

Running title: PEER INTERACTIONS AMONG CHILDREN WITH PIMD

Peer Interactions among Children with Profound Intellectual and Multiple Disabilities during Group  
Activities

**Keywords:** profound intellectual and multiple disabilities; peer interactions; peer directed behaviour;  
social scaffolding; positioning; group activities

**Abstract**

*Background* Children with profound intellectual and multiple disabilities (PIMD) meet other children with PIMD in day care centers or schools. This study explores interactions among children with PIMD and the influence of the direct support worker's behaviour and the child's positioning on these interactions.

*Method* Group activities of children with PIMD initiated by a direct support worker were video-recorded. Peer directed behaviour and positioning of the children, and peer interaction influencing behaviour of the direct support workers were coded.

*Results* Limited peer directed behaviour of the children with PIMD and peer interaction influencing behaviour of the direct support workers is observed. Positioning and peer interaction influencing behaviours are related to the behaviour of children with PIMD.

*Conclusions* Children with PIMD show social interest in each other during group activities. A peer interaction facilitating support worker and an adequate positioning to realise mutual interactions are associated with peer directed behaviour.

## 1. Introduction

Social relationships between children can positively influence various quality of life outcomes such as their subjective well-being (e.g. Karelina & De Vries 2011; Rook 1984) and their mental and physical health (e.g. Cacioppo *et al.* 2000; Cohen 2004; Karelina & De Vries 2011; Lincoln 2000; Umberson & Montez 2010). Various developmental outcomes with regard to cognitive and language development (e.g. Canevello & Crocker 2010; Hartup 1989) and stress coping (e.g. Hartup & Stevens 1997) can also be influenced positively by social relationships. During these relationships with peers, children develop skills such as problem solving, initiating and maintaining conversations and interactions, and cooperating with each other (Berk 2003; Hartup & Moore 1990). Long lasting supportive social peer relationships, such as friendships, are built on successful peer interactions (Beauchamp & Anderson 2010). Peer interactions are far more demanding, complex, and unpredictable compared to adult-child interactions as they are built with persons with the same social power and the same social developmental level (Berk 2003; Guralnick 1999; Hartup & Moore 1990; Mueller & Silverman 1989).

Persons with profound intellectual and multiple disabilities (PIMD) are at risk for experiencing difficulties during peer interactions due to their profound and multiple disabilities. Persons with PIMD mostly communicate on a pre- or protosymbolic level using idiosyncratic expressions such as body movements, muscle tension, vocalisations, and other subtle signals which are context bound and personal (Hostyn & Maes 2009). Due to their profound intellectual disabilities they have difficulties in understanding verbal and symbolic language (Nakken & Vlaskamp 2007). These difficulties in expressing themselves and in understanding the others make social exchanges of their needs, thoughts, and emotions difficult and sometimes misunderstood or ignored by their interaction partner (Grove *et al.* 1999). Moreover, the slowness of their reactions forms a barrier during the interactions with others. Their physical disabilities make it difficult to present behaviours such as waving, smiling, or pointing that draw attention from other people and can initiate a reciprocal interaction. Additionally, their visual or hearing impairments impede successful interactions with others (Vlaskamp 2011). However, persons with PIMD are able to understand the social behaviours of an affective and familiar interaction partner during interactions in a familiar context (Snell 2002).

The research to date on interactions in persons with PIMD has tended to focus on interactions with direct support staff or parents rather than on interactions with peers (for review see: Hostyn & Maes 2009). In the majority of the research on peer interactions in persons with PIMD, interactions with typically developing peers were investigated (Anderson & Brady 1993; Brady *et al.* 1991; Hunt *et al.* 1996; Kennedy & Haring 1993). Other researchers compared interactions of persons with PIMD with typically developing peers on the one hand and with peers with PIMD on the other hand (Foreman *et al.* 2004; Hanline 1993; Logan *et al.* 1998). The results of these studies show that peer interactions among persons with PIMD are rare (for review see: Nijs & Maes in press).

