Original Article

Mobilization-Observation-Behavior-Intensity-Dementia Pain Scale (MOBID): Development and Validation of a Nurse-Administered Pain Assessment Tool for Use in Dementia

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Abstract

Pain assessment in older persons with severe cognitive impairment (SCI) is a challenge due to reduced self-report capacity and lack of movement-related pain assessment instruments. The purpose of this article was to describe the development of the Mobilization-Observation-Behaviour-Intensity-Dementia Pain Scale (MOBID) and to investigate aspects of reliability and validity. MOBID is a nurse-administered instrument developed for use in patients with SCI, where presence of pain behavior indicators (pain noises, facial expression, and defense) may be observed during standardized active, guided movements, and then inferred to represent pain intensity. Initially, the MOBID contained seven items (observing at rest, mobilization of the hands, arms, legs, turn over in bed, sitting on bedside, and teeth/mouth care). This was tested in 26 nursing home patients with SCI. Their primary caregivers, five registered nurses and six licensed practical nurses (LPNs), rated the patients' pain intensity during regular morning care, and by MOBID, both at bedside and from video uptakes. Three external raters (LPNs), not knowing the patients, also completed the MOBID by rating the videos. Internal consistency of the MOBID indicated high Cronbach's alpha ($\alpha = 0.90$) after deleting the items for observation at rest and observation of teeth/mouth care. MOBID disclosed significantly more pain than did pain scorings during regular morning care, and video observation demonstrated higher pain intensity than bedside scoring. Intertester reliability for inferred pain intensity was high to excellent (intraclass correlation coefficient = 0.70–0.96), but varied between poor and excellent for pain behavior indicators ($\kappa = 0.05$–0.84). These results suggest that registration of pain behavior indicators during active, guided movements, as performed by the MOBID procedure, is useful to disclose reliable

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Key Words

Pain, pain assessment, behavioral assessment, movement-related pain, older adults, dementia, reliability, validity, nursing home

Introduction

Advancing age is associated with increased prevalence of pain,[1–3] often caused by musculoskeletal conditions, previous fractures, and neuropathies.[4] Pain is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage."[5] Always subjective, pain depends on the patient's memory, expectation, and emotion. Therefore, when older adults in pain also have severe cognitive impairment (SCI) and reduced communication abilities, they are at high risk for being underdiagnosed and untreated for their pain.[6]

In industrialized countries, 2% of the population suffer from Alzheimer's disease and related dementias.[7] Dementia refers to a clinical syndrome that has many causes, such as Alzheimer's disease (50%–60%), vascular dementia (30%–40%), and secondary dementia.[8] Patients with dementia have memory disturbances as well as defects in other mental abilities, such as abstract thinking, personality, language, and neuropsychological disorders.[8] In Norwegian nursing homes (NHs), 72% of patients suffer from dementia, the main reason for admission.[9] The problem of underdiagnosed and untreated pain seems, accordingly, to be substantial in NHs.[1,2,10–14]

Although older adults tend to have more painful acute and chronic illnesses than their younger counterparts, they often report less pain.[15,16] Chronic pain may be difficult to detect in older adults because they are getting used to it,[15,16] and they might expect pain to be associated with normal aging.[17] The incidence of pain, however, differs among studies of older people, and patients with cognitive impairment (CI) are often excluded in these studies.[18,19] With increasing CI, patients' ability to report pain decreases,[20] and self-report pain assessment tools cannot be used.[21]

In response to a strong need to assess pain and improve pain management in patients with SCI, several pain behavioral scales have been developed[22–36] and reviewed in the literature.[37–39] These instruments are based on observation of patients' behavior and function, involving aspects like sleep, appetite, physical activity, mobility, facial/body language, and social indicators, and they intend to provide indirect pain measures. There is strong evidence that pain behavior indicators, such as guarding, bracing, or grimacing, should be used,[40,41] but these indicators may be absent or difficult to interpret because symptoms attributed to dementia may also be indications of pain.[42] Furthermore, behavioral indicators are more likely to be associated with acute pain, which, although important, is less prevalent than persistent pain in older adults.[43]

Movement-related pain behavior seems to be of clinical significance,[44] but few attempts have been made to investigate the utility of using a standardized movement protocol.[43] A shortcoming of existing scales is that pain behavior in connection with movements is observed only in daily life activities as they naturally occur.[24,26,28,31,35] In a sample of elderly patients with and without CI, Feldt[26] observed high frequencies of verbal and nonverbal pain indicators during movement and transfer. However, pain tended to change the way activities are performed.[45] Changes may be subtle and not easily observed during daily life activities, as people may simply move less or change the way they move to avoid pain.[46–48] To better capture movement-related pain behavior, a protocol of standardized movements of different body parts might be used.

