond. Several authors have pointed out that the early language initiatives of a child are intimately connected to the child's emotional life. For example, according to the intentionality model of language acquisition (Bloom and Tinker, 2001), word learning is intimately connected to a child's emotional life, because infants learn language to talk about those things they are feeling. The model is in Figure 1. It builds on the notion that language learning requires both

engagement and processing. According to their view, children learn language in acts of expression and interpretation; all aspects of a child's development contribute to this process.
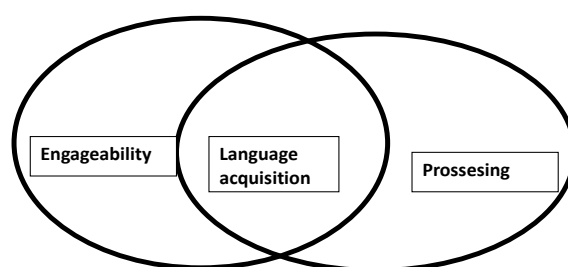

Figure 1: The intentionality model: language acquisition requires both engagement and processing (Bloom and Tinker, 2001)

Other authors have argued along the same line as Bloom and Tinker. For example, Greenspan and Shanker (2004) argue that the emotional interchange taking place among very young children and their caregivers prepares the child for her entry into language. According to their view, the ease with which a child may be engaged and engage her/himself in early social interaction may reflect the development of an underlying emotional quality of empathy indicating that sustained relations to the caregiver or other important caregivers is beginning to develop. In sum, we are intrinsically motivated to learn new words and their meaning, and first language acquisition occurs within a permanent emotional interaction between parents and children. To engage in the world in an enthusiastic way, looking for resources, searching and exploring may be classified as one of our fundamental emotions (Panksepp, 2012). In this perspective, one of our fundamental emotions may operationally be de-

fined in terms of engagement and engageability. By extending the view that emotions are a driving force in language development to children who has passed the preverbal stage, one could be tempted to assume that a child's engageability is casually related to his/her language development. Could it be than, that children who are difficult to engage in language context suffer from a motivational/emotional problem? On the other hand, it is also reasonable to assume that language development increases the opportunities to engage in language context, and hence, that language development is casually related to a child's engageability. The exact mechanism behind the human drive to acquire communicative and language skills is yet to be established. However, in a recent study Rippoles et al (2014) experimentally proved that human adult word learning exhibit activation not only of cortical language regions but also of the ventral striatum, a core region of reward processing. Their results confirm that motivation to learn words is preserved throughout the lifespan, helping adults to acquire a second language.

If first language acquisition occurs within a context of emotional interaction between parents and children one could be tempted to believe that a child's engageability will contribute to his/her acquisition of language. If this is the case, engageability may be taken as a proxy of language development. Thus, a main challenge in exploring the relation between engageability and language acquisition among children is the question about the causality between language acquisition and engangeability. This question is of particular relevance for understanding the problems of language impaired children. Applied to language impaired children one would like to explore the direction of this causality. About 5 to 10 percent of young children have been described as language impaired (Bishop & Leonard, 2000). It is well known that children with language disorders show a heightened risk of developing emotional problems (Beitchman 2001; Comti-Ramsden and Botting, 2008). What is not so well understood is how language

impairment may influence early language engageability and engagement; i.e., the ability to explore the world of language in an enthusiastic manner. Could it be that language impairment results in a reduced willingness or ability to explore language, or is it the other way around, that reduction of engagement and engageability leads to language impairment?

To come into a position to explore the relation between children's engageability, engagement and language acquisition after the age of 12 months, some instrument was needed. The present questionnaire was developed in response to a perceived lack of instruments focusing on young children's engageability and engagement in the interpersonal world. By describing children's early development along these two dimensions, we hope to contribute to early identification of children who are in need for further assessment. The questionnaire is presented in Appendix 1. It is composed of three parts; engageability, engagement and physical activity-passivity. For young children (ages 1 to 4) we ask questions about engageability, for example: "how easy is it to invite the child to imitate an activity, to imitate a simple sentence, to look at something together with an adult, to find an object and give it to an adult", etc. For older children (ages 4 to 6) we ask questions about their language engagement, for example "does the child ask for the meaning of words?", "does the child show joy and engagement in language activities", "does the child contribute actively in conversations"? In short, the questionnaire focuses on the child's language engageability and engagement. However, if it is difficult to engage a child in intimate social interchange, this could reflect a more general form of passivity. For this reason, we have also included a third short list of questions about the child's physical activity/passivity in routine settings like the meals, gathering time, dressing, etc. This list covers the ages 1 to 6 years. In short, the main purpose of the present questionnaire is to provide a short list of items that could serve as a frame of reference for discussing and evaluating children's

engageability, engagement and physical activity. Any such instruments should be reasonable brief, easy to administrate and usable with both groups and individuals.