Persons with PIMD often live in residential facilities, go to special daycare centers and (special) schools where they get in contact with their peers (Lancioni *et al.* 2002). Research has pointed out that in day activity centers in the Netherlands persons with PIMD spent almost 30% of their time to group activities with other persons with PIMD. In only 13% of the time individual activities were provided (Vlaskamp *et al.* 2007). According to parents and direct support staff living in a group is assessed as more important compared to individual contacts with peers (Petry *et al.* 2005). These group activities can be an excellent opportunity for persons with PIMD to meet their peers and to interact with each other. By sharing a common experience, such as group activities, friendships may arise (Beauchamp & Anderson 2010).

The aim of this study is twofold. First, the frequency and nature of peer directed behaviours of persons with PIMD during group interactions will be investigated. During peer interactions, persons show social behaviour directed towards the peer. *Peer directed behaviour* includes a combination of looking at the peer and presenting another action such as smiling, waving, or vocalizing (Mueller & Brenner 1977; Williams *et al.* 2010b). Besides the personal characteristics of persons with PIMD, environmental factors such as the presence of toys (e.g. Vandell *et al.* 1980; Eckerman & Whatly 1977), the group size (Hartup 1983), and peer familiarity (e.g. Doyle *et al.* 1980; Priel & Zeidman 1990) can influence these peer directed behaviours during group activities.

The second aim of this study is to investigate if two important conditions for peer interactions are fulfilled, namely a peer interaction facilitating support worker and the positioning of the child to make mutual interactions between peers with PIMD possible. In the context of peer interactions in normally developing children, adults can present *peer interaction influencing behaviour*. Adults teach, coach, or give children guidance and feedback during peer interactions. Based on Vygotsky's (1978) concept of the 'zone of proximal development', later called 'scaffolding' (Wood *et al.* 1976), which describes the learning of a child by guidance of or in collaboration with an adult, Williams *et al.* (2010a) used the concept 'social scaffolding' to describe the adult guidance during peer interactions. However, adults can also distract children from peer interactions. Especially mothers are competitors for social attention, but when asked to facilitate peer interactions they are no longer distractors (Bhavnagri & Parke 1991; Field 1979; Hartup 1983; Smith & Howes 1994). Teachers disturb peer interactions in the context of classroom management and when they are in the proximity of interacting peers (Kemple *et al.* 1997; Williams *et al.* 2010a). In children with PIMD, it is found that when both adults and children with or without PIMD are present, more interactions between the child with PIMD and the adult were observed than between the children. By training the typically developing peer, adult interactions during peer interactions can be reduced (Hunt *et al.* 1996; Logan *et al.* 1998).

Especially during childhood it is important to frequently meet peers in order to develop peer interaction skills and competences (Girolametto *et al.* 2004; Hartup & Moore 1990). Besides their peer interaction influencing behaviours adults can also influence peer interactions by bringing

children physically together (Rubin *et al.* 1999). In order to make physical contact with a peer and to see a peer, persons with PIMD heavily depend on their direct support workers. A study of Johnson *et al.* (2012) in adults with moderate intellectual disabilities and limited symbolic communication pointed out their preference to interact with facial expressions, body language and touch. Almost all participants in this study demonstrated an interest in physical contact during peer interactions. The positioning of persons with PIMD can distract or facilitate their ability to see or touch a peer. The body position of persons with PIMD can improve the quality and quantity of goal-directed behaviour and increases their participation in meaningful activities (Smith *et al.* 2001). An optimal body position depends on the abilities and disabilities of every individual person. Earlier studies on positioning in persons with PIMD focused among others on assistive positioning during interactions with support workers or teachers. McEwen (1992) and Hulme *et al.* (1987) found that in persons with PIMD the positioning can have an influence on their interactions. McEwen (1992) compared interactions of persons with PIMD while sitting in a wheelchair, lying in a sidelyer, or lying free on a mat and concluded that there is no ideal position for all children. Nevertheless, they observed in lower functioning students more communication during structured interactions while lying freestyle on the mat. In the study of Hulme *et al.* (1987) parents indicated increased social interactions of their children with their parents and the community when using adaptive seating devices. Also in young infants it has been found that their position has an impact on their attention and interactions with their mother (Fogel *et al.* 1992).

To summarize, the concrete research questions were:

- (1) What is the frequency and nature of peer directed behaviours presented by persons with PIMD during group activities?
- (2) What is the frequency and nature of peer interaction influencing behaviours presented by direct support workers during group activities?
- (3) If persons with PIMD show peer directed behaviour does the support worker tries to maintain these peer interactions by showing social scaffolding behaviour?
- (4) How are the persons with PIMD positioned towards each other during the group activity?
- (5) Does the positioning have an influence on the peer directed behaviour of persons with PIMD?