The aim of the present study was the development of an instrument to assess pain in patients with SCI, using a procedure of active, guided movements. The following research questions were posed: Is internal consistency and intertester reliability satisfactory regarding pain behavior indicators and inferred pain intensity? Is there support that the construction of the new instrument is appropriate for capturing valid data on pain intensity in patients with SCI?

Methods

Instrument Development

Behavioral terms and pain assessment tools regarding pain in dementia were reviewed through an intensive survey of the literature. Pain behavior indicators observed in connection with movements and inferred to reflect pain intensity were chosen. An initial draft of the new pain assessment scale was developed by an expert panel (one registered nurse [RN], one licensed practical nurse [LPN], two physicians, two physiotherapists, one clinical psychologist) experienced in pain assessment, examination of psychometric properties of assessment tools, and treatment and care of the elderly, including patients with SCI. The panel consensus was as follows: 1) commonly used indicators of pain behavior should be included; 2) active, guided movement items should be included involving joints of all body parts (arms, legs, and trunk); 3) the movements should be easy to perform by an LPN in connection with morning care; and 4) all items should be obligatory.

Pain Behavior Indicators

Based on clinical experience and survey of the literature,[22,26,28,29,33–35,41,49–55] three indicators of pain behavior were selected: "pain noises," "facial expression," and "defense." These aspects of pain behavior are all commonly included in staff-administered instruments.[38] Verbal expressions of pain, "pain noises," are often heard in patients experiencing pain and are easy to notice by the observer. In the protocol, this indicator was accompanied by the explanatory words: "This hurts!," groaning, moaning, gasping, and screaming. "Facial expression" is used to denote movement caused by pain, expressed by the words: grimacing, frowning, tightening mouth, and closing eyes. "Defense" is used to register reluctance to move, or a protective attitude to avoid pain, explained in the test protocol by the words: stiffening, guarding, pushing, and crouching. In the instructions, the LPN was encouraged to tick one or more of the three boxes for each item when pain behavior indicators were observed.

Movements Included in the Protocol. The initial draft of the Mobilization-Observation-Behavior-Intensity-Dementia Pain Scale (MOBID) consisted of one item for observation of pain behavior before movement is started (observe the patient lying in bed for two minutes), followed by six active, guided movement items: open both hands, one hand at a time; stretch both arms toward head, one arm at a time; stretch and bend both ankles, knees and hips, one leg at a time; turn over in bed to both sides; sit at the bedside; and brush teeth/do mouth care.

Pain Intensity

After the LPN rated the pain behavior indicators, they were encouraged to infer the pain intensity with a cross on a 0–10 point Numerical Rating Scale (NRS),[56] answering the question: "How intense do you regard the pain to be?" Finally, after completion of the entire protocol, an overall inferred pain intensity rating was completed, again using the NRS.

Instruction to Use the MOBID

Nurses were instructed to pay attention to the patient's pain behavior during morning care, observe the patient before starting mobilization, clearly explain what was going to happen, mobilize the patient gently through the activities, reverse the movement immediately if pain behavior was demonstrated, rate observation after each activity, tick the boxes for "pain noises," "facial expression," and "defense" whenever observing such pain behavior, and rate pain intensity with a cross on the lines (Appendix).

Face Validity

To examine face validity, the initial draft of the MOBID was presented to a focus group of two RNs, two LPNs, two physiotherapists, one occupational therapist, and two physicians, all experienced in evaluation and management of pain in NH patients. The following questions were discussed: 1) Do the pain behavior indicators and movement items seem adequate and sufficient to disclose pain in patients with dementia? 2) Is the test procedure easily performed in connection with morning care?

The focus group maintained that the initial draft of MOBID seemed well suited to identify pain behavior related to musculoskeletal pain, as well as pain provoked by movements. They suggested, however, adding items to capture pain not necessarily provoked by movement, such as visceral and neuropathic pain and headache syndromes. The focus group considered the test procedure feasible for LPNs to perform in connection with morning care. Some suggestions of change in the layout of the instrument were made. The draft of MOBID pain scale was then pilot tested with three NH patients with pain and SCI, and minor changes of the written instructions were made.

NH Patients

The study site was one of the largest NHs in Norway, a 174-bed nonprofit facility consisting of 16 units with 8–12 patients in each, situated in Bergen. Inclusion criteria were age>65 years, patients in the long-term wards defined as SCI by the Mini-Mental State Examination (MMSE ≤ 11),[57] and having a regular family visitor or advocate. Only patients were included who were suspected to have chronic pain (>three months),[58,59] with pain intensity believed to be >3 on the NRS. Exclusion criteria were delirium, psychosis and receptive aphasia, severe hearing impairment, acute illness, or acute pain. Thirty patients were not considered for inclusion in the study as they were allocated to rehabilitation and short stay admissions or palliative care for cancer patients. Among the remaining 144 long-term patients, 26 met the criteria for participation.