The purpose of the present paper is three-fold:
1. To present a questionnaire focusing on children's language engageability, engagement and physical activity.
2. To present data about the relation between language development and engagement based on data from this questionnaire focusing on the direction of causality between language acquisition and engagement.
3. To present data about the relation between engagement and physical activity asking whether children who are difficult to engage in language contexts also are physically passive.

Method

For each child, a pre-school teacher who knew the child quite well was asked to fill in the questionnaire. For items on the engageability and engagements scales values from 1 to 5 was used, and the participants were asked to indicate whether it was very simple (1) or very difficult (5) to engage the child in social activities. On this scale, the maximum raw score is 60 and the minimum score is 12. For the physical active / passive dimension, the participants were asked to indicate whether the child nearly always was active and impulsive (1) or nearly always passive (5) in routine situations. On the scale the maximum score is 40 and the minimum score is 8. To explore the validity of the questionnaire, a subsample of the youngest children (N=58) were assessed with the BPVS (Dunn et al 1997), and parental data from the MacArthur scale (2010) was collected (N=55). To explore the relation between the BPVS and engageability, a sum score was calculated by adding the item scores. For the MacArthur scale, the sum scores from six different areas of communication were used. For the older children, parental data was collected (N=213) using a questionnaire referred to as Language 20Q (Ottem, 2009). This questionnaire is composed of 20 items each representing a symptom of language impairment. The main reason for using this questionnaire was to explore the relations between the number of symptoms of language impairment and language engageability. This questionnaire was filled in by preschool teachers at the same time as they filled in present scales. In addition a small scale composed of items covering psychosocial aspects, referred to as "Relations to others", was included in the study. This scale is included as a separate scale in the more comprehensive scale Language 20Q.

Participants

The children were recruited form 14 different kindergartens in Norway, representing a cross section of preschool population. Bilingual children were not included in the data. The engageability scale (1 to 4 years) was administered to 534 children (275 boys and 259 girls), mean age 28.2 months. The engagement scale was administered to 363 children (186 boys and 177 girls), mean age 54.7 months. The physical activity scale was administered to 994 children (513 boys and 481 girls), mean age 39.65 months.

Reliability

The raw scores for each item were used to calculate reliability statistics for the three scales Engageability, Engagement and Physical activity. Table 1 shows Chronbach's Alpha for each of the scales used in the study. As can be seen from Table 1, the reliability of the scales is satisfactory.

Scale	Number of items	Chronbach's Alpha
Engageability	12	.95
Engagement	10	.94
Physical activity	8	.81

Table 1: Reliability statistics.

Validity

Validity was explored by examining the correlations between raw scores on the various instruments. For the youngest children (1 to 3 years), we found significant associations between engageability

and BPVS (N=51, r= -.44, p<.001) and between engageability and MacArthur's scale (N=47, r= -.53, p<.001). For the older children Language 20Q (N=275) correlated .75 with engagement. These figures suggest that the scales of engagement and engageability are valid scales, capturing variance from language development. On the other hand, we found no significant correlations between physical activity and the above measures. These findings suggest that the dynamic aspect interaction of the present scale, represented by engagement, is associated to aspects of language development, while the active-passive dimension is relatively independent of language development.

RESULTS

The results will be presented in three sections. First, we will explore the relations between engageability, engagement, physical activity and age. Next, we shall approach the problem of causality by exploring the relations between language performance, engageability, engagement and physical activity using structural equation modeling. Finally, we would like to explore the relation between engageability, engagement and physical activity/passivity.

Changes in engageability and physical activity as a function of age.

