

University of Groningen

Attention please!

Munde, Vera Solveig

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2011

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Munde, V. S. (2011). *Attention please! alertness in individuals with profound and multiple disabilities*. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

6

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments*

* This chapter has been accepted for publication as: Munde, V.S., Vlaskamp, C., Post, W.J., Ruijsenaars, A.J.J.M., Maes, B., & Nakken, H. Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in stimulation situations. *Journal of Cognitive Education and Psychology*.

Abstract

Alertness is widely acknowledged as one of the most important preconditions for learning and development in individuals with profound intellectual and multiple disabilities (PIMD). Individuals within this target population, however, experience a wide range of difficulties in the contact with their environment. Because they are alert for only short periods, and because expressions of alertness are difficult to notice and interpret, the promotion and maintenance of optimal alertness levels poses a recurring challenge to their direct support persons (DSPs). A clear protocol for approaching the interrelated tasks of DSPs involving determining and influencing alertness levels could thus be a first step in solving this problem. The aim of the present study was to identify aspects of stimulation provided in multisensory environment (MSE) sessions that influence the alertness levels of individuals in the target population, as investigated according to a predefined observation list.

Video recordings were made of each of the 24 participants during one-on-one interaction with a DSP in the MSE. Alertness levels and environmental conditions were described based on the first five minutes of each session. Multilevel logistic regression analysis was used to identify the aspects of the stimulation situation that were related to occurrence of alertness.

While participants were generally alert for 76.3% of the time, results show that visual stimuli (optimally in combination with auditory stimuli) produced the highest alertness levels. Furthermore, large individual differences were found in reactions to different approaches and stimuli.

The results show that the effects of stimuli dominated the effect of time. The role of DSPs is thus especially important in alertness stimulation of individuals with PIMD. Future studies are necessary in order to formulate definite conclusions.

6.1 Introduction

Alertness is one of the most important preconditions for development and learning in individuals with profound intellectual and multiple disabilities (PIMD, Guess, Roberts, & Guy, 1999). Only if individuals are alert and focused on their surroundings can they be expected to process presented stimuli at a conscious level (Nelson, Van Dijk, McDonnell, & Thompson, 2002). Alertness can be described as an individual's level of interaction and engagement with the environment, which becomes manifest and observable in the individual's behavior (Munde, Vlaskamp, Ruijsenaars, & Nakken, 2009a).

The promotion and maintenance of alertness levels that are optimal for development and learning in individuals with PIMD poses a recurring challenge to direct support persons (DSPs). Guidelines for DSPs can provide information about how the stimulation can be optimally adapted to the needs and abilities of individuals with PIMD and, consequently, how the alertness of the client can be influenced.

While DSPs agree with researchers regarding the importance of alertness in the education and support of individuals with PIMD (Munde, Vlaskamp, Ruijsenaars, & Nakken, 2009b), they face a number of problems. On one hand, DSPs are not always sure how to determine alertness levels in their clients. Alertness observations reported in previous studies can be reduced to three general levels (e.g., Green, Gardner, Canipe, & Reid, 1994; Guess, Roberts, & Guy, 1999; Mudford, Hogg, & Roberts, 1997): 1) being alert and actively focused on the environment; 2) being awake, but focused on oneself and not in contact with the environment; and 3) being asleep, without any focus or contact. In practice, however, DSPs are faced with the complex task of linking particular expressions of alertness in individuals in the target population to one of these three levels. Because of the

Chapter 6

severity of their disabilities, individuals with PIMD do not use spoken language (Nakken & Vlaskamp, 2007). They show only subtle signals (e.g., sounds or changes in facial expression or muscle tension) in order to express themselves. These signals can easily go unnoticed by DSPs, and they are often difficult to interpret. Not only can the meaning of a particular signal differ across individuals, it can also have different meanings in different situations for the same individual (Hogg, Reeves, Roberts, & Mudford, 2001; Petry & Maes, 2006). The determination of alertness in individuals with PIMD is further complicated by rapid and irregular shifts between being alert and *not being in contact with the environment* (Mudford et al.).

Another issue faced by DSPs involves the task of influencing the level of alertness in order to make decisions about the timing of activities. Because of the severity and complexity of their disabilities, individuals with PIMD exhibit only short periods of alertness (Mudford et al., 1997), thus making it difficult for DSPs to determine *when* they should start an activity. They may also be uncertain whether to continue the stimulation when the alertness of their clients decreases. They must further determine *how* they can optimally influence the alertness of an individual with PIMD. According to the literature (Munde et al., 2009a), influencing factors can be described in five categories: modifications of the direct environment, interaction and stimulation strategies, treatment activities, and staff training. The same approach can produce different results in terms of alertness, however, due to the heterogeneity of the target population. Individual differences in preference and reaction make it difficult to influence alertness in individuals with PIMD (Munde et al., 2009a).