## **2. Methods**

### *2.1. Participants*

Four groups of three to four children or adolescents with PIMD participated in this study. For each group one direct support worker was selected. In total 14 children and adolescents with PIMD participated. Nine of them were female (64.29%). All children were aged between four and 19 years

( $M = 10.43$ ;  $SD = 4.18$ ). Based on their personal files, all children can be considered as persons with PIMD. If their developmental age was known it was rated between six and 20 months, assessed by use of the Bayley Scales of Infant Development. Four participants were diagnosed with visual impairments (28.57%), two with auditory impairments (14.29%), and 11 with severe physical impairments (78.57%). Four direct support workers participated in this study. Three of them were female and their average age was 33 years (range = 26-46). They all were direct support workers and had a bachelor's degree in the pedagogical field. The mean years of experience with persons with PIMD was 10 years (range = 2-19).

## 2.2. Procedure

### 2.2.1. Selection process

Special schools, day care centers, and residential facilities for children with PIMD in Flanders were contacted to participate in the study. Three day care centers were willing to participate and were asked to select some participants. The inclusion criteria were: (a) the children are aged between three and 21 years old; (b) the children have PIMD; (c) a group activity is offered in a group of three or four children; (d) one direct support worker is willing to participate and to provide a group activity. The direct support workers of the day care centers selected several participants and the participating direct support workers as well as the representatives of the children gave their written consent. They were all informed about the nature of the study, the anonymity, and the confidentiality of the obtained data. The observations were conducted in coherence with the standards of the university ethical committee who reviewed and approved this study.

### 2.2.2. Group activities

The support workers were asked to do a group activity, which is described as an activity in which there is a maximal chance for the children to interact with each other. The group activities that have been chosen were music activities and multisensory storytelling.

During the first group activity the three participants with PIMD were sitting next to each other in a semicircle, the direct support worker sat in front of them and read a multisensory story telling book. All participants were wheelchair users. The direct support worker read the book and showed the drawings. When the support worker offered a sensory stimulus, such as listening to noises or feeling materials related to the story, she went to the participants one-by-one.

The organization of the second group activity was comparable with the previous one. Three children were sitting in a semicircle while the direct support worker provided a music activity. The support worker showed the music instruments to the children one-by-one. At the end of the activity all children played together on the Ocean drum.

The direct support worker in the third group activity provided a music activity for four children with PIMD. The children were sitting in a semicircle, three of them were wheelchair users. They were sitting next to each other. The direct support worker showed music instruments to the children one-by-one.

In the last group activity four children participated in a music activity. Two of them are wheelchair users. All children were sitting next to each other. The support worker showed the instruments to the children one-by-one. At these moments the three other participants with PIMD were not offered another activity and were sitting on their own.

### 2.2.3. Video observation

The group activities were video recorded by use of two cameras. One recorded the group of children as a whole and the direct support worker. The other camera recorded the children individually and alternating for five minutes. The peers in proximity of the child were also recorded. To make reliable observations it was important to record the children's faces closely. It was not possible to record all the children's faces at the same moment and during the total duration of the activity, because therefore there had to be a camera for every child which would have made the observation too intrusive. If possible, every child was recorded for at least five minutes. When all children were video recorded for at least five minutes, we started again with video recording the first child for another five minutes. The direct support worker was asked not to turn his back to the camera. Eye contact between the cameramen and the children or direct support workers was avoided. The activity had to proceed as naturally as possible.

### 2.2.4. Questionnaires and communication profiles

At the end of the observation the direct support worker was asked to fill in a questionnaire and a communication profile about every child and a questionnaire about the direct support worker himself. They were asked to send these questionnaires back in two weeks. The communication profile of the children was based on three factors out of the Inventarisatielijst Kindkenmerken (Tadema & Vlaskamp 2004) which focus on (1) the active directed behaviour on the environment and possibilities to recognise and react on events and sounds in the environment; (2) the expression of basal communicative behaviours; (3) the behaviour directed on others, searching for contact, and reacting on contact. For every child a quartile score can be attributed to the three factors which reflects the ability level as weak, moderate, reasonably strong, or strong for every factor. On average the children scored reasonably strong on these three factors, however their scores always ranged between weak and strong.