Figure 2 shows the distribution of the mean raw scores across five age groups for the social active-passive dimension of the scale. This scale has descending values because it represents a problem-scale. It can be seen that it becomes easier and easier to engage children in language related activities as their age increases ($F_{(2,533)}=46.82$, p<.001). Similarly, children become more linguistically curious and engaged as time passes ($F_{(2,362)}=7.92$, p<.001). In contrast, there was no significant association between physical activity and age ($F_{(4,853)}=2.09$, NS).. One way of interpreting these age-effects is to assume that they are effects of language acquisition; as children grow older and their language become more sophisticated, they become easier to engage in language contexts. It follows from this view that language performance ought to be causally related to language engageability and engagement among young children. If this is the case, engageability and engagement may be taken as a proxy of a child's language development.
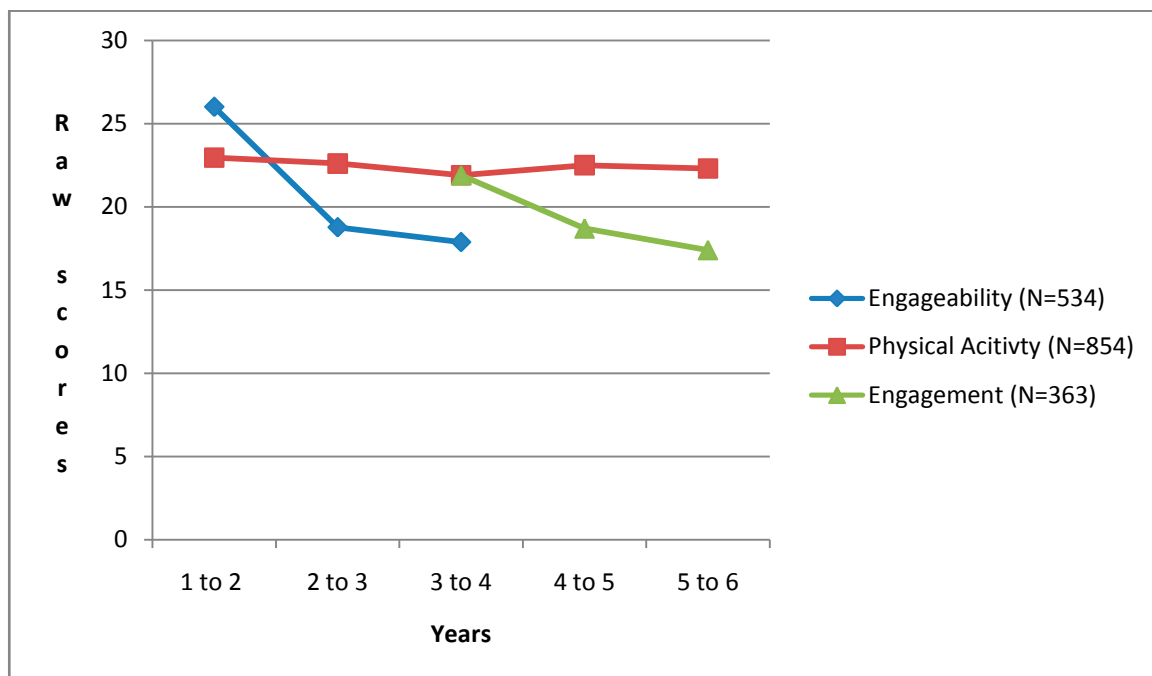