An additional aggravating factor involved in determining and influencing alertness is the interrelatedness of all of the issues described above. From the perspective of a DSP, a change in the alertness level of an individual with PIMD can be seen only as a reaction of the individual to influencing

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

factors. At the same time, DSPs need information about individual expressions of alertness in order to adapt the timing and content of stimulation to the abilities and needs of individual clients. The task of determining and influencing alertness levels in individuals with PIMD is consequently challenging and time-consuming.

While previous studies have shown that stimulation in general can help to influence alertness in individuals with PIMD (Munde et al., 2009a), stimulation situations also yield the potential to reveal valuable information in the process of determining and influencing alertness in individuals of the target group. During stimulation in one-on-one interaction, DSPs can engage in the careful observation of individuals with PIMD. When they notice changes in alertness levels, they can immediately adapt the situation to the preferences and needs of the individual. In addition to allowing DSPs time to notice and interpret the communicational signals of their clients, such situations allow the clients time to express themselves (Munde et al., 2009b). For example, previous research suggests that self-initiation of activities is particularly likely to generate increased and prolonged alertness and engagement (Lancioni, Singh, O'Reilly, Oliva, & Severini, 2005; Mellstrom, Saunders, Saunders, & Olswang, 2005). The actual stimulation can be individualized as well. Different kinds of stimuli (e.g., auditory, visual, tactile, vestibular, olfactory, or gustatory) can be presented separately or in combination, repeatedly or alternately. Adapting the stimulation to the individual is particularly important, given the wide variety of sensory impairments in individuals with PIMD (Van Splunder, Stilma, Bernsen, & Evenhuis, 2006). The difficulties that these individuals experience in processing information can cause them to become quickly overwhelmed when confronted with multiple, unstructured stimuli. Because they are not always aware of their wider surroundings, stimulation aimed at the basic

Chapter 6

senses can be a first step in exposing individuals with PIMD to their environment (Hulsegge & Verheul, 1987). While experts in the study of the target population have described sensory stimulation in a structured environment as one possibility for promoting alertness levels, they attach primary importance to the consideration of individual differences in preferences and reactions (Munde et al., 2009b).

Because multisensory environments (MSEs) comply with the assumptions described above concerning determining and influencing alertness, these were chosen as the setting for the present study. With the goal of investigating the relationship between alertness and stimulation situations, the central question of this study is as follows: Which aspects of stimulation provided in an MSE are related to the occurrence of alertness in individuals with PIMD?

6.2 Method

Participants

Nine daycare centers and schools for special education situated in Flanders (the Flemish speaking part of Belgium) and the Netherlands participated in this study. The facilities were randomly selected from the overall population of care centers and schools for individuals with PIMD that provide MSE sessions to activate their clients. Within each facility, DSPs choose between one and four clients, for a total of 24 participants. The number of male and female participants was equal. The mean age was 15.66 years ($SD=12.02$), ranging from 4 to 49. All participants could be described as individuals with PIMD according to the definition of Nakken and Vlaskamp (2007). Fifteen of the participants had epilepsy; 17 had been diagnosed with visual impairments, and 4 had auditory impairments. An overview of the characteristics of the participants is provided in Table 6.1. Informed consent for

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

participation in this study and video registration was obtained from the parents or legal representatives.

Instruments

The Alertness Observation List (AOL; Vlaskamp, Fonteine, Tadema, & Munde, 2010) was used to determine alertness levels. The observation list distinguishes four levels of alertness, each of which is associated with a color: 1) active, focused on the environment (green); 2) inactive, withdrawn (orange); 3) sleeping, drowsy (red); and 4) agitated, discontented (blue). Information recorded on four different forms is used to formulate an individual alertness profile. The overall description of each of the individual's alertness levels is supplemented with concrete examples of behavior.

Previous research shows that the AOL is a reliable instrument for determining alertness in individuals with PIMD. Both inter-observer and intra-observer agreement exceeded the 80% criterion when 78 videotapes of 23 children with PIMD were included (Munde, Vlaskamp, Ruijsenaars, & Nakken, 2011). In addition, similar results for alertness observations with the AOL and physiological measurements suggest that the instrument fulfills the aim of determining alertness and is, thus, valid (Munde et al., submitted).

