

# Complementary and Integrative Medicine in Nursing Homes: Results of a Cross-Sectional Study in Residents and Caregivers

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## Keywords

Complementary and integrative medicine · Kneipp therapy · Elderly care · Nursing homes

## Abstract

**Objective:** Some nursing homes for the elderly in Germany integrate complex complementary and integrative medicine interventions in the form of hydrotherapy, herbal and mind-body therapies, physical activities, and healthy eating, known as Kneipp therapy (KT), in care. This pilot study explored health- and work-related characteristics and acceptance of KT amongst residents and caregivers. **Methods:** Within a mixed-methods cross-sectional study in nursing homes who had integrated KT, we assessed work ability, psychosocial burden at work and health-related quality of life of caregivers, as well as a broad selection of health-related data of residents by questionnaires and assessments. Data were analyzed descriptively. **Results:** The data from 29 female caregivers (42.0 ± 11.7 years) and 64 residents (83.2 ± 8.1 years) were analyzed. Both caregivers (96%) and residents (89%) considered KT to be beneficial for health and well-being. Ninety percent of the caregivers indicated an improved relationship to residents since implementing KT. Caregivers showed a good work ability and quality of life. Residents attained remarkable ratings in social relation and affect-relat-

ed aspects of quality of life. **Conclusion:** The results of this cross-sectional study indicate a high acceptance of integrating KT by residents and caregivers. The effectiveness and safety of KT should be explored in further comparative studies.

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## Schlüsselwörter

Komplementärmedizin · Kneipp-Therapie · Altenpflege · Senioreneinrichtungen

## Zusammenfassung

**Hintergrund:** Einige Senioreneinrichtungen in Deutschland integrieren die Kombination aus Hydrotherapie, Phytotherapie, Ordnungstherapie, Bewegung und gesunder Ernährung als Kneipp-Therapie (KT) in die Pflege und Betreuung von Bewohnern. Diese Pilotstudie zielte darauf ab, gesundheits- und arbeitsbezogene Charakteristika und die Akzeptanz von KT bei Bewohnern und Mitarbeitern dieser Pflegeeinrichtungen zu untersuchen. **Methoden:** Im Rahmen einer Mixed-Methods-Querschnittsstudie in vier Senioreneinrichtungen, die KT integrierten, wurden unter anderem die Arbeitsfähigkeit, die psychosoziale Belastung am Arbeitsplatz und die gesund-

heitsbezogene Lebensqualität der Pflegekräfte sowie eine breite Auswahl an gesundheitsbezogenen Daten und die Lebensqualität der Bewohner durch Fragebögen erhoben. Alle Daten wurden deskriptiv analysiert. **Ergebnisse:** Es wurden die Daten von 29 Mitarbeiterinnen (42,0 ± 11,7 Jahre) und 64 Bewohnern (83,2 ± 8,1 Jahre) analysiert. Sowohl die Pflegekräfte (96%) als auch die Bewohner (89%) betrachteten KT als vorteilhaft für die Gesundheit und das Wohlbefinden. Ausserdem gaben 90% der Mitarbeiterinnen eine verbesserte Beziehung zu den Bewohnern seit der Einführung von KT an. Die Mitarbeiterinnen zeigten eine gute Arbeitsfähigkeit und Lebensqualität. Die Bewohner zeigten gute Bewertungen von Aspekten der Lebensqualität, die mit sozialer Beziehung und Affekt zusammenhängen. **Fazit:** Die Ergebnisse zeigen, dass KT in den untersuchten Senioreneinrichtungen von den Bewohnern und Betreuern gut angenommen wurde. Die spezifische Wirksamkeit und Sicherheit von KT sollten in weiteren vergleichenden Studien untersucht werden.

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## Introduction

In the last decades, an increasing number of facilities for the care of the elderly have emerged due to the demographic changes of society in industrialized countries. In 2017, 14,480 nursing homes provided care in Germany, while 3.4 million people were care dependent [1]. Despite a nationwide basic care standard, nursing homes are characterized by different concepts, