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ABSTRACT

Objective: The aim of the study is to identify the degree of association between mood, activity engagement, activity location, and social interaction during everyday life of people with dementia (PwD) living in long-term care facilities.

Method: An observational study using momentary assessments was conducted. For all 115 participants, 84 momentary assessments of mood, engagement in activity, location during activity, and social interaction were carried out by a researcher using the tablet-based Maastricht Electronic Daily Life Observation-tool.

Results: A total of 9660 momentary assessments were completed. The mean age of the 115 participants was 84 and most (75%) were women. A negative, neutral, or positive mood was recorded during 2%, 25%, and 73% of the observations, respectively. Positive mood was associated with engagement in activities, doing activities outside, and social interaction. The type of activity was less important for mood than the fact that PwD were engaged in an activity. Low mood was evident when PwD attempted to have social interaction but received no response.

Conclusion: Fulfilling PwD's need for occupation and social interaction is consistent with a person-centred dementia care focus and should have priority in dementia care.

Introduction

Psychosocial outcomes such as mood are well-established hallmarks in judging quality care for people with dementia (PwD) (Kitwood, 1997a; Rabins & Black, 2007). Numerous studies assessed constructs related to mood such as depressive symptoms, happiness, positive affect, or negative affect. Findings of these studies support the importance of a positive mood for PwD's well-being and quality of life (QoL) (Banerjee et al., 2009; Beerens, Zwakhalen, Verbeek, Ruwaard, & Hamers, 2013; Byrne-Davis, Bennett, & Wilcock, 2006; Cahill & Diaz–Ponce, 2011; Dröes et al., 2006). Earlier research indicates that negative mood or major depressive symptoms are not inevitable aspects of living with advanced dementia in a long-term care facility. For example, an European survey (Beerens et al., 2014) found that PwD who were recently admitted to a long-term care facility had less depressive symptoms than those who lived at home at risk for admission within the next six months. Furthermore, a systematic review showed that depressive symptoms do not necessarily worsen as the dementia progresses (Verkaik, Nuyen, Schellevis, & Francke, 2007). Yet there continues to be a compelling need to identify ways to ensure positive mood as studies indicate that 20%–50% of the PwD living in long-term care facilities experience depressive symptoms (Garre-Olmo et al., 2003; Smalbrugge et al., 2006; Zuidema, Derksen, Verhey, & Koopmans, 2007).

Mood can be defined as a broad range of affective states which fluctuate over the day (Clark & Watson, 1988; Lee, Algase, & McConnell, 2013). As such mood may well be related to the variation in what happens during daily life. This includes activities and social interactions (Clark & Watson, 1988). To support residents to achieve and maintain a positive mood during the day, it is important to have an understanding of the association between mood levels and activity, and social engagement. Such an understanding can be used to provide practical guidance to long-term care staff on how to improve PwD's mood.

Studies which have used questionnaires to assess associations with mood indicate that depressive symptoms of PwD living in long-term care facilities are associated with negative outcomes such as a decreased QoL, worse physical health, a decreased ability to perform activities of daily living, a lack of social support, pain, loneliness, and negative life events (Barca, Engedal, Laks, & Selbaek, 2010; Beerens et al., 2013; Jongenelis et al., 2004). Studies which used real-time observational assessments indicate that negative affect was associated with the presence of agitated behaviour (Cohen-Mansfield, Dakheel-Ali, Jensen, Marx, & Thein, 2012) and positive affect is associated with social stimulation and recreational activities (Cohen-Mansfield, Marx, Thein, & Dakheel-Ali, 2011; Schreiner, Yamamoto, & Shiotani, 2005).

To date, in-depth knowledge about the association between mood, activities, and social interaction during everyday life is lacking. First, there is little research that directly investigates variations in mood levels in relation to variations in activities and social interaction, which would enable us to 'capture the film of PwD's daily life rather than a snapshot of daily life reality' (Myin-Germeys et al., 2009). Second, most studies do not specifically focus on activities and social interaction as potential correlates of mood for PwD but rather on clinical correlates

such as cognition and functional dependency. This is a significant omission given that activity levels and social interaction are more amenable to change by care staff than cognitive status or functional dependency (e.g. Nehen & Hermann, 2015; van der Ploeg et al., 2013). Third, most studies focus on correlates of negative mood such as depressive symptoms. These studies will not directly provide information to guide how a positive mood can be achieved. Again a significant omission given that positive mood is essential for PwD's well-being (Byrne-Davis et al., 2006; Dröes et al., 2006). Fourth, most studies mainly used proxy-reported questionnaires to assess mood and its associated factors. These measures may be influenced by proxies' feelings of burden or distress (Arons, Krabbe, Scholzel-Dorenbos, van der Wilt, & Olde Rikkert, 2013; Sands, Ferreira, Stewart, Brod, & Yaffe, 2004). In addition, questionnaires are prone to recall bias (Bolger & Laurenceau, 2013), which may for example affect estimates of the time spent in activities (Smit, de Lange, Willemse, Twisk, & Pot, 2015).

The current study was designed to address these gaps in knowledge. Therefore, the aim of the current study is to identify the degree of association between mood, activity engagement, activity location, and social interaction during everyday life of PwD living in long-term care facilities.

Methods

Design

The current study has an observational design and includes ecological momentary assessments (Shiffman, Stone, & Hufford, 2008) during the daily lives of PwD living in long-term care facilities. These momentary assessments enable researchers to repeatedly observe and examine real processes and outcomes during daily life.

Setting and participants

This study was part of a larger study focusing on long-term care facilities in the Netherlands (de Boer et al., 2015). Both small-scale and large-scale facilities were included. Eighteen wards from eight locations in the south of the Netherlands participated. In total, 158 people with an official diagnosis of dementia were potentially eligible for inclusion in the study.

Measures

Mood, activity engagement, activity location, and social interaction were observed using the Maastricht Electronic Daily Life Observation-tool (MEDLO-tool) (de Boer et al., 2016). Using this tablet-based tool, momentary assessments (Shiffman et al., 2008) of PwD's daily life were recorded over time. The MEDLO-tool has demonstrated feasibility, validity, and reliability and interrater-reliability was sufficient for all domains (agreement ranging from 69% to 100%) (de Boer et al., 2016). A detailed manual of all scoring options is available upon request. Box 1 provides operational definitions of mood, activity engagement, activity location, and social interaction.

Mood

Mood was observed using a 7-point rating scale, ranging from 1 = great signs of negative mood to 7 = very high positive mood. A neutral scoring option (4) is scored in situations in which PwD's mood is not clearly positive or negative, e.g. when they are gazing.

Box 1. Mood, activity, interaction, and associated operationalizations. *Mood*

Mood during observation minute
1 = great signs of negative mood
2 = considerable signs of negative mood
3 = small signs of negative mood, discomfort, or boredom
4 = neutral: no positive or negative mood observable (e.g. gazing, sleeping)
5 = contentment and small signs of well-being
6 = considerable positive mood
7 = very high positive mood

Activity and interaction
1. Engagement in activity taking place during the observation minute
   (one from the 14 listed activities can be chosen as an activity that took place)
   0 = was not engaged in activity (sleeping, staring, doing something else)
   1 = was actively (= participating in activity) or passively (= focusing on activity) engaged in activity

Activity	Example
Care activity	Visit (para) medical personnel, (self-) care activities
Communication/social activity	Talking with others, making telephone call, helping others
Eating/drinking	Eating or drinking
Household activity	Doing household chores, cooking, gardening and caring for plants
Intellectual activity	Playing cards or games, doing (crossword) puzzles, reading, writing
Musical activity	Dancing, singing
Nature/outdoor activity	Walking outside, farming activity, activity related to pets
Outing/shopping	Excursion, outing with family
Purposeless behaviour	Repetitive behaviour
Sitting/lying	Sitting or lying (not sleeping) without being occupied in an activity
Sleeping purposively	Sleeping
Television/radio activity	Watching television or listening to the radio
Other activity	Activity related to beauty, spirituality, arts, sensory stimulation, walking, sports, smoking, etc.
Not observable	(For any reason)

2. Location of activity during observation minute
0 = inside the facility (communal area on/off the ward, own room, bathroom/toilet)
1 = outside the facility (not present inside the facility)
3. Presence of social interaction during observation minute
0 = no social interaction, attempted interaction without response
   If 0 (no social interaction), the presence of one-way social interaction (defined as resident's attempt to have social interaction without getting a response) was recorded
      0 = no, there was social interaction with one or more persons
      1 = yes, there was one-way interaction
1 = yes, social interaction with one or more persons

Activities and social interaction

To determine engagement in activity, the observers recorded the type of activity (e.g. household activity, musical activity) first and the level of engagement afterwards (yes or no).