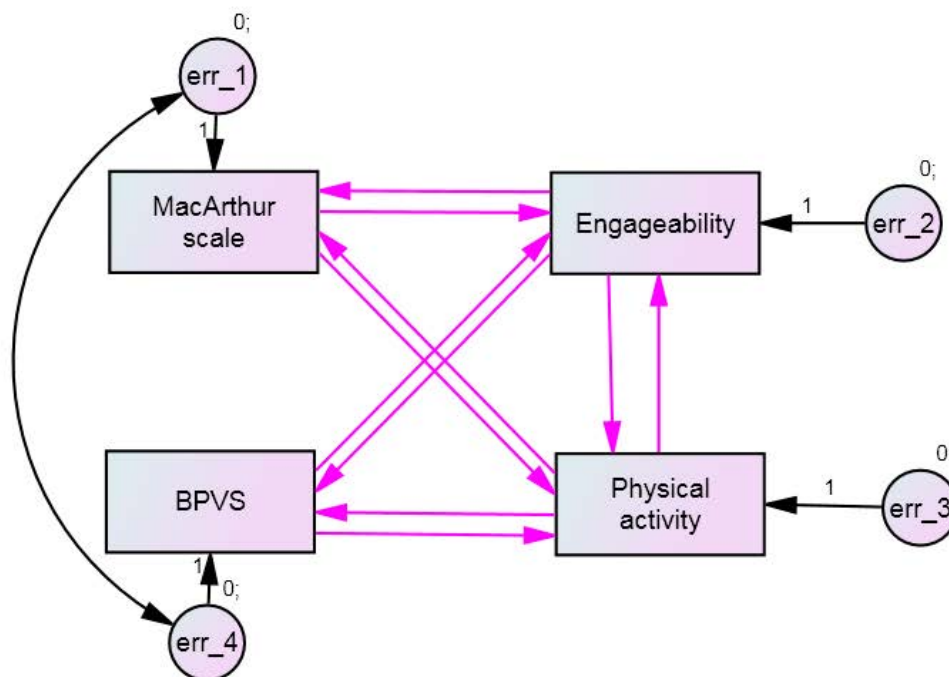*Figure 2: Changes in engageability, engagement and physical activity as a function of age.*

Figure 3: Model used to explore the relation between language acquisition and engageability.

Structural equation modeling

To gain support for the view that language performance drives a child's engageability and engagement among children who have passed the preverbal level, structural equation modeling was used. The section is divided into three parts. First, the model will be applied to the youngest children using BPVS and MacArthur scales as the dependent variables and the engagement variables as the independent variable. Next, the same model will be applied to older children using Language20Q as the dependent variable. Finally, data from a small sample of the younger children, assed with the Language20Q, will be analyzed.

1) The relation between language acquisition, engagement and physical activity for young children.

Could it be that language acquisition is a driving force underlying engageability, or, is it the other way round; i.e., that engageability drives language acquisition? To explore these issues,

structural equation modeling was used (AMOS 19). As a first step, all data were transformed to standardized scores to avoid underlying effects of differences in age. Next, a model for the relations between BPVS, MacArthur scale, engageability and physical activity was constructed (see Figure 3). The variables BPVS and the MacArthur scale were allowed to correlate with each other, as represented by the double headed arrow. A double set of single headed arrows were placed between the four variables. All single-headed arrows were then made optional and a specification search was carried out to find the best model of the relation between the four variables. If the best model ends up with arrows pointing from engageability and physical activity towards the BPVS and MacArthur scale, one may conclude that engageability is a driving force in language development. On the other hand, if the best model ends up with arrows pointing from the language tests towards engageability, one may conclude that language acquisition has a boosting effect on engageability.
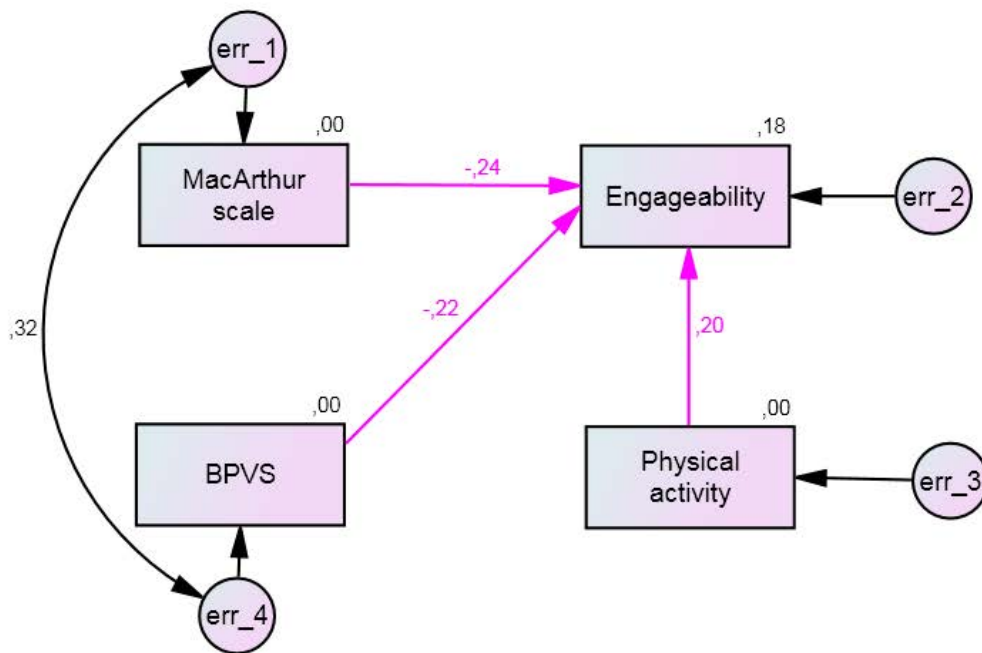
Figure 4: The results of a specification search for exploring the relations between language and engageability for young children.