### 2.3. Coding

#### 2.3.1. Coding schemes

To answer our research questions three coding schemes were developed. One for the peer directed behaviour of the participants with PIMD, one for the peer interaction influencing behaviour of the direct support workers, and one for the positioning of the persons with PIMD.

To observe the peer directed behaviours of persons with PIMD a coding scheme was developed (Table 1) which was based on the coding scheme used in earlier research on peer interactions between babies and toddlers (Williams *et al.* 2010b). The original coding scheme has been adjusted by inserting behaviours which can be shown by persons with PIMD, taking their profound and multiple disabilities into account. The concepts social and non-social peer directed behaviour, which were used in the initial coding scheme, were replaced by socially active and socially non-active peer directed behaviour. The reason is twofold. First, in this study we considered all peer directed behaviour as social behaviour. Second, the profound and multiple disabilities of the target group made it interesting to explore if persons with PIMD show social interest, but do not present their social interest in an active way. *Socially active peer directed behaviours* were defined as all behaviours with which a person wants to express something to the peer or attract the attention of the peer. This can be observed when the child looks at or turns his head or body in the direction of the peer in combination with another behaviour such as waving, touching, or making vocalisations. *Socially non-active peer directed behaviours* were defined as all behaviours with which the person does not explicitly elicit a reaction of the peer or express something to the peer, however, alertness towards the peer or the object of the peer can be observed. Finally, some categories displaying other behaviours besides peer directed behaviours were added. The final coding scheme consists of six main categories. All codes are mutually exclusive.

< Please insert Table 1 about here >

A second coding scheme (Table 2) was developed to measure the peer interaction influencing behaviours of the direct support workers. Again, a coding scheme of Williams *et al.* (2010a) was used as a basis. We added the difference between social scaffolding behaviour and distracting behaviour. When the direct support worker shows *social scaffolding behaviour*, he/she provides direct support, guidance, and feedback during peer interactions. When presenting *distracting behaviours*, he/she avoids or interrupts peers from interacting with each other. The code *other* was used when the direct support worker was organising the activity such as searching materials or putting a CD on or when the direct support worker was distracted by something in the environment. The coding scheme was adjusted to the target group, taking their profound and multiple disabilities into account. The final coding scheme considered of three main categories. All codes are mutually exclusive.

< Please insert Table 2 about here >

A last coding scheme (table 3) was used to evaluate the positioning of the child with PIMD during the group activities. More specifically, we observed if the child is placed in the group in such a way that he could see and touch at least one of his peers. A coding scheme with nine codes was developed. First, it is determined if the child can make eye contact with at least one peer. A distinction is made if he can make eye contact from rest or needs to move his head. Second, it is determined if the child can touch at least one peer. A distinction is made if he can touch a peer from rest or if he needs to do an effort or to overcome an obstacle.

< Please insert Table 3 about here >

### 2.3.2. Coding process

The coding was done using the software program Mediacoder 2010. The video recordings were coded continuously, for every second a code was allocated to the behaviour as well as to the position. For the children the alternating observations of five minutes periods were used. The behaviour of the direct support worker was coded for the total duration of the video recordings. As mentioned earlier one camera recorded the setting as a whole, the other focused on one child.

The codes for the three coding schemes were clearly described and for every code several examples of possible behaviours were given. Before coding, the client profiles were consulted which made understanding of the idiosyncratic behaviours of the participants in light of their (dis)abilities possible.

### 2.3.3. Interobserver agreement

For the coding schemes the interobserver agreement was calculated in order to assess the reliability of the coding schemes. The exact agreement was calculated between the primary investigator and a second independent rater. Agreements were marked when two observers allocated the same code to the same second. The percentage of agreements was determined by dividing the number of agreements by the sum of agreements and disagreements and multiplying by 100. These scores were considered satisfactory when reaching 70% to 80% (Kazdin, 1977). The coding scheme of the direct support worker was double coded for 20% of the total observation time, the coding scheme of the children with PIMD for 10% of the total observation time and the coding scheme for the positioning for 53.36% of the total observation time. The percentage agreement was 80.69% for the coding scheme for the direct support worker 74.50% for the coding scheme for the children with PIMD and 74.96% for the coding scheme for the positioning.