Verbal and written informed consent was obtained in direct conversation with the patient and his/her legal guardian, usually a regular family member or advocate; collateral source consent was required for all patients, given their level of CI. The study was approved by the Regional Committee for Medical Research Ethics of Western Norway (REK-Vest nr: 190.04), the Data Inspectorate (nr: 11529). The Department for Health Care, Norway decided that this research project (200502098-/ASD) bore a minimal risk regarding the nature of the intervention. According to the Council of Europe,[60] the investigation would result in a very slight and temporary negative impact on the health of the person concerned.

NH Staff

There were two separate groups of MOBID raters. The first group consisted of the patients' primary caregivers (five RNs and six LPNs) who were familiar with the patients' habits and regular conditions. The second group consisted of external raters A, B, and C (three LPNs), who did not know the patients. Both groups received a one-hour briefing in which they learned basic information about pain and dementia, pain physiology, pain behavior, and pain assessment. They practiced the use of the MOBID on patients.

Examination

Participant information on demographics was taken from the patients' medical charts. The two physicians responsible for the patients' diagnostic and treatment in the NH collected the information about medical conditions including the international classification of diagnoses (ICD-10), dementia type, and pain etiology. They also rated each patient's cognitive function by the MMSE,[57] Clinical Dementia Rating (CDR),[61] and Severe Impairment Rating Scale (SIRS).[62] Measurements of daily functioning included the Cornell Scale for Depression in Dementia,[63] the Neuropsychiatric Inventory,[64] and Activities of Daily Living (ADL)[65] collected by a geriatric study nurse and the patients' primary caregivers.

Two responsible physicians performed clinical examinations of the patients focusing on pain, following a standard procedure used at the NH. This included observation of pain behavior in connection with the consultation, palpation for trigger points, and active and/or passive movements of the limbs. After completion of the examination, an overall pain intensity was suggested, using the NRS. Examinations by the physicians were performed the same day, shortly before the MOBID assessments by the patients' primary caregivers.

Test Procedures

The patients' primary caregivers carefully observed two to three patients each during regular morning care procedure (washing and dressing) and rated an overall pain intensity using an NRS after care completion. Shortly after regular morning care, the patients were assessed by their caregivers using the MOBID procedure at the bedside (MOBID-b). For at least two minutes, each patient was observed while lying in bed (item 1). A clear explanation about what was going to happen was given to the patients before starting each movement, e.g., "Mrs., can you please open and close your left hand? I will help you!" Then each item (2–7) was performed by gentle, standardized movements. Registration of pain behavior indicators and inferred pain intensity for each item was completed. At completion of this bedside examination, an overall assessment of pain intensity was made.

Video Uptakes

The patient's behavior during the standardized movements of the MOBID was recorded by continuous video uptakes with a stationary (3.80 m distance) and a mobile camera. Voices and noises by the patient and staff were documented by a sensitive microphone. The operator processed the video uptakes ($n = 26$) by a visual dictionary[66] regarding film frame, motion time, and noises. In the final presentation, each MOBID item was announced by a short title. The film sequence for each patient lasted for six to eight minutes, resulting in three hours of film material.

Pain Assessment by MOBID from Videos

Each primary caregiver assessed her own video uptakes and repeated the scoring by MOBID-video (MOBID-v) four to six days after the bedside assessment (MOBID-b). Additionally, three external raters assessed the 26 videos concurrently and independently. They were blinded from each other's scorings and from the results of the primary caregivers and physicians. The ratings were performed in the course of one working day, with regular breaks after rating four to six videos to maintain attention.

Statistical Analyses

Reliability

Internal Consistency. An estimate of the seven MOBID pain intensity items was computed for the external raters watching video uptakes ($n = 26$) using Cronbach's α formula, an indicator of reliability. Ideally, the Cronbach's α coefficient of a scale should be >0.7.[67] Internal consistency refers to the degree to which the items that make up the scale are measuring the same underlying construct, and care should be taken not to include items that assess a different construct.[68] Corrected item-total correlations and α scores also were calculated if each item was deleted from the MOBID. Corrected item-total correlation gives an indication of the degree to which each item correlates with the total score. The term "if item deleted" compares these values with the final α-value obtained.[67]

Inter-Rater Reliability of Pain Behavior Indicators and Pain Intensity. Overall interobserver agreement was assessed pair-wise (A–B, A–C, and B–C) by the external raters watching the video uptakes for each MOBID item. Interobserver agreement for pain behavior indicators was analyzed by kappa (κ) statistics. This test provides a measure of concordance between the raters and is chance-corrected. Interpretation of κ was as follows: ≤ 0.20 (poor), 0.21–0.40 (fair), 0.41–0.60 (moderate), 0.61–0.80 (good), and ≥ 0.81 (very good agreement).[69,70] Interobserver agreement for pain intensity was analyzed by intraclass correlation coefficient (ICC) model 1.1.[71] The within-subject standard deviation (s_w) was also calculated, which includes both random and systematic components of measurement error and is expressed in the same metric unit as the measurement tool.[72]