Procedure

In the present study, data were gathered in two steps. First, the AOL was completed for all participants. Second, at least three MSE sessions were videotaped for each participant. In these sessions, participants were offered stimuli during one-on-one interaction with a DSP. The DSPs were instructed to consider the individual's alertness profile when choosing stimuli. The choice as well as the presentation of the stimulus had to be based on

Chapter 6

Table 6.1

Characteristics of the participants

	Gender	Age (years)	Epilepsy	Visual impairment	Auditory impairment
1	male	10		x	
2	male	4		x	
3	male	16		x	
4	female	23		x	
5	female	13	x	x	
6	male	11	x	x	
7	male	47	x		x
8	male	28	x		
9	male	20	x		
10	female	31	x	x	
11	male	49	x	x	
12	male	10		x	
13	male	10			x
14	female	12	x	x	
15	male	10	x	x	
16	female	13			
17	male	15		x	
18	female	6	x		
19	female	11	x	x	
20	female	13	x		
21	female	13	x	x	x
22	female	16		x	x
23	female	6	x	x	
24	female	5	x	x	

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

the preferences of the individual participant in order to include only stimuli that were expected to be salient for the participant and, therefore, increase the participant's alertness. Because the DSPs were free to discontinue the activity whenever they deemed it appropriate for the client, the length of sessions varied from 5 to 30 minutes.

A total of 76 MSE sessions were videotaped. Because of low quality of the recording or the absence of interaction with a DSP, 14 tapes were excluded from further analyses. From the remaining pool of 62 tapes, one session of each participant (24 sessions in total) was selected at random and scored by one of the observers using the Media Coder (Bos & Steenbeek, 2008). Five tapes (20%) were scored by a second observer, employing the general agreement formula (Mudford et al., 1997). Inter-observer agreement was 86.2%. Because of the short alert periods experienced by individuals with PIMD, the first minutes of the sessions were expected to reveal a maximum of information. For this reason, only the first five minutes after the start of the activity were included in the further analyses. Event sampling was used for the observations, and the data were prepared with one score per second for the analyses.

Videotapes were scored by three observers. All of the observers had been trained in the use of the AOL, and they were familiar with the aim of the study. Individual alertness profiles were employed as frameworks for determining alertness levels. For scoring purposes, the alertness level alert was subdivided into two levels (i.e., *actively alert* and *passively alert*), in order to separate reactions including or excluding motor action. The MSE was described according to three aspects: 1) the focus of the DSP (*on the individual with PIMD, on the material, and other*); 2) the initiation of the activity (*by the individual with PIMD and by the DSP*); and 3) the presented stimuli (differentiating between visual, auditory, tactile, vestibular, olfacto-

Chapter 6

ry, and gustatory). Depending on the preferences and abilities of the individual with PIMD, stimuli could range from a bubble tube to a colored stuffed animal for the visual stimuli and from music to the voice of the DSP for auditory stimuli. Examples of tactile and vestibular stimuli are receiving a massage and swinging in a hammock, respectively.

Additional analyses of this data have been described in Munde, Vlaskamp, Maes, & Ruijsenaars (submitted).

Analysis

We began by exploring the data according to descriptive statistics, using SPSS 16. Percentages of the various alertness levels and aspects of the stimulation situation were compared to each other. We then performed multilevel modeling on these data, using MLwIN software (version 2.20). A multilevel logistic regression model was necessary in order to estimate more unbiased effects and to consider dependencies within subjects (Snijders & Bosker, 1999). In the present study, the occurrence of alertness was nested within the subjects. To test the associations between the occurrence of alertness and aspects of the Snoezelen sessions, the aspects were used as predictors, with alertness as the dependent variable. Scores were dichotomized into the categories alert and not alert, in order to compare higher percentages and thus ensure robust estimations. A number of different models were developed initially, and the final model was selected according to interpretability and complexity. Although the ordinal logistic regression model and the multinomial model did not reveal plausible results, the logistic regression model (based on the occurrence of alertness) did. The model was developed by adding the separate aspects of the stimulation situation, as well as interaction effects. Fixed and random effects were considered, and only significant effects were included in the model. The effects were estimated using MCMC (Markov Chain Monte Carlo)

method. The Deviance Information Criterion (DIC) diagnostic was used (Browne, 2009) to compare different models.

6.3 Results

The alertness observations showed that most of the individuals with PIMD were passively alert during the first five minutes of the stimulation situation. The frequencies were 52.9% (passively alert), 23.4% (actively alert), 18.3% (withdrawn), and 5.3% (*asleep*), without any effect of time. In addition, the majority of the participants (75%) exhibited irregular and sometimes rapid shifts. In most cases, shifts occurred between two adjacent levels, with shifts between passively alert and actively alert or withdrawn occurring most frequently.