## 2.4. Analysis

To answer the research questions, descriptive analyses were done using SAS Enterprise Guide 5.1. Because not all observations had exact the same duration, first the codes for each participant were adjusted for duration. For every child and direct support worker the number of seconds a certain code

was allocated was divided by the total time the child, or direct support worker was observed and multiplied by 100. The average duration of the children's observations was 6 minutes and 20 seconds (range: 1 minute and 50 seconds to 14 minutes and 57 seconds). The average duration of the direct support worker's observation was 22 minutes and 10 seconds (range: 11 minutes and 10 seconds to 36 minutes and 9 seconds). On these corrected data the descriptive analyses were done.

To investigate the relation between the behaviours of the children with PIMD and those of the direct support workers, clusters of peer directed behaviours of the children were marked. Clusters were sequences of peer directed behaviour. When the behaviour is stopped for one second or more a new sequence or cluster was marked. For every cluster of peer directed behaviours, the behaviours of the direct support worker were coded during, and ten seconds after this cluster. Based on this data the chi square and Cramér's V were calculated. These tests were also used to investigate the relationship between the positioning and the behaviour of the persons with PIMD.

### **3. Results**

#### *3.1. Behaviour of children with PIMD during group activities*

During 67.75% of the time of the group activities the children (Table 4) were focused on the direct support worker or on the interaction between the direct support worker and a peer. The second most frequently coded category included behaviours focused on the environment (16.74%). In 8.14% of the time children with PIMD showed peer directed behaviours of which 5.51% was coded as socially non-active behaviour. This socially non-active peer directed behaviour was mostly presented by looking at the peer. Sometimes a child touched the peer next to him/her without looking at the peer. When they showed socially active peer directed behaviour they often touched each other, took each other's hand, or tried to grab or touch the object of the peer.

< Please insert Table 4 about here >

#### *3.2. Behaviour of direct support workers during group activities*

During 94.23% of the time the direct support workers (Table 5) were doing other things than focusing on peer interactions, for example organising the activity. When they showed peer interaction influencing behaviours (5.15%), 4.44% was coded as social scaffolding behaviour. The direct support workers showed social acts to scaffold peer interactions between the children with PIMD. For example: the direct support worker played guitar for one child and at the end of the song the direct support worker said 'now we go to X'. Other social scaffolding behaviour appeared when the direct support worker talked about the intentions of the peer. For example: the peer touched the guitar when playing for one child, the direct support worker said 'I think X wants to play the guitar too'. The direct support worker also disturbed peer interactions. For example: the direct support worker saw two

children touching each other and said 'stop touching each other'. Or the direct support worker attracted the attention of the children with PIMD towards himself. For example: two children were interacting with each other and the direct support worker interrupted this interaction by offering an activity to one of the children.

< Please insert Table 5 about here >

As mentioned earlier, children with PIMD showed other than peer directed behaviours in 91.86% of the time during group activities. When no peer directed behaviour of the child was observed, but also during, and after the child's peer directed behaviour, the direct support worker was mostly doing other things than presenting peer interaction influencing behaviour. However, an increase from 4.16% to 8.55% of social scaffolding behaviour was observed when the children show peer directed behaviour. Besides, also the distracting behaviour increased from .37% to 3.84% of the time during the child's peer directed behaviour. During the 10 seconds after the peer directed behaviour the support worker still showed social scaffolding behaviour (6.88%) and the distracting behaviour decreased (1.17%). A relation was found between the behaviour of the support worker and the peer directed behaviour of the child:  $\chi^2(4, N = 5320) = 101.33, p < 0.0001$ . According to Cramer's V value (= 0.100) this relation is very weak. The cell chi square values show that most of the association is due to the higher amount of social scaffolding behaviour during the child's peer directed behaviour and to the higher amount of distracting behaviour during the child's peer directed behaviour.

< Please insert Table 6 about here >

### 3.3. *Influence of the positioning of children with PIMD on their peer directed behaviour*

The support workers were asked to do a group activity, which is described as an activity in which there is a maximal chance for the children to interact with each other. In all activities the participants with PIMD were sitting next to each other in a semicircle, the direct support worker sat or stand in front of them and read a multisensory story telling book or played music.