Construct Validity. The nonparametric Wilcoxon Signed Rank Test[67] was used to examine the following questions: 1) Is less overall pain intensity captured during regular care activities than during standardized, guided movements by MOBID? 2) Are pain intensity scores of MOBID items obtained in a bedside situation different from those obtained from video watching? 3) Is the ability to observe pain behavior by MOBID dependent on knowing the patient? Spearman correlation was used to examine the association between the scores. Spearman correlation was finally used to examine the association between the maximum and the mean pain intensity scores of each test item and the overall pain intensity.

The number of pain behavior indicators, and the mean and standard deviation (SD) of pain intensities for each of the five items were calculated. The research question whether the number (0–3) of observed pain behavior indicators related to the staff's interpretation of pain intensity was calculated by one-way between-groups ANOVA with linear trend. ANOVA compares one independent variable (pain behavior indicators) and one dependent continuous variable (pain intensity scale).[67,73]

The data were analyzed using SPSS for Windows 13.0.

Results

Participants

Patients. Mean age of the 26 patients was 87.0 (SD = 6.1) years; the majority were female (89%) and widowed (81%). They had lived in the NH for a mean of 34 months (SD = 23). The patients' SCI was demonstrated by MMSE (mean = 4.3, SD = 4.3), CDR (mean = 16.7, SD = 2.0), and SIRS (mean = 7.0, SD = 7.0). Daily functioning was characterized by ADL score (mean = 5.9, SD = 5.9). They were neither depressed nor demonstrated psychiatric disorders. Negative correlations between MOBID-b and depression ($r = -0.009$) and neuropsychiatric disorders ($r = -0.110$) could be shown. They had multiple ICD-10 diagnoses (mean = 5.1, SD = 1.4), as well as pain diagnoses (mean = 2.9, SD = 1.2) distributed between shoulder, knee, back, hip, and elbow. Mean number of medications was 4.0 (SD = 1.6), including pain medication (mean = 1.2, SD = 0.7). All patients except one received one or more analgesic; 19.2% received an opioid.

Raters. Mean age of the patients' primary caregivers and the external raters was 37.9 years (SD = 11.4). Both the groups had long working experience (mean = 11.2 years, SD = 10.2) and worked at the NH for years (mean = 7.7 years, SD = 6.8). In this period, they all received pain education (mean = 7.7 hours, SD = 7.6).

Pain

Pain Behavior and Pain Intensity of Each MOBID Item. Highest number of pain behavior indicators per patient assessed by the external raters was observed for mobilizing the arms (mean range 1.2–1.8) and legs (mean range 1.0–1.8) (Table 1). Little pain behavior was assessed for observation of the patients lying in bed (mean range 0.1–0.5). Facial expression was the most demonstrated pain behavior indicator (mean range 2.2–3.2), followed by pain noises (mean range 1.9–2.3) and defense (mean range 0.4–1.5). The most painful movements were mobilizing the arms (mean range 5.0–5.8) and mobilizing the legs (mean range 4.9–6.0). Less pain intensity was referred for the observation item (mean range 0.3–0.7). The intensity scores of the teeth/mouth care item were shown to differ between the raters (mean range 2.0–5.3).

Reliability

Internal Consistency. Cronbach's α^1 of the seven MOBID items rated by the three external raters ranged from 0.86 to 0.89. Items for observation during rest and teeth/mouth care demonstrated low correlation with the total score for all raters (Table 2). When these items were deleted, Cronbach's alpha (α^2) increased, ranging from 0.90 to 0.91. As a consequence, the items for observation and teeth/mouth care were removed from the initial MOBID draft.

Inter-Rater Reliability of Pain Behavior Indicators of Pain Intensity. Moderate to very good κ-values were demonstrated for "pain noises" ($\kappa = 0.42-0.84$). Low to good agreement was shown for "facial expression" ($\kappa = 0.06-0.77$) and low to very good agreement for "defense" ($\kappa = 0.05-0.87$) (Table 3). Good to excellent inter-rater reliability of inferred pain intensity was demonstrated for each MOBID item, ICC = 0.70–0.96, $s_w \leq 1.5$, and for the comprehensive pain intensity score, ICC = 0.76–0.82, $s_w \leq 1.3$ (Table 4). Inter-rater reliability estimated between the three raters (A–B–C) was high (ICC = 0.86, $s_w \leq 1.3$).