Se figure 3: Model used to explore the relation between language acquisition and engageability.

Figure 4 shows the results of a specification search for the best model of the relation between the four variables. Of the 1024 alternative models, the best model fitted the data quite well (Chi-Square=.51, df=2, p=.78, CFI=1.0, RMSEA=.000). As can be seen from the model, the single-headed arrows are pointing from the language tests towards engagement indicating that an increase of 1 standard deviation on the MacArthur scale results in .24 standard deviations in engageability (S.E.=.37, C.R.=-1.91, p=.056), and that an increase of one standard deviations on the BPVS results in .21 standard deviations in engageability (S.E.=.36, C.R.=-1.98, p=.047). Furthermore, the model shows that an increase of one standard deviation in physical activity results in .20 standard deviations on the engageability scale (S.E.=.16, C.R=3.79, p=.001). Taken together, these three variables explained 18 percent of the variability

on the engageability scale. These findings suggest that linguistically more advanced children are easier to engage in language contexts. Thus, language acquisition has a boosting effect on engageability. Similarly, as children become less physical active, it becomes easier to engage them in language activities. In sum, the structural equation modeling indicated that the direction of causality goes from language towards engageability; it does not go from engageability towards language acquisition.

Se figure 4: The results of a specification search for exploring the relations between language and engageability for young children.

2) The relation between language performance, engagement and physical activity for older children.

For children in the age groups 4 to 6 a questionnaire composed of twenty questions about symptoms of language disorders (Language 20Q) was filled in at the same time as the
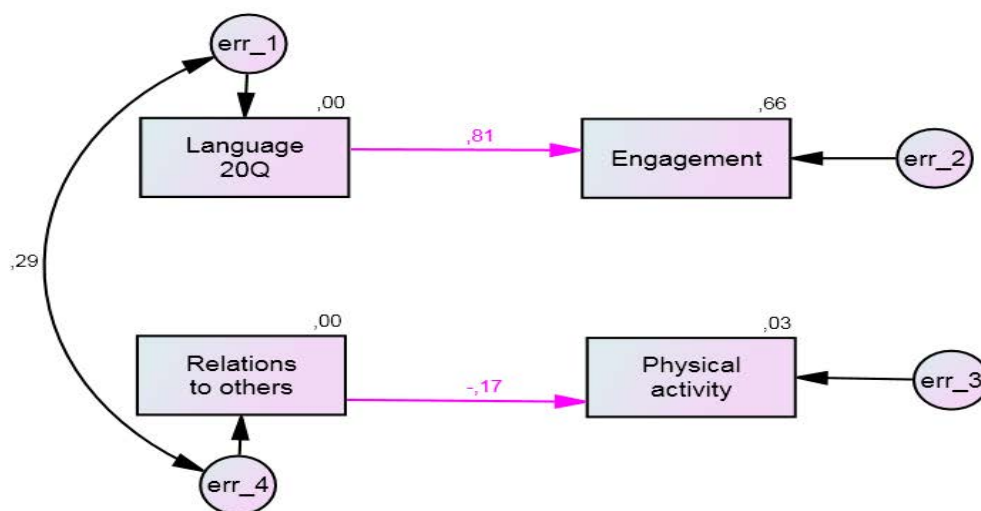
Figure 5: The results of a specification search for exploring the relations between language and engagement for older children