All children were adjusted to their place by the direct support worker. They were all positioned in a certain way in relation to the other children and not moved throughout the activity. Consequently, one code was adjusted to each child for the total duration of the observation. Taking their abilities into account it was for all children with PIMD possible to make eye contact with at least one peer, although they all had to move their head to make eye contact. Six children were able to touch a peer easily, without effort. Four children needed to do an effort or overcome an obstacle to touch the peer. Four peers were not able to touch another child with PIMD.

Most active (6.05%) as well as non-active (8.74%) peer directed behaviour was shown when the children could touch their peer from rest. The least amount of active peer directed behaviour was observed in the group of children can only make eye contact (0.17%). The least amount of non-active peer directed behaviour was observed in the group of children who needed to do an effort to see and

to touch a peer (3.54%). All groups showed mostly other than peer directed behaviour. A relation was found between the child's peer directed behaviour and position  $\chi^2(4, N = 5320) = 148.79, p < 0.0001$ . According to Cramer's V value (= 0.118) this relation is very weak. The cell chi square values show that most of the association is due to the lower amount of active peer directed behaviour in children who can only make eye contact, the higher amount of active peer directed behaviour in the children who can touch their peers from rest, and the lower amount of non-active peer directed behaviour in children who need to do an effort to touch their peers.

< Please insert Table 7 about here >

#### 4. Discussion

In this study we investigated the peer interactions among children with PIMD during group activities and two important influencing factors. The first research question was related to the frequency and nature of peer directed behaviours presented by persons with PIMD during group activities. The children observed in this study demonstrate limited peer directed behaviours. They most frequently present socially non-active peer directed behaviours which can be described as observer behaviours such as looking at the peer or touching the peer without looking. However, during most of the time, the children with PIMD focus on the direct support worker or on the interaction between the direct support worker and a peer.

The second and third research question were related to the frequency and nature of peer interaction influencing behaviour of the direct support worker and its relationship with the child's peer directed behaviour. The direct support workers spend most of their time at organizing the activity or interacting in a one on one situation. They present limited peer interaction influencing behaviours which is mostly social scaffolding behaviour: behaviour with which they support or coach the children with PIMD to interact with each other. However, distracting behaviour is also observed. In the literature on peer interactions in typically developing children this distracting behaviour has also been demonstrated. Especially mothers seem to be competitors for the social attention of their child and interfere in the children's peer interactions (Hartup 1983). Preschool and kindergarten teachers also intervene in peer interactions by terminating the peer interactions or expressing rules and commands (Kemple *et al.* 1997). During the child's peer directed behaviour the support workers mostly show other behaviour, but when they do present peer interaction influencing behaviour, it is mostly social scaffolding behaviour. Another important conclusion is however that also the distracting behaviour of the direct support worker increases during and after the peer directed behaviour of the children with PIMD.

To answer the two final research questions in this study, we investigated if the positioning has an influence on the amount of peer directed behaviour presented by the children with PIMD. A relation is found between the behaviour and the positioning. Children who can see their peers with head

movement and touch their peers from rest show most peer directed behaviour. The most striking observation however was that all children were positioned by the direct support worker at the start of the activity and were not moved during the activity. No attention was paid to the positioning in order to make peer interactions possible, although the support workers were asked to do an activity with a maximal chance for the children to interact with each other

Some limitations of this study can be formulated. First, the coding schemes used to observe the behaviour of persons with PIMD and of the direct support workers could be even more adapted to the specific characteristics of the research group in this study. Although the inter-rater reliability was relatively high, a clearer description of the codes in light of the profound and multiple disabilities can possibly increase this inter-rater reliability. Based on this study the coding schemes can be refined on the nature of the behaviours. Second, in this study we wanted to investigate if a different positioning of the persons with PIMD results in a variation in their amount of peer directed behaviour. But none of the children was moved during the total duration of the group activity. It would be interesting to investigate the amount of peer directed behaviours in various positions in every individual child. Third, due to the large amount of observed other behaviour and the rather small amount of the focus behaviour namely peer directed and peer interaction influencing behaviour, it was impossible to do for example reliable sequential analysis and make generalizations. Additionally, this extreme unequal distribution can be the reason that only a very weak association was found between the evaluated variables. Fourth, based on our analysis and results no conclusions can be made related to the influence or efficiency of peer interaction influencing behaviour of the support worker on the behaviour of the children with PIMD can be made. Based on our results we can conclude that there is an association between the peer interaction influencing behaviour of the support workers and the peer directed behaviour of the children, but it is not known which behaviour causes the other. To conduct relevant sequential analyses the amount of focus behaviour was too limited. Additionally, in the group interactions it was not always clear on which child the direct support worker was directing his behaviour.