Construct Validity

Pain Intensity Based on Regular Care Activities versus the MOBID Procedure. When primary caregivers used the MOBID procedure during bedside examination (MOBID-b), higher

Table 1
Mean Number of Pain Behavior Indicators[a] and Mean Pain Intensity Per Patient for Each MOBID Item, Assessed by External Raters (A, B, and C) Using Video Uptake ($n = 26$)

	A		B		C	
	Pain Behavior Indicators	Pain Intensity	Pain Behavior Indicators	Pain Intensity	Pain Behavior Indicators	Pain Intensity
Item	Mean (SD)		Mean (SD)		Mean (SD)	
Observation	0.3 (0.5)	0.3 (0.8)	0.5 (0.8)	0.5 (1.2)	0.1 (0.3)	0.7 (2.0)
Hands	1.3 (1.3)	3.5 (2.8)	1.1 (1.1)	4.0 (3.5)	0.8 (0.9)	3.8 (3.3)
Arms	1.8 (1.2)	5.0 (2.5)	1.3 (0.9)	5.7 (3.0)	1.2 (0.8)	5.8 (2.5)
Legs	1.8 (1.0)	4.9 (2.5)	1.3 (0.8)	5.9 (2.5)	1.0 (0.8)	6.0 (2.0)
Turn	1.1 (1.1)	3.0 (2.3)	0.9 (0.9)	5.0 (2.2)	0.8 (0.8)	4.7 (2.2)
Sit	0.9 (1.1)	3.2 (2.4)	0.7 (0.9)	4.6 (2.9)	0.7 (0.6)	4.9 (1.8)
Teeth/mouth care	1.2 (1.2)	2.0 (2.0)	0.8 (1.0)	4.7 (2.8)	0.9 (0.7)	5.3 (2.0)

[a]Pain noises, facial expression, and defense.

overall pain scores (4.4 [SD = 1.8]) were registered than after regular care activities (3.0 [SD = 1.9] $P < 0.005$). Low and no significant association was demonstrated between the overall pain scores ($r_s = 0.38$).

MOBID Scorings from Video Watching versus Bedside Scoring. When primary caregivers rated their own videos after four days (MOBID-v), the mean overall pain scores increased significantly to 5.3 (SD = 1.9), compared with MOBID-b scores of 4.4 (SD = 1.8, $P < 0.001$). High correlation between MOBID-b and MOBID-v was, however, demonstrated at $r_s = 0.67$ ($P < 0.01$).

MOBID Scorings from Video Watching by Primary Caregivers versus External Raters. No statistically significant difference in pain intensity ($P = 0.07$) was demonstrated between primary caregivers (mean = 5.3) and external raters (mean = 5.3), and moderate correlation was demonstrated between the overall pain scores, $r_s = 0.56$ ($P < 0.01$).

Impact of the Number of Pain Behavior Indicators on Pain Intensity. In 20 of 21 calculations, ANOVA analysis showed significant differences ($P < 0.005$) in pain intensity according to the number of observed pain behavior indicators rated by the external raters (Table 5). A linear trend was demonstrated, showing that more pain behaviors implied higher pain intensity ($P < 0.05$).

The Best Pain Intensity Estimate of the MOBID Items on Overall Pain Intensity. The maximum pain intensity among all MOBID items demonstrated higher correlation with the overall pain

Table 2
Item-Total Correlation and Cronbach's Alpha (α) if Item Deleted, Assessed by External Raters (A, B, and C) Using Video Uptake ($n = 26$)

	A		B		C	
Item	Item-Total Correlation	α if Item Deleted	Item-Total Correlation	α if Item Deleted	Item-Total Correlation	α if Item Deleted
1. Observation	0.20	0.88	0.23	0.92	0.34	0.92
2. Hands	0.79	0.82	0.77	0.87	0.78	0.88
3. Arms	0.71	0.83	0.79	0.87	0.82	0.87
4. Legs	0.79	0.82	0.78	0.87	0.83	0.87
5. Turn	0.70	0.83	0.76	0.87	0.80	0.87
6. Sit	0.75	0.82	0.75	0.87	0.79	0.88
7. Teeth/mouth care	0.40	0.87	0.77	0.87	0.69	0.89
Cronbach's α^1		0.86		0.89		0.89
Cronbach's α^2		0.90		0.90		0.91

α^1 = Initial draft of MOBID (Cronbach's α for all seven items).
α^2 = Final draft of MOBID (Cronbach's α when items 1 and 7 were deleted).