Engagement recorded as 'yes' included both active engagement (real participation in the activity, for example doing household chores) and passive engagement (having a clear focus on the activity without active participation, for example watching someone else doing household chores). The location of the resident during the activity was recorded as inside or outside. Social interaction was recorded as yes or no. As a subcategory of 'no interaction', it was recorded when a resident attempted to socially interact with someone but received no response (i.e. one-way interaction) (yes versus no).

Background characteristics

Cognitive status was assessed using the Standardized Mini-Mental State Examination (S-MMSE) (Molloy, Alemayehu, & Roberts, 1991). The total score of the S-MMSE ranges from 0 to 30, with higher scores indicating less cognitive impairment. Furthermore, demographic data including age, gender, and the number of months that residents lived in the facility were collected.

Procedures

All data were collected within a period of three weeks in each long-term care setting. Two researchers and one research assistant collected these data. Using the MEDLO-tool, all individual PwD were observed on seven days: two weekday mornings (07:00–11:30), two weekday afternoons (11:30–16:00), two weekday evenings (16:00–20:30), and one Saturday afternoon (11:30–16:00). There was a half-hour break in each 4.5 hour observation block. A randomized observation schedule ensured that every participant (with a maximum of eight per ward) was observed for one minute during every 20-minute period. After observing a resident for one minute, the observer recorded residents' individual scores on mood, activity engagement, activity location, and social interaction (see also Box 1). In total, 12 (observation minutes per day) × 7 (observation days) = 84 momentary assessments were recorded per resident.

PwD's background characteristics were provided by certified nursing assistants (age, gender, months living in facility) and PwD themselves (S-MMSE).

Statistical analyses

First, descriptive analyses were conducted. Mean mood scores during activities and social interactions were calculated. Second, three groups of observations were constructed based on mood scores: observations in which PwD had (1) a negative mood (mood scores ranging from 1 to 3); (2) a neutral mood (mood score of 4), and (3) a positive mood (mood scores ranging from 5 to 7). After this, we calculated how often activity engagement, activity location, and social interaction occurred with a low, neutral, or positive mood.

Second, a random-effects regression analysis (random intercept) was conducted to assess the association between the continuous variable mood (dependent variable) and activity engagement, activity location, and social interaction (independent variables). In this hierarchical model, the repeated measurements (level one) were nested in participants (level two). Descriptive analyses indicated that engagement in any kind of activity was beneficial for PwD's mood, and therefore the variable 'engagement in activity' was included rather than

variables on engagement in types of activities separately (e.g. engagement in musical activities). This increased the stability of the model. No distinction between active engagement and passive engagement was made, as descriptive analyses indicated that this would not lead to more differentiated results. One-way social interaction (resident's attempt for social interaction without receiving a response) was excluded for this regression analyses because of its low prevalence. Furthermore, we controlled for the effects of gender, cognition, and type of long-term care facility. All independent variables were entered in the model simultaneously.

Because some participants had missing observations on both dependent and independent variables, a multiple imputation technique (Schafer & Graham, 2002) was used to complete the dataset for the regression analysis. The main reasons for missing data were unavailability of participants due to, for example, care activities or appointments with (para) medical personnel, which make the missing at random assumption plausible. Missing values were imputed using the participant's mood score, scores on other observed variables, background variables such as gender and cognition and variables that were associated with the reasons for missing data (e.g. there were frequently missing observations during care activities). Missing data were imputed using the MICE package (Buuren & Groothuis-Oudshoorn, 2011) in R version 3.2.1 and analysed and pooled in SPSS version 20. In this publication, the pooled result derived from five imputations is reported.

Ethics

The study protocol was reviewed by the medical ethics committee of the Maastricht University Medical Center. They declared on 24 January 2014 that the study was non-invasive for people with dementia according to the Medical Research Involving Human Subjects Act (Medical Research Involving Human Subjects Act, 1998). Legal representatives of PwD provided written informed consent. PwD were asked to assent to participation, where 'assent' was defined as agreeing to participate without having a full understanding of the study and what it would involve (Slaughter, Cole, Jennings, & Reimer, 2007).