Several questions for future research can be formulated based on this study. First it seems to be difficult for the support workers to organise a group activity in which children with PIMD get the chance to interact with each other. Possibly, persons with PIMD are able and willing to show more peer directed behaviour but are unable due to the limited possibilities in these activities. More research is needed to get a clearer view on how children with PIMD interact with each other and what important factors in the environment may create maximal chances for interactions. Second, looking at the video recordings, many peer directed behaviours can be observed when the direct support worker is not focused on the child. It would be interesting to look at the spontaneous peer interactions and social behaviours of persons with PIMD without the presence of the direct support worker. Thirdly, as mentioned earlier, sequential analyses are necessary to investigate which social scaffolding

behaviours are most effective and which behaviours distract the children with PIMD from presenting peer directed behaviours. And at last, in the general literature on social peer interactions, it is accepted that peer interactions are important and critical in everyone's life (e.g. Hartup 2009; Hay *et al.* 2004; Rubin *et al.* 1998). During child-child interactions, children learn skills and attitudes that cannot be attributed to the parent-child relationship. Parents of children with PIMD mention social interactions and relations as a core indicator of the Quality Of Life (QOL) of persons with PIMD (Petry *et al.* 2005). These assumptions are based on general research about social interactions in persons with intellectual disabilities and about peer interactions in typically developing children. It can be questioned what the developmental and QOL-outcomes are of peer interactions among persons with PIMD.

Based on this study, it can be concluded that persons with PIMD show interest in their peers and are capable of showing active peer directed behaviours. However, these peer directed behaviours are not often recognised and supported by the direct support workers. The study's results also show a relation between the child's positioning and his peer directed behaviour. The knowledge on how this interest in peers can be recognised and how peer interactions can be supported needs to be broadened in further research. This study points to the fact that more research is necessary to get a better idea of the nature of the peer directed behaviour and how direct support workers can create an optimal environment for persons with PIMD in order to present increased peer directed behaviours.

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### **Conflict of Interest**

We do not have any conflict of interest in publishing the results of our study.

**Table 1** Coding scheme for the child's peer directed behaviour

Child behaviour	Code	Examples
Peer directed socially active behaviour		
Looking at or turning head or body in the direction of the peer in combination with:		
Touching, taking, asking,... the object of the peer	a	Pointing, hitting the object
Offering the peer an object	b	Throwing, handing over
(Trying to) touch the peer	c	Pushing, stroking
Vocalisations	d	Laughing, crying
Gestures	e	Waving, nodding
Facial expression	f	Smiling, looking angry
Peer directed socially non-active behaviour		
Looking at peer or object of peer	g	Looking in the direction
Touching peer or object of peer	h	Touching without looking
Moving towards peer or object of peer	i	Moving without looking
Orientated on the support worker or interaction between the support worker and a peer	B	One-on-one interaction with the support worker
Orientated on something else in the environment	C	Looking in the direction of a noise outside the room
Not alert or sleepy	D	Looking to themselves, closing the eyes
Insufficient clarity of the video recording	E	Someone else is in front of the camera

**Table 2** Coding scheme for the direct support worker's peer interaction influencing behaviour

Direct support worker's behaviour	Code	Examples
Peer interaction influencing behaviour		
Distracting behaviour		
Displacing a child	a	Displace a child away from the peers
Displacing an object	b	Displace an object with which two peers were playing
Other	c	Clapping in the hands, offering an object
Social scaffolding behaviour		
Name social actions	d	"Give it to X", "Let's go to Y"
Include a child in a peer group	e	Interacting with the child, together with a peer
Initiation of proximity	f	Placing the children in each other's proximity
Communicate about a peer	g	"Look there is X"
Communicate about the feelings and intentions of a peer	h	"I think Y looks sad"
Recognise peer interactions without reacting	B	Looking at peers who interact but do not try to support or stop them
Other	C	One-on-one interaction, organising the activity