To examine the alertness observations in relation to the stimuli, mean alertness levels of all those participants who received a certain stimulus at one moment were compared to the mean alertness levels of all those participants who did not receive that kind of stimulus at the same moment. Making these comparisons for every second of the first five minutes of the stimulation situations reveals several patterns. Visual stimuli were associated with considerably higher alertness levels at all times (see Figure 6.1). Only slight positive effects were observed for tactile stimuli (see Figure 6.2). The effects of these stimuli were greater for individuals with auditory and/or visual impairments than they were for those without these types of impairments. While auditory stimuli did not produce any difference in alertness levels in the beginning of the stimulation situation, their impact increased with time (see Figure 6.3). Vestibular stimuli were presented only rarely, and olfactory and gustatory stimuli were not presented in any of the selected stimulation situation.

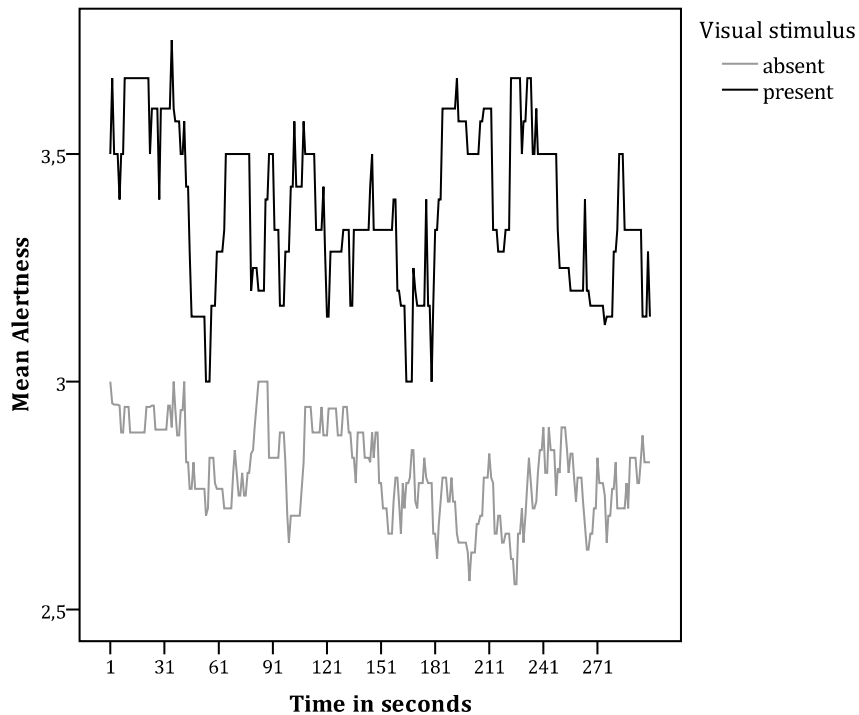


Figure 6.1 Alertness related to visual stimuli

Note. In Figures 6.1 to 6.3, the mean alertness is displayed for the entire group of participants. Alertness levels are scored as follows: *actively alert* (4), *passively alert* (3), *withdrawn* (2), and *asleep* (1).

The number of stimuli was also associated with different levels of alertness (see Figure 6.4). The individuals with PIMD were alert in most cases involving the presentation of one (83.0%) or two (91.9%) stimuli, including a large observed percentage of passive alertness (57.3% and 66.0%, respectively). The combination of three stimuli (which occurred during only 6.6% of the sessions) was always associated with alert behavior, with high percentages (56.7%) of active alertness. In all cases, this combination included a tactile stimulus. Situations in which no stimulus was presented tended to

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

generate withdrawn behavior (46.9% of the time) and passive alertness (30.3% of the time).

Although the DSPs were focused on the individuals with PIMD for the major portion of the stimulation situation (91.2% of the time), only briefly turning their attention to the material (0.4%) or other matters (8.4%), the alertness levels of the individuals with PIMD showed high observed percentages of passive alertness in all three conditions (53.5%, 100%, and 44.5%, respectively). Focusing on the individual with PIMD also led to frequent active alertness (23.7%), while focusing on other things resulted in a relatively large percentage of withdrawn behavior (33.4%). This data is illustrated in Figure 6.5.