engagement scale. In addition seven questions about the child's relation to others were responded to by the preschool teachers using the same questionnaire. To explore the relations between symptoms of language disorders and engagement, these variables were standardized and inserted into the model in Figure 3. Figure 5 shows the results of the specification search. The model represented the data quite well (Chi-Square=2.95, df=3, p=.40, CFI=1.0, RMSEA=.000). Language 20Q predicted the scores on Engagement quite well (S.E.=.035, C.R=21.82, p=.000) and the scale "Relations to others" predicted the scores on Physical activity (S.E.=.029, C.R.=.-1.96, p=.05). As can be seen from the figure, the questionnaire Language 20Q explained 66 percent of the variance in engagement. Thus, children with many symptoms of language disorders show less engagement than children with few symptoms. This finding supports the view that language performance boost engagement. The model also shows a weak, but significant association between the scale Relations to others, and physical activity (S.E.=.029, C.R.=-1.96, p=.05), indicating that children with poor relations to others were physically more active than children with better relations to others. In sum, the structural equa-

tion modeling indicated that the direction of causality goes from language towards engagement; it does not go from engagement towards language acquisition.

Se figure 5: The results of a specification search for exploring the relations between language and engagement for older children.

3) The relation between language performance, engageability and physical activity for younger children.

Of the children in the youngest group (1 to 4 years) data from Language20Q was available from 38 children. The above model was applied to this smaller sample to explore the relations between engageability and language performance as measured by the Language 20Q. The best model fitted the data quite well (Chi-square=.35, DF=3, p=.96, CFI=1, RMSEA=.000), indicating that symptoms of language disorders predicted engageability (S.E. =.16, C.R. =3.42, p<.001) (see Figure 6). In addition, the variable physical activity (S.E. =.16, C.R. =3.43, p<.001 predicted engagement in a significant manner. Taken together these variables explained 33 percent of the variance in engageability.
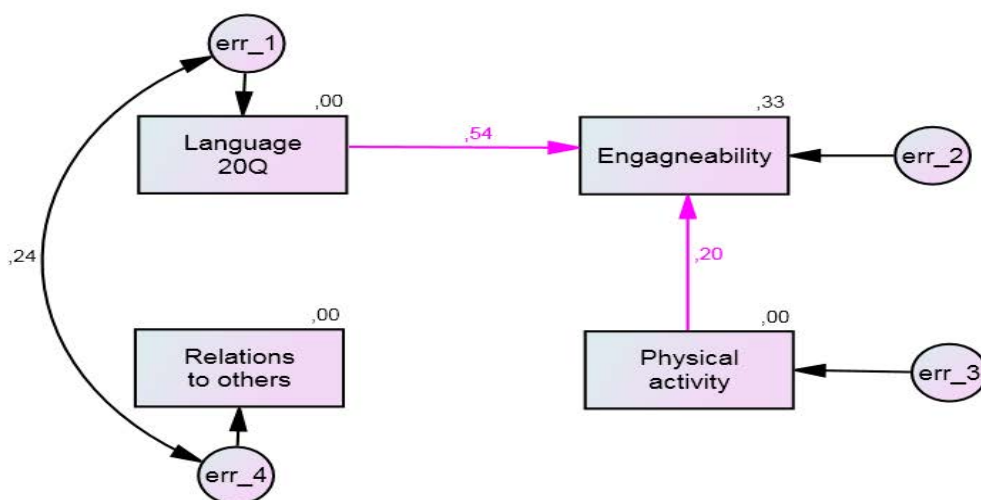
Figure 6: The results of a specification search for exploring the relations between language and engageability for young children.

Se figure 6: The results of a specification search for exploring the relations between language and engageability for young children.

A common trait of the above models is that the arrow between language performance and engagement or engageability is pointing towards engagement. Thus, the three data sets suggest that children with advanced language performance are easier to engage compared to children with less advanced language performance. It does not appear to be the other way around; that children who are easy to engage have better language performance than children who are less easy to engage. In short, the models suggest that language performance and freedom from symptoms of language disorder has a boosting effect on engageability and engagement.

The association between engagement and physical activity.