Table 3
Inter-Rater Reliability Examined by Kappa Statistics (κ) Between the External Raters (A, B, and C) Rating Pain Behavior Indicators[a] for Each MOBID Item Using Video Uptake ($n = 26$)

	A1−B1 (κ)	A1−C1 (κ)	B1−C1 (κ)
Hand			
Pain noises	0.83[b]	0.82[b]	0.82[b]
Facial expression	0.77[b]	0.27	0.17
Defense	0.62[b]	0.51[c]	0.87[b]
Arm			
Pain noises	0.68[b]	0.68[b]	0.68[b]
Facial expression	0.72[b]	0.41[d]	0.32
Defense	0.26[d]	0.26[d]	0.62[c]
Leg			
Pain noises	0.62[c]	0.69[b]	0.46[d]
Facial expression	0.27	0.19	0.06
Defense	0.23	0.20	0.63[c]
Turn			
Pain noises	0.77[b]	0.84[b]	0.76[b]
Facial expression	0.32	0.24	0.09
Defense	0.26	0.36[d]	0.05
Sit			
Pain noises	0.74[b]	0.54[c]	0.42[d]
Facial expression	0.60[c]	0.38[d]	0.44[d]
Defense	0.34	0.65[b]	0.47[c]

[a]Pain noises, facial expression, and defense.
[b]$P < 0.001$.
[c]$P < 0.01$.
[d]$P < 0.05$.

Table 4
Inter-Rater Reliability Between the External Raters (A, B, and C) for Each MOBID Item and the Comprehensive Pain Intensity Measured as Pair-Wise Relative Reliability by ICC (1.1), and Absolute Reliability Calculated as the Within-Subject Standard Deviation (s_w) by Rating 26 Videos

Item	A1−B1		A1−C1		B1−C1	
Observation	ICC	s_w	ICC	s_w	ICC	s_w
Hand	0.96	0.8	0.87	1.2	0.90	1.0
Arm	0.90	1.0	0.79	1.3	0.70	1.5
Leg	0.89	1.1	0.91	1.0	0.90	1.1
Turn	0.82	1.2	0.73	1.3	0.77	2.0
Sit	0.81	1.2	0.76	1.0	0.83	1.2
Comprehensive pain intensity	0.81	1.3	0.76	1.3	0.82	1.2

intensity ($r \geq 0.92$) than the mean pain intensity of all items ($r \geq 0.86$) (Table 6).

Discussion

The MOBID is the first nurse-administered assessment tool of pain intensity that is based upon observation of defined pain behavior indicators during standardized active, guided movements for persons with SCI. This study describes the development and the construction of the MOBID, providing evidence of reliability and validity.

Reliability

There was indication that five of seven MOBID items (mobilization of the hands, arms, legs, turn over in bed, and sitting on bedside) contributed to assess a shared phenomenon, pain intensity as inferred by the testers, demonstrated by high Cronbach's α-values. Observation of rest did not contribute to heighten the Cronbach's α-value and captured very low pain intensity values, as inferred by the raters. It seems important, however, to have a baseline for observing the patients, comparing behavior at rest and during mobilization. The observation item was, therefore, moved from the test items to the instruction part in the final MOBID, requesting the raters to observe the patient before starting mobilization.

Also, the item brushing the teeth/mouth care seemed to assess another construct than the remaining five items and was, therefore, removed from the instrument. The patients' behavior related to teeth/mouth care was found difficult to interpret by the raters, as some patients seemed to dislike it being performed. The test procedure also tended to differ between patients having prostheses or not. The mouth is the central organ to express pain and emotional distress like fear, anger, and depression.[50] Patients still able to brush their teeth may react with confusion or anxiety by this manipulation, as the activity was difficult to guide. The low correlation with the total score of the MOBID may imply that scores from teeth/mouth care capture another phenomenon, like surprise or confusion.

Inter-rater reliability of pain behavior indicators showed varying degrees of agreement. Best agreement between testers was demonstrated for "pain noises," which showed moderate to very good κ-values of the different test items. It seems, accordingly, easy to hear and judge whether vocal expressions are related to pain or not. However, "facial expression" and "defense" did not achieve comparable good agreement. The criteria for scoring these domains may seem vaguer. "Facial expression" was the most commonly

Table 5
One-Way Between-Groups ANOVA with Linear Trend Explores the Impact of the Number of Pain Behavior Indicators on Pain Intensity Assessed by External Raters (A, B, and C)