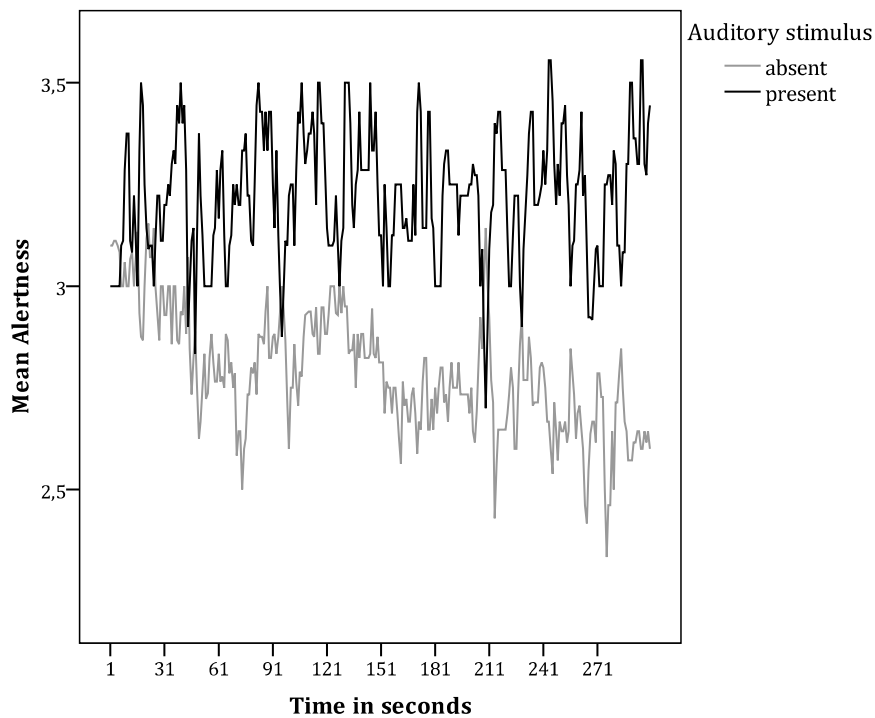


Figure 6.2 Alertness related to auditory stimuli

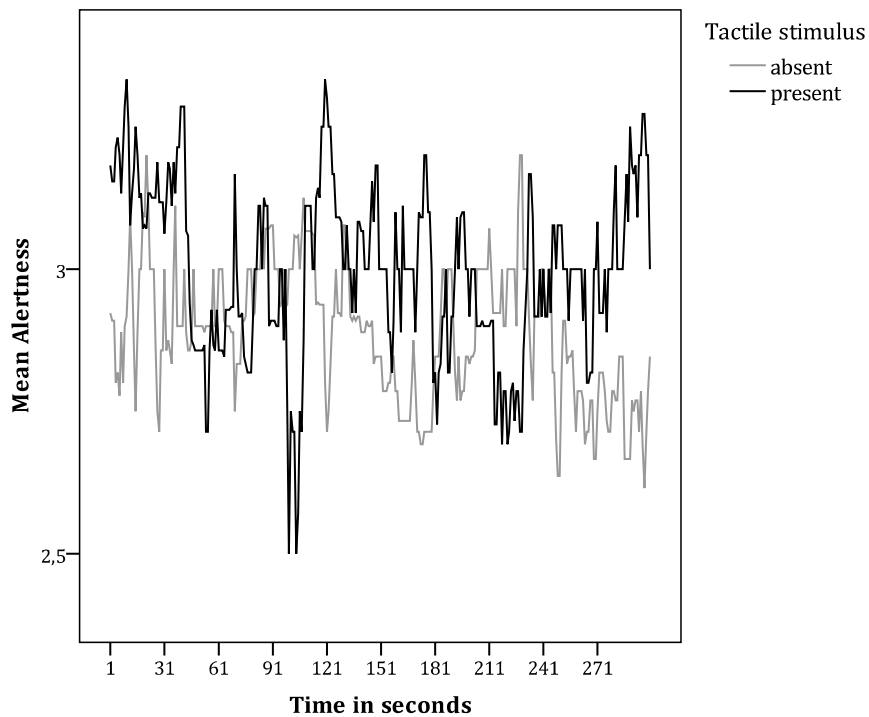


Figure 6.3 Alertness related to tactile stimuli

The examination of alertness observations according to the initiation of the activities reveals a number of differences (see Figure 6.6.). When activities were initiated by the DSP, as in the majority of cases (79.3%), observed alertness levels were generally high. Individuals with PIMD were alert for 72% of the time during the activities initiated by the DSPs, although they exhibited more passive alertness (58.6%) than active alertness (13.4%). When individuals with PIMD initiated the activity themselves, as in 20.7% of the cases, they were more frequently alert (93%) and more frequently active (61.9%). For the remaining 7% of the time in cases in which they had initiated activities themselves, individuals with PIMD were withdrawn. In cases involving DSP-initiated activities, the clients tended to be more withdrawn (21.3% of the time) or to fall asleep (6.7% of the time).