Results

Sample characteristics

The legal representatives of 115 of the 158 potential participants (73%) agreed to participate in the study. In total, 9660 observations were conducted (115 participants × 84 observations per participant). Table 1 provides the sample characteristics of the participants.

Table 1. Sample characteristics.

	Total $n = 115$
Age, mean (SD)	83.8 (7.8)
Gender (female), %	75
Marital status (widowed), %	66
Months living in facility, mean (SD)	29.5 (22.7)
S-MMSE, mean (SD)	8.5 (6.9)

Note: SD = standard deviation.

Table 2. Activities and social interaction: frequency and associated mood score.

		Frequency	Mean mood score (SD*)
Engagement in any activity (%)	All activities together	73.1	5.0 (0.5)
Engagement in activity related to… (%)	Care	7.3	4.8 (0.7)
	Communication/social	19.7	5.0 (0.6)
	Eating/drinking	19.1	5.0 (0.3)
	Household	8.4	5.0 (0.3)
	Intellect	6.5	5.1 (0.3)
	Music	3.2	5.2 (0.5)
	Nature/outdoor	1.2	5.2 (0.5)
	Outing/shopping	3.6	5.5 (0.6)
	Purposeless behaviour	NA**	NA**
	Sleeping	NA**	NA**
	Sitting/lying	13.6	4.9 (0.4)
	Television/radio	7.6	5.0 (0.3)
	Other	9.8	4.9 (0.7)
	Not observable	NA**	NA**
No engagement in any activity (%)	All activities together	26.9	4.2 (0.4)
Location of activity (%)	Outside	7.6	5.1 (0.4)
	Inside	92.4	4.7 (0.6)
Social interaction (%)	Yes	33.5	5.0 (0.6)
	No	66.5	4.6 (0.5)
	One-way interaction	1.3	4.4 (1.0)

*SD = standard deviation, **NA = not applicable because: (1) engagement in this activity could not be assessed, or (2) engagement in this activity was not considered relevant.

Mood

A negative, neutral, or positive mood was recorded during 2%, 25%, and 73% of the observations, respectively. More specifically, a mood value of 5 – indicating contentment and small signs of well-being – was recorded most frequently (68%). PwD's mean mood score was 4.8 (SD: 0.6), indicating an overall positive mood.

Activities and social interaction

Table 2 provides an overview of the percentage of observations PwD spent on activity engagement, where this activity took place, and social interaction.

PwD were engaged (actively and passively) in some kind of activity during 73% of the observations, whereas they were disengaged during 27% of the observations. Engagement in communication and eating or drinking occurred most frequently (20% and 19%, respectively). Furthermore, people were engaged during sitting or lying – meaning that they were awake and actively looking around without doing a specific activity – during 14% of the observations. Most activities took place inside the facility (92%).

PwD had social interaction (verbal or non-verbal) during 33.5% of the observations. As a subcategory of 'no interaction', PwD's attempt for social interaction without getting any response was observed during slightly more than 1% of the observations. Further analyses showed that this happened at least once to 49 (of the 115) individual PwD.

Association between mood, activities, and social interaction

Descriptive analyses

The mean mood scores during activity engagement, when PwD were inside or outside and during social interaction are shown in Table 2. In addition, Table 3 provides percentages of how activity engagement, activity location, and social interaction were accompanied by negative, neutral, or positive mood.

When PwD were engaged in an activity they had a mean mood score of 5.0. During 96% of the observations they had positive mood scores. On the other hand, PwD had mostly neutral mood scores (83%) when they were disengaged (mean mood: 4.2). Highest mood scores were recorded when PwD were engaged in an outing or shopping activity (mean mood: 5.5), musical activity (mean mood 5.2), and (outdoor) activity related to nature (mean mood: 5.2). When activities were performed outside (mean mood: 5.1), PwD mainly had positive mood scores (95%). When activities were performed inside, PwD had positive mood scores during 72% of the observations (mean mood 4.7).

During social interactions – either verbal or non-verbal – PwD displayed signs of a positive mood (mean mood: 5.0) during 94% of the observations. When PwD had no social

Table 3. Activities and social interaction divided by mood scores.