In the above two models for the youngest children, it can be seen that a single-headed arrow representing physical passivity/activity is pointing towards engageability. This means that children who were physically passive were more difficult to engage in language contexts than physically more active children. This

piece of information may be of clinical relevance because it points towards an association between engageability and physical activity among young children. The information is of clinical relevance because a distinction can now be made between 1) children who are difficult to engage linguistically and who are physically passive, 2) and those children who are difficult to engage linguistically and who are normally physically active, and 3) those who are difficult to engage and who are physically active. This distinction may be helpful to detangle the nature of the relation between engagement and physical activity among children who are linguistically passive.

To explore the relation between physical activity and engagement further, standardized data was sorted into categories and then crosstabulated. Normal standardized scores were used for the physical active-passive scale, and the scores were sorted into three categories representing the normal distribution. Children with normalized values below -1.5 SD were classified as active, children with scores between - 1.5 and 1.5 SD were classified as normally active and children with scores above 1.5 SD were classified as passive. Normalized quartiles were used

for the engagement dimension. Children below the 25th percentile were classified as active and children above the 75th percentile were classified as passive.

Table 2 shows a strong association between physical activity and engageability for young children (1 to 4 years old). Of the 32 physical passive children, 21 (66%) were linguistically difficult to engage (Chi-Square=49.66, df=6, p<.001). However, the table also shows that 58 of the 325 normally developing children (17.3%) percent were difficult to engage. Thus, there is no necessary association between engagement and physical activity, but the co-occurence of problems of engagement and physical inactiveness for some children could be of clinical importance.

			Physical activity			
			Active (>1.5 SD)	Normal	Passive (<1.5 SD)	Total
Quartiles	Easy	< 25		10	115	3
		25-50		8	84	3
		50-75		14	78	5
	Difficult	>75		3	58	21
Total			35	335	32	402

Table 2: The association between engageability and physical activity for young children

A similar crosstabulation with data from older children indicated a significant association between engagement and physical activity (see Table 3). Of the 18 physical passive children 13 (72.2 %) were difficult to engage (Chi-Square=28.99, df=6, p<.001).

			Physical activity			
			Active (>1.5 SD)	Normal	Passive (<1.5 SD)	Total
Quartiles	Easy	< 25		7	64	2
		25-50		7	82	1
		50-75		3	69	2
	Difficult	>75		8	52	13
Total			25	267	18	310

Table 3: The association between engagement and physical activity for older children.

In sum, language engagement and language engageability is to some extent associated with physical passivity. However, there is no necessary association between physical passivity and language passivity since we found many children who shows normal physical activity and who are linguistically passive. However, the co-occurrence of physical passivity and poor engagement may be of clinical importance for some children.

Discussion

It may not be surprising that language acquisition has a boosting effect on a child's language engageability and engagement. It does not appear to be the other way around; that engageability predicts language performance in children who have passed the preverbal stage. This finding might apparently seem to contradict the view that emotions and engageability are causally related to language development. Greenspan & Shanker (2004) suggested that emotions are intimately related to the development of intelligence and language even at the preverbal level. They argue that the emotional interchange taking place among very young children and their caregivers prepares the child for her entry into language. According to this view, questions about engageability may lay at the root of early language development. Questions about how easy or difficult it is to invite the very young child to respond in different social contexts may therefore reflect important emotional and empathic precursors of language acquisition and cognitive development. Furthermore, Greenspan & Shanker (2004) argues that emotions actually give birth to our very ability to create symbols and to think. They describe four presymbolic levels of interchange including shared attention and regulation, engagement, two-way purposeful communication, and complex, co-regulated emotional problem solving interactions, and a sense of self (p.212). In this perspective, engageability reflects an emotional and empathic quality that underlies language development. Moreover, according to Bloom and Tinker (2001), word learning is intimately connected to a child's emotional life, because infants learn language to talk about those things

they are feeling. We do not disagree with these views because they may well fit children at the preverbal level. It should be noted that the children participating in the present study were quite old and no data was available for children at the preverbal level. For children who have passed the preverbal level, language performance appears to have a boosting effect on engagement and engageability. This implies that constraints in language learning could be one possible characteristic of older children who are difficult to engage in early social interactions, but not necessarily for younger children at the preverbal level. It should also be noted that language tests explains only about 18 percent of the variance in engageability. Thus, most of the variance in engageability remains unexplained. However, the percentage of variance explained by language performance may depend upon the type of questions we ask. When the respondents were asked to rate the children according to symptoms of language impairment, using Language 20Q, the percentage of variance explained in engageability and engagement increased to 33 and 66 percent. This could mean that children with less sophisticated language than their peers do not engage themselves in language contexts to the same extent as children with a more typical development of language. Physical activity is significantly related to engagement and engageability in the sense that there were more physically passive children among those who were difficult to engage in language contexts.