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

The trends described above were tested in a multilevel logistic regression model. The model reveals a number of relationships. Alertness was highly associated with visual stimuli, meaning that visual stimuli increased the likelihood of being alert. The combination of visual and auditory stimuli was also associated with significantly higher levels of alertness. No significant results were found for tactile and auditory stimuli, although there was considerable variation in the reactions of individual participants to these stimuli. This was demonstrated by large random effects (not shown in the table). When interaction effects for all three stimuli were added to the model, only the combination of visual and auditory stimuli produced significantly higher alertness levels. Combinations of tactile and visual or tactile and auditory stimuli did not result in significant changes in the occurrence

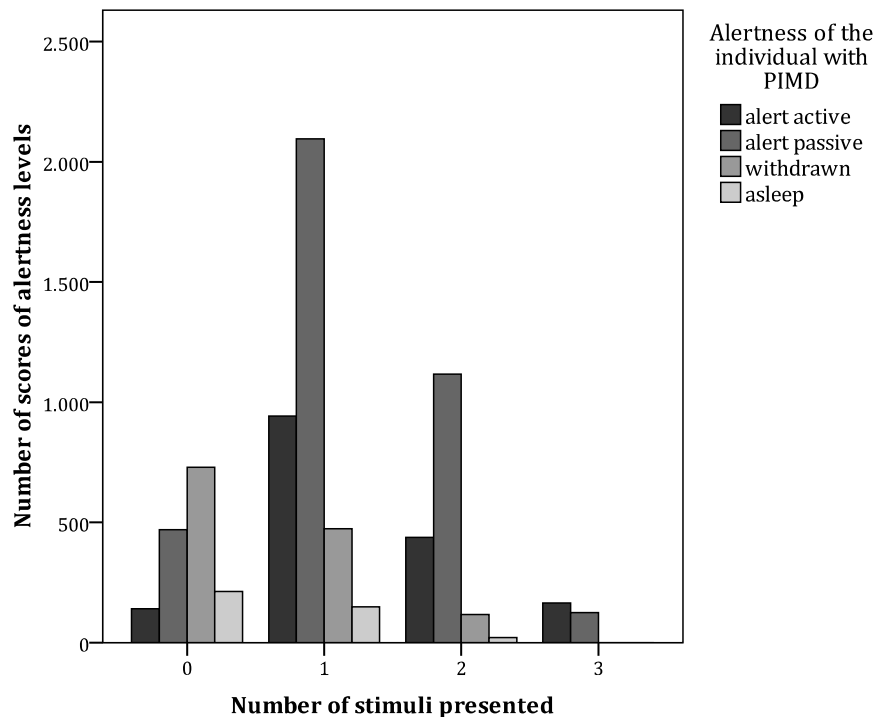


Figure 6.4 Alertness related to the number of stimuli

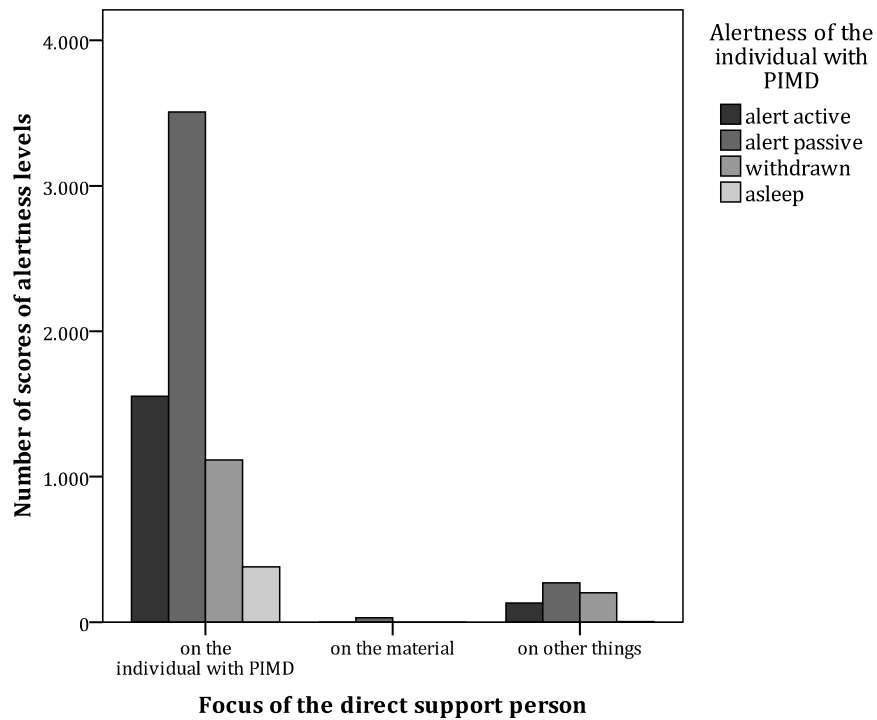


Figure 6.5 Alertness related to the focus of the direct support person

of alertness. No associations were found for the other stimuli, the focus of the DSP, or the initiation of the activity.

The multilevel logistic regression model is displayed in Table 6.2.

6.4 Conclusion and discussion