	A		B		C	
	n	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)
Hands	$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$	
0	5	0.0 (0.0)	8	0.0 (0.0)	10	0.0 (0.0)
1	9	2.2 (1.9)	6	2.2 (1.1)	7	4.9 (1.9)
2	3	5.0 (1.7)	4	6.5 (1.3)	5	7.2 (0.8)
3	9	6.3 (0.7)	8	8.0 (0.5)	4	7.2 (9.5)
Arms	$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$	
0	1	0.0 (0.0)	3	0.0 (0.0)	1	0.0 (0.0)
1	7	1.9 (1.2)	4	3.0 (2.8)	9	4.1 (2.7)
2	5	6.8 (1.0)	8	6.4 (1.5)	13	7.1 (0.9)
3	13	6.4 (1.0)	11	7.6 (0.8)	3	7.7 (0.6)
Legs	$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.005$, $P(lt) < 0.001$		$P(c) < 0.1$, $P(lt) < 0.01$	
0	1	0.0 (0.0)	1	0.0 (0.0)	0	—
1	7	1.9 (1.2)	8	4.2 (2.3)	15	5.4 (2.3)
2	6	5.9 (1.7)	13	6.7 (1.8)	11	6.9 (1.2)
3	12	6.6 (0.9)	4	8.0 (0.0)	0	—
Turn	$P(c) < 0.005$, $P(lt) < 0.005$		$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$	
0	3	0.0 (0.0)	2	0.0 (0.0)	3	0.0 (0.0)
1	12	2.3 (1.8)	10	4.3 (1.4)	18	5.1 (1.5)
2	7	4.1 (2.0)	12	6.1 (1.6)	5	6.2 (1.3)
3	4	5.2 (2.5)	2	7.0 (1.4)	0	—
Sit	$P(c) < 0.005$, $P(lt) < 0.001$		$P(c) < 0.001$, $P(lt) < 0.001$		$P(c) < 0.005$, $P(lt) < 0.05$	
0	3	0.0 (0.0)	5	0.0 (0.0)	0	0.0 (0.0)
1	15	2.8 (1.9)	7	4.6 (2.0)	22	4.4 (1.6)
2	3	4.7 (1.5)	11	6.0 (1.6)	3	7.3 (0.6)
3	5	5.6 (1.6)	3	7.3 (1.2)	1	8.0 (0.0)

Pain Behavior Indicators (0 = no pain behavior indicator, 1 = pain noises, 2 = facial expression, 3 = defense).
Results for groups (c) and linear trend (lt) were calculated. The number of pain behavior indicators, the mean and SD of pain intensities for each item were calculated.

observed pain behavior indicator, but demonstrated the lowest agreement between the raters, especially during the complex movement of turning over in bed. Higher agreement was achieved when guided movements were defined by exact onset and end, for instance when stretching the arms. The least frequently observed pain behavior indicator was "defense," which may be more difficult to capture. When subtle signs of defense are accompanied by expressions of astonishment, effort, or fear, it is difficult for observers to interpret the patients' behavior as an expression of pain.

Table 6
Pearson Correlation Between the Maximum and the Mean Pain Intensity Scores of the MOBID Items, and the Overall Pain Intensity Assessed by External Raters (A, B, and C)

Item Description	A	B	C
Maximum pain intensity	0.97	0.92	0.95
Mean pain intensity	0.87	0.86	0.89

Correlation is significant at the 0.01 level for all values given above.

When investigating inter-rater reliability of inferred pain intensity by the five MOBID items, high to excellent ICC values were demonstrated. Simple sequences of movements, such as guiding the hand, tended to achieve higher ICC values compared to more complex tasks, such as turning over in bed. Whereas intertester reliability for pain intensity measures was high to excellent, it varied between poor and excellent for the presence of pain behavior indicators. High reliability of separate pain behavior indicators may, therefore, not be a prerequisite for adequate reliability of inferred pain intensity. Transforming pain behavior indicators into pain intensity is an individual process, reflecting the observers' experience and attention. The magnitude of the behavior, rather than the presence of it, may be most important for inferring pain intensity.

Validity

As patients with pain tend to avoid painful movements and thereby conceal acute and chronic pain, standardized movements were included in MOBID to unmask pain. Our findings showed that overall observed pain intensity was substantially higher following the MOBID procedure than after regular care activities. There seems, accordingly, to be support for using this movement procedure to capture pain in patients with SCI.

Overall pain intensity scores by the MOBID were shown to be higher when scoring from video rating than from bedside observation, although the scores were highly correlated. This finding indicates that important pain indicators may be overlooked during bedside observation. To move the patient and observe him while interpreting pain behavior is demanding. A primary caregiver commented on her experience: “Pain is more visible when watching the video. You have better time to study the patient’s face and defense, and you better hear his voice. I am concerned that I did not recognize the entire patient’s pain reaction during regular care.” Video seems, accordingly, to be a valuable tool to mediate pain in patients with SCI.[74] However, video filming is not practical to use in everyday practice. The high correlation between bedside and video scorings supports the use of bedside scores, but it should be taken into consideration that pain behavior and inferred pain intensity probably are even more pronounced than what is observed and scored in a bedside situation.