		Mood		
		Negative (score 1–3)	Neutral (score 4)	Positive (score 5–7)
Engagement in any activity (%)	All activities together	2.2	1.8	96.0
Engagement in activity related to… (%)	Care	5.7	2.6	91.8
	Communication/social	3.5	1.5	95.0
	Eating/drinking	1.3	1.2	97.5
	Household	0.4	1.6	98.0
	Intellect	0.2	0.9	98.8
	Music	0	0	100.0
	Nature/outdoor	1.6	0.0	98.4
	Outing/shopping	0.0	0.0	100.0
	Purposeless behaviour	NA*	NA*	NA*
	Sleeping	NA*	NA*	NA*
	Sitting/lying	3.4	3.3	93.4
	Television/radio	1.0	2.2	96.8
	Other	6.6	2.7	90.7
	Not observable	NA*	NA*	NA*
No engagement in any activity (%)	All activities together	1.0	82.6	16.3
Location of activity (%)	Outside	0.2	4.4	95.4
	Inside	2.3	26.0	71.7
Social interaction (%)	Yes	3.7	1.9	94.4
	No	1.5	35.4	63.0
	One-way interaction	25.5	11.7	62.8

*NA = not applicable because: (1) engagement in this activity could not be assessed, or (2) engagement in this activity was not considered relevant.

Table 4. Factors associated with mood: regression analysis (adjusted for gender, cognition, and type of long-term care facility).

	Estimate	Standard error	95% confidence interval		P value
			Lower	Upper	
Engagement in activity	.712	.015	.741	.742	<.001
Location of activity	.126	.027	.070	.181	<.001
Social interaction	.118	.014	.090	.147	<.001

interaction (mean mood: 4.6), their mood was positive during 63% of the observations. PwD's mood was more negative when they attempted to have social interaction but received no response (mean mood: 4.4): 26% of the PwD showed signs of negative mood and 12% had a neutral mood during these attempts for interaction.

Regression analyses

The result of the random-effects regression analysis (adjusted for gender, cognition, and type of long-term care facility) is presented in Table 4. In line with the descriptive analyses, these analyses revealed that a higher (positive) mood was associated with engagement in activities, being outside during activities, and having social interaction.

Discussion

This is the first study to: (1) directly investigate variations in mood levels in relation to variations other variables using momentary assessments; (2) focus specifically on variations in activity engagement, activity location, and social interaction as potential predictors of mood; (3) focus on positive mood outcomes; and (4) study the relationship between mood and PwD's attempt for interaction without getting a response. We found that PwD's mood was associated with engagement in activities, doing activities outside, and having social interaction. The type of activity was less important for mood than the fact that PwD were engaged in an activity. Furthermore, we found that PwD's mood was negative when they attempted to have social interaction but received no response.

The mood assessments in the current study indicate that PwD who live in a long-term care facility feel content and present small signs of well-being most of the time. This result is consistent with other studies that found that PwD who live in long-term care facilities express positive emotions approximately 8–13 times more frequently than negative emotions (Kolanowski, Litaker, Catalano, Higgins, & Heineken, 2002; Lee et al., 2013).

Although the current study demonstrated that more activity engagement and social interaction are related to a positive mood, the best balance between activity/social engagement and disengagement is highly personal. Disengagement, which is likely to occur during for example resting, could be a self-chosen time to relax and therefore may be important for PwD as well. In addition, not every social interaction is by definition a positive experience due to misconceptions and misinterpretations that can occur (Ericsson, Hellström, & Kjellström, 2011).

Participants in the current study were engaged in an activity during 73% of the observations. This number is relatively high in comparison with other studies (den Ouden et al., 2015; Wood, Harris, Snider, & Patchel, 2005). However, definitions of 'activity engagement' differ among studies. For example, in the current study 'activity engagement' was a broad construct and also included residents who were passively engaged. For example, residents were rated as engaged when they focused clearly on others who did an activity, whereas other studies regarded this as inactivity (den Ouden et al., 2015; Wood et al., 2005). Our finding that activity engagement is associated with better mood is in line with other empirical studies (Schreiner et al., 2005; Smit et al., 2015). Kitwood's theory on psychological needs (Kitwood, 1997b) also shows that occupation – defined as engagement in the process of daily life in a way that is personally relevant – is a key psychological need. Our finding that there is not one single activity that improves PwD's mood suggests that, in line with Kitwood's emphasis on individualized activities, the type of activity that has a positive influence on PwD's mood differs per person.