The aim of the present study was to identify aspects of stimulation situations that influence alertness in individuals with PIMD. Based on observations of 24 individuals with PIMD, the results of the present study point to some clear conclusions. First, one-on-one interaction with a DSP can generally reveal a high percentage of alert behavior in an individual with PIMD during the first five minutes of a stimulation situation. Second, activities initiated by the individual with PIMD seem to be related in more prolonged,

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

higher alertness levels than do activities initiated by DSPs. Third, visual stimuli are associated with significantly higher alertness levels than other stimuli, also when they are combined with auditory levels. Other combinations of stimuli are not significantly more likely to be related to changes in alertness levels.

While the overall percentages of alert behavior confirm the potential of stimulation situations to promote alertness, the results concerning the various aspects of these situations are not in line with previous studies (Lindsay, Pitcaithly, Geelen, & Buntin, 1997; Vlaskamp, De Geeter, Huijsmans, & Smit, 2003). Only visual stimuli (optimally in combination with auditory stimuli) were clearly effective in increasing the occurrence of alertness. In

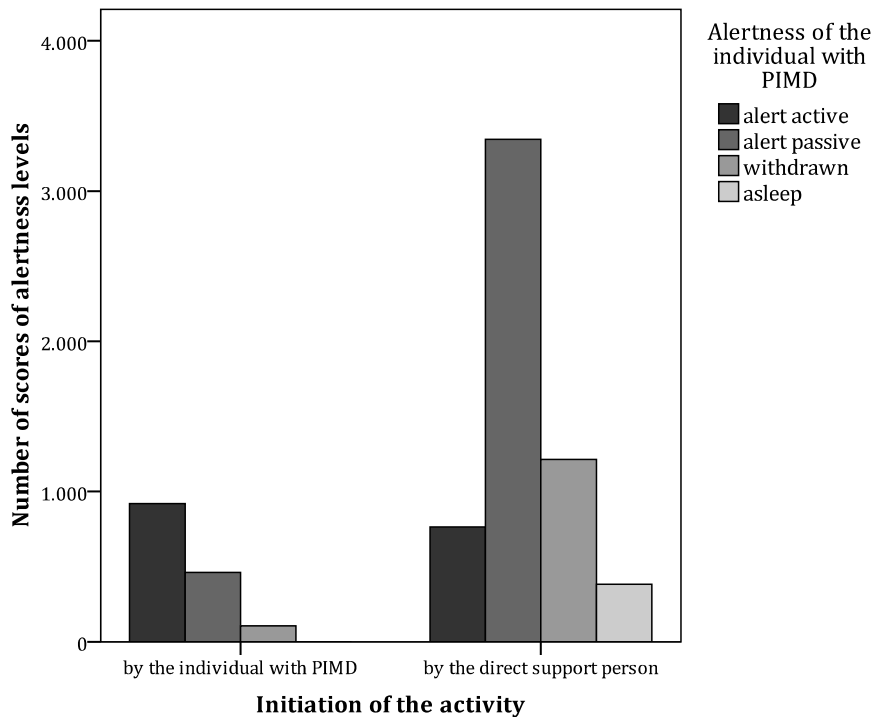


Figure 6.6 Alertness related to the initiation of the activity

Chapter 6

Table 6.2

Association of alertness and different aspects of the multisensory environment in a multilevel logistic regression model

	Empty model	Final model
<i>Intercept</i>	2.974 (1.078)	3.903 (1.515)
<i>Fixed</i>		
Visual		1.691 (0.388)
Tactile		-0.419 (0.976)
Auditory		0.835 (0.794)
<i>Interaction</i>		
visual-auditory		2.351 (0.934)
<i>DIC</i>	3358.91	2929.78