The number of pain behavior indicators was shown to influence the raters’ interpretation of pain intensity. When no pain behavior was observed, no pain intensity was registered, whereas an increasing number of pain behavior indicators caused increased pain intensity scores, with linear trend. Transforming pain behavior indicators into pain intensity is an individual process, reflecting the observers’ experience and attention. High reliability of pain intensity seems, however, to be based on the overall concept of the behavior indicators, rather than the presence of it. Facial expression alone may not be suitable to measure pain in patients with SCI, whereas body reactions are suitable.[75] Little is known about the validity and reliability of proxy pain report for patients with SCI, but agreement between patient and proxy reports regarding pain assessment underlines that the nurses’ perception and observation may be an important source.[27,76]

Scoring procedures of an assessment tool may not be straightforward. To get an overall impression of a problem, the mean or sum scores of test items are commonly calculated. It was an unexpected finding that the highest intensity score of all MOBID items was a better determinant of overall pain intensity than the mean score of all items. This makes sense, as it is probably less important for a patient to be pain-free, in his knees, for example, when he struggles with serious back pain, because back pain will dominate his overall pain experience.

Limitations of the Study

In this paper, the development and construction of MOBID has been described, and aspects of validity and reliability have been examined. However, this is only an initial examination of measurement properties of the instrument, and further investigation is needed. Suggestions were made in our focus group that the instrument should also include items that were not necessarily provoked by movement, such as visceral and neuropathic pain. Such items will be included in a second part of the instrument and are not within the scope of this paper.

The procedure of using standardized active, guided movements may be debated, as these may be more pain provoking than naturally occurring movements. Observation of, and care for, a patient in pain, however, represents a psychological burden for the staff. They may try to avoid the pain problem during daily care, as expressed by one of the primary caregivers: “It’s usual to see pain during morning care, but knowing the localization of pain, I try to avoid this area. I do not move a painful arm! To defend myself, I try not to acknowledge the pain problem when I hurt the patient. It’s like forbidden. I hurry to get ready and say: ‘Oh, does it hurt? I apologize. I am soon ready.’” Presence of pain contributes to less mobilization of the patient, causing less muscle volume, contractures, and often more pain. The ethics of ignoring pain by the primary caregivers may, accordingly, be questioned. The aim of the MOBID procedure is not to provoke unnecessary pain, but to disclose the problem and to give the staff a pain assessment instrument as a prerequisite for pain management.

It is a challenge to distinguish pain behavior from psychological distress, such as fear, depression, or restlessness caused by dementia. The explicit instruction for raters to observe behavior of the person simply lying in bed is the basis for observing pain behavior during the movement items. Common behavior related to dementia, such as rocking, yelling, or a sad look, was not considered expressions of pain in MOBID. However, the issue of discrimination between behavior caused by dementia, and caused by dementia and pain, is difficult to handle and was a major concern in the present study of MOBID development.

Conclusion

MOBID is a nurse-administered assessment tool to assess pain intensity, which is based upon observation of defined pain behavior indicators during standardized active, guided movements for persons with SCI. Internal consistency of the final version and inter-rater reliability of pain intensity scores were high, although pain behavior indicators demonstrated varying degrees of intertester reliability. Indications were provided that the guided movements can be used to disclose pain behavior in a bedside situation, although video watching seemed to yield higher pain intensity scores.

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Appendix

MOBID Pain Scale

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MOBILIZATION – **O**BSERVATION – **B**EHAVIOUR – **I**NTENSITY – **D**EMENTIA

Patient´s name: **Date:** **Time:** **Unit:**

Pay attention to the patient´s pain behaviour during morning care. **Observe the patient before you start mobilization.** Explain clearly what is going to happen. Guide the patient carefully through the activities 1–5. Reverse the movement immediately if pain behaviour is perceived.

Rate your observation after each activity:
I) Tick the boxes for Pain noises, Facial expression and Defence, whenever you observed such pain behaviour.
II) Based on pain behaviour, rate the pain intensity with a cross on the lines (0-10).

I) Pain Behaviour



Pain noises:	**Facial expression:**	**Defence:**
Ouch!	Grimacing	Freezing
Groaning	Frowning	Guarding
Gasping	Tightening mouth	Pushing
Screaming	Closing eyes	Crouching

YOU MAY TICK SEVERAL BOXES FOR EACH ACTIVITY

II) Pain Intensity

HOW INTENSE DO YOU REGARD THE PAIN TO BE?
0 is no pain and 10 is as bad as it possibly could be

	Pain noises	Facial expression	Defence	Pain intensity
1. Guide to open both hands, one hand at a time	☐	☐	☐	0 1 2 3 4 5 6 7 8 9 10
2. Guide to stretch both arms towards head, one arm at a time	☐	☐	☐	0 1 2 3 4 5 6 7 8 9 10
3. Guide to stretch and bend both knees and hips,one leg at a time	☐	☐	☐	0 1 2 3 4 5 6 7 8 9 10
4. Guide to turn in bed to both sides	☐	☐	☐	0 1 2 3 4 5 6 7 8 9 10
5. Guide to sit at the bedside	☐	☐	☐	0 1 2 3 4 5 6 7 8 9 10

Based on your observations, rate the patient´s overall pain intensity 0 1 2 3 4 5 6 7 8 9 10