The current study demonstrated that a higher frequency of social interaction is associated with better mood. In line with this result, Abbott et al. reported – next to the finding that PwD showed no affect during three quarters of all social interactions – that pleasure was the type of affect that was most frequently observed during social interactions. Almost half of all participants were not being responded to as they attempted to interact with other people at least once during the observations. Although the percentage of these one-way interactions appears relatively low (1.3%), it should be regarded as clinically significant as it had a detrimental effect on PwD's mood. Kitwood & Bredin (1992) suggest that PwD's attempt for social interaction is a positive thing and indicates the presence of agency, defined as 'the ability to control life in a meaningful way, to make some mark upon others and the world' is central to PwD's well-being (Kitwood & Bredin, 1992). However, institutional living holds a great potential for the loss agency, since people are bound to the structures and routines of an institution, with few space for individual habits and preferences (Goffman, 1968). PwD's struggle to interact and thus to maintain a sense of agency is not always recognized by nursing staff. They often have unspoken assumptions about PwD's 'problematic' behaviour and accordingly do not recognize agency (Rodriquez, 2009). In addition, they label some PwD too quickly as a person who is unable to communicate (Ward, Vass, Aggarwal, Garfield, & Cybyk, 2008). Ward et al. (2008) refer to this as 'cognitive disablism', and point out that failing to recognize PwD's communication attempts denies them the right to a relationship with the world they inhabit. Consequently, PwD's mood may decrease and their behaviour remains misunderstood.

PwD were mostly inside the facility. However, although few activities took place outside, being outside was associated with a better mood than being inside. Outdoor areas offer PwD the opportunity to stimulate their senses and to engage in a variety of activities that may remind of their previous home life, for example gardening, walking, and relaxation (Brawley, 2010; Cohen-Mansfield & Werner, 1999). In addition, qualitative literature shows that PwD, relatives, and nursing staff value having an accessible, attractive, and safe outside space in long-term care facilities (Innes, Kelly, & Dincarslan, 2011; Whear et al., 2014). A recent systematic literature review showed mixed results regarding the association between PwD's emotions and outdoor spaces such as gardens (Whear et al., 2014). However, they did find a clear association between decreased levels of agitation and garden use.

Limitations

This study does have some limitations. First, no causal relationships could be established because this study focused only on associations. As a result, we cannot state that activity engagement, being outside, and social interaction cause a positive mood. It could also be that PwD with a positive mood are more likely to participate in activities, to go outside, or to have social interaction. Second, 14 of the 18 wards that participated in this study were small-scale facilities. PwD in small-scale facilities may be, compared to those in large-scale facilities, relatively often engaged in (outside) activities and may have more social interaction. This could have influenced the association between mood, activities, and social interaction.

Implications for practice

As a variety of activities have the potential to be important for a positive mood, the results of this study call for a person-centred approach by offering activities based on PwD's individual preferences (see for example, Van Haitsma et al., 2015). PwD and their family members can therefore be involved in the development of individualized activity plans (DiNapoli, Scogin, Bryant, Sebastian, & Mundy, 2015; Tak, Kedia, Tongumpun, & Hong, 2015; Van Haitsma et al., 2015). As PwD with a lower cognition participate in fewer everyday activities (Edvardsson, Petersson, Sjogren, Lindkvist, & Sandman, 2014), the inclusion of people with more advanced dementia should be promoted by activities adapted to individual possibilities. Furthermore, teaching nursing staff how to recognize PwD's sense of agency and psychological needs is a priority. Finally, nursing staff could encourage PwD to go outside, either alone or with company. A small-scale intervention study showed that recognizing resident's autonomy and independence by unlocking the exit door decreases the number of agitated behaviours (Namazi & Johnson, 1992).

Implications for research

Future studies on the association between mood and social interaction should focus on the quality and type of social interactions. Quality of interaction ratings can be made with the personal enhancers and personal detractions in Dementia Care Mapping (University of Bradford, 2005). Such a level of detail will provide a more sensitive picture of what happens during the daily lives of PwD and why some interactions are associated with a negative mood. For example, Ward et al. (2008) described that one of the most frequently heard carer's instruction during daily life was that PwD should 'sit down', which has probably not the highest potential for a positive mood. Furthermore, more high-quality studies, preferably randomized intervention studies, are needed to assess in what way being outdoors and access to the outdoor area influence mood and which specific activities in the outside environment have the highest potential for positive mood.

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