Note. With the exception of those for deviance (DIC, Deviance Information Criterion), all cells contain the regression coefficient and the standard error. Random effects are not included in this table.

previous studies, experts have suggested that visual stimulation in an MSE can reveal higher percentages of alert behavior, especially in individuals with visual impairments (Munde et al., 2009b), although no studies to date have provided evidence to support this suggestion. Even though tactile stimuli were presented most frequently in the present study (in contrast to the low frequencies reported in previous studies), the present data do not confirm previous findings that these stimuli produce the largest effects (Vlaskamp et al.). An explanation could involve the fact that tactile and auditory stimuli are often part of the communication. For example, when DSPs talk to their clients while introducing activities, or when they touch clients in order to help them explore objects, clients with PIMD may not clearly notice these functional stimuli. Reactions in terms of alertness may therefore be less clear than those exhibited in response to explicitly pre-

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

sented visual or other stimuli. At the same time, the interaction effect of visual and auditory stimuli may indicate the importance of supporting communication during activities. Furthermore, previous studies were conducted in environments including several simultaneous stimuli (Vlaskamp et al.). Comparing the results, we may hypothesize that visual stimuli can be effective in single-stimulus situations, while individuals with PIMD could be better at distinguishing tactile stimuli from a larger number of stimuli.

Another striking finding in this study involves the absence of a time effect. Although previous studies (Guess et al., 1999; Mudford et al., 1997) have shown that individuals with PIMD can be alert for only short periods of time, the present data suggest that DSPs are able to keep their clients alert for at least five minutes. Even though individuals with PIMD showed changes between alertness levels throughout the entire time of the observations, the effect of the stimuli did not differ over time. The effects of the stimuli thus dominated the effect of time.

Descriptive results for the initiation of activities confirm previous suggestions that the individualization and self-initiation of activities may also affect levels of alertness (Lancioni, O'Reilly, & Martini, 1999; Lancioni, Cuvo, & O'Reilly, 2002; Lancioni et al., 2005; Munde et al., 2009b). While it is not surprising that participants showed high levels of alertness when they were allowed the opportunity and time to determine the situation as much as possible, additional aspects of the stimulation situation may have led to passive alertness or even to withdrawn behavior in such situations.

This study has several limitations that should be noted when interpreting the results. Because of the small sample size, not all conditions were present in equal amounts. The frequencies of some combinations were too low to allow further analysis. It was therefore not possible to include all aspects of a stimulation situation in the multilevel model. However, our

Chapter 6

study was meant as an initial exploration of the data, and future experimental studies that control for these aspects could complement the present results. In addition, the choice of a stimulus and the way of interacting was different for each participant. Because individualized stimulation is especially important for individuals in the target group, DSPs were instructed to adapt their behavior to the needs and abilities of the individual with PIMD. Consequently, stimuli were only comparable regarding their salience for the individual participant. While the design of our study did not allow for a control group, comparing similar stimuli or ways of interaction to individualized situations may yield supplementary information. The small sample size in combination with the high variation between individuals also prevented us from deriving robust estimates of the random effects. Future studies that include differentiation between subgroups (e.g., individuals with and without auditory impairments) may reveal a more distinct picture. Furthermore, sequential aspects of the situations were not taken into account. For example, the results produced by repetition may differ from those produced by presenting a stimulus only once. The exclusion of the sequential aspect from the present model may have distorted the actual effects. The present analysis should therefore be seen as an initial exploration of the data. In future studies, the limitations will be approached by searching for a better design of the model and conducting sequential analyses.

Despite the limitations of this study, the results reveal valuable information for education and support of individuals with PIMD. One recommendation is to advise DSPs to take the time to engage in short individual interactions in stimulation situations. Such situations can be helpful in observing and determining the alertness levels of individuals with PIMD. In addition, the clients need the DSPs in order to become and remain alert. Because stimulation always has the potential to bring an individual with

Observing and influencing alertness in individuals with profound intellectual and multiple disabilities in multisensory environments

PIMD back to a higher level of alertness, DSPs should not discontinue activities in response to irregular changes between alertness levels. At the same time, individuals with PIMD should be given the time to determine the situation themselves as much as possible, both directly and indirectly. Stimuli should be presented explicitly, while adapting the choice of stimuli to the needs and preferences of individual clients. As one of the most frequently applied activities in education and support of individuals with PIMD (Vlaskamp & Nakken, 2008), MSEs make the realization of the presented procedure quite feasible in clinical practice. The use of stimulation situations as a diagnostic method for determining alertness in individuals with PIMD can be further developed in the future.