Usually, we do not worry about the development of young children who engage themselves in the social world in an enthusiastic manner, who show a normal level of activity, and who acquire language at an expected rate. However, from time to time parents and preschool teachers report upon young children who are difficult to engage in social interactions and who, at the same time, may be passive in various settings, both linguistically and physically. These children represent a cause of worry. From a clinical point of view, the observation that there is

an association between physical activity and engagement is important, because it makes sense to distinguish between children who are difficult to engage in linguistics context and who are normally physically active and those who also are physically passive and not easy to engage. Thus, both language development and physical activity contribute to explain variance in engageability and engagement in particular for younger children. In sum, the present data suggest that language development creates language engageability and engagement, and that it is not the other way around.

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Appendix 1
Overview of engageability and engagement items
Engageability (1 to 4 years)
On a scale where 1 = very easy and 5= very difficult, the adult should indicate how easily they can invite the child to
1. imitate an activity in interaction (pat a cake, pat a cake, baker's man)
2. imitate simple statements (silly rhymes/ chatter)
3. imitate simple songs (Ba ba black sheep)
4. look at something together with an adult (pictures/books)
5. point at an object and interact with the adults about what the child   points at
6. give an object to an adult (give/take)
7. find an object and show it to an adult
8. take part in a simple activity with the adults (look for something. Switch something on/off)
9. take part in simple play activities with other children
10. take part in simple play activities with adults
11. Dressing up
12. plav "now you see me, now you don't (hands in front of eyes)

Engagement (4 to 6 years)
On a scale where 1 = very easy and 5= very difficult, how well do they fit as a description of the child.
1. is linguistically curious (asking questions about why, how, causes)

2. asks questions about the meaning of words
3. shows joy and engagement in language activities (telling stories, listening to stories)
4. easily maintains its focus when something is told or explained
5. takes initiatives to tell about experiences
6. shows sustained attention in language contexts (gathering time, common activities)
7. contributes actively with questions and comments in discussions and when things are explained
8. provides comments that fit the language context well
9. sticks to the topic of the conversation
10. can repair a dialogue when this is broken
Overview of items on the physically active/passive scale

How passive/active (physically) is the child in the following situations:
1=Nearly always too overactive/governed by impulse 2= Often over
active/governed by impulse 3=Usually behaves typically compared with age-adequate peers
4=Often passive/reserved 5=Nearly always passive/reserved
1. Collecting/delivering situation

2. Gathering time
3. Mealtimes
4. Outdoor play
5. lndoor "free" play
6. Adult-directed play
7. Dressing/undressing (cloakroom activities)
8. Activity transitions

Appendix 2
Overview of items used to assess language performance and relations to others from the Language 20Q

1. Forgets words s/he knows the meaning of
2. Mixes up words with similar meaning
3. Has difficulties in understanding the meaning of common words
4. Has difficulties in responding to questions as quickly as others
5. Is often searching for the right words
6. Has difficulties in using complete sentences
7. Is using short sentences when s/he is responding to questions
8. Has difficulties in retelling a story s/he has heard
9. It doesn't seem like what s/he is learning is remembered

10. Has difficulties in remembering things
11. Difficulties in understands what others are saying
12. Misconceive instructions and when told to
13. Has problems with remembering messages
14. Misunderstands context and what is going on
15. Is difficult to understand
16. Has difficulties in expressing wishes and needs
17. Is not understood by others
18. Is not initiating communication and are passive in the use of language
19. Has difficulties in pronunciation
20. Are able to have a dialogue with peers

Relations to others
The child:
1. is seldom together with other children
2. needs help to come to agreement with other children
3. often makes other children become angry with it
4. expresses distress
5. refuses other children
6. is often frustrated
7. is often refused by other children

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