**Table 3** Coding scheme for the positioning of persons with PIMD

Code	Touching	Eye contact
A	The child can at least touch one peer from rest (with minimal effort touching the peer, lifting his arm, already lying or sitting close to the other,...)	No eye contact possible
B	The child can at least touch one peer with effort (need to move, turn or bent forward the upper body, overcome an obstacle,...)	No eye contact possible
C	No touch possible	The child can at least make eye contact with one peer without head movement
D	No touch possible	The child can at least make eye contact with one peer with head movement
E	The child can at least touch one peer from rest (with minimal effort touching the peer, lifting his arm, already lying or sitting close to the other,...)	The child can at least make eye contact with one peer without head movement
F	The child can at least touch one peer from rest (with minimal effort touching the peer, lifting his arm, already lying or sitting close to the other,...)	The child can at least make eye contact with one peer with head movement
G	The child can at least touch one peer with effort (need to move, turn or bent forward the upper body, overcome an obstacle,...)	The child can at least make eye contact with one peer without head movement
H	The child can at least touch one peer with effort (need to move, turn or bent forward the upper body, overcome an obstacle,...)	The child can at least make eye contact with one peer with head movement
I	No touch possible	No eye contact possible

*Note:* to code the positioning the abilities and disabilities of every child are taken into account.

**Table 4** Child behaviour during group interactions

Child behaviour	Mean Frequency (%)	Min (%)	Max (%)	Standard Deviation (%)
Peer directed behaviour	8.14	0	32.51	8.67
Socially active behaviour	2.63	0	19.87	5.33
Socially non-active behaviour	5.51	0	19.99	5.52
Focused on support worker or interaction support worker and peer	67.75	41.90	97.27	18.81
Focused on the environment	16.74	2.30	46.93	15.28
Not alert or sleepy	5.33	0	43.62	11.45
No coding possible	2.02	0	11.59	3.68

**Table 5** Behaviour of the direct support worker during group activities

Behaviour of the support worker	Mean Frequency (%)	Min (%)	Max (%)	Standard Deviation (%)
Peer interaction influencing behaviour	5.15	3.37	7.7	2.06
Social scaffolding behaviour	4.44	2.24	7.13	2.13
Distracting behaviour	0.73	0	1.35	0.57
Noticing peer interactions without reacting	0.65	0	1.06	0.49
Other	94.23	91.32	96.42	2.45

**Table 6** The relation between the behaviour of the direct support worker and the peer directed behaviours of the children

		Social scaffolding behaviour	Distracting behaviour	Other behaviour
No peer directed behaviour	Frequency	169	15	3880
	Expected value	202.44	34.38	3827.2
	Cell chi square	5.52	10.92	0.73
	Row percentage	4.16	0.37	95.47
During peer directed behaviour	Frequency	49	22	502
	Expected value	28.54	4.45	539.61
	Cell chi square	14.66*	60.71*	2.62
	Row percentage	8.55	3.84	87.61
10 seconds after peer directed behaviour	Frequency	47	8	628
	Expected value	34.02	5.78	643.2
	Cell chi square	4.95	0.86	0.36
	Row percentage	6.88	1.17	91.95

\* the association between the behaviour of the direct support worker and the children is most due to the difference between the frequency and the expected frequency in these cells

**Table 7** The relation between the behaviour of the peer directed behaviours of the and the positioning of children with PIMD

		Peer directed behaviour: active	Peer directed behaviour: non- active	Other
Eye contact with head movement	Frequency	3	121	1660
	Expected value	61.70	130.45	1591.9
	Cell chi square	55.85*	0.68	2.92
	Row percentage	0.17	6.78	93.05
Eye contact with head movement + touching from rest	Frequency	166	240	2339
	Expected value	94.94	200.72	2449.3
	Cell chi square	53.19*	7.69	4.97
	Row percentage	6.05	8.74	85.21
Eye contact with head movement + touching with effort	Frequency	15	28	748
	Expected value	27.36	57.84	705.8
	Cell chi square	5.58	15.39*	2.52
	Row percentage	1.90	3.54	94.56

\* the association between the behaviour of the direct support worker and the children is most due to the difference between the frequency and the expected frequency in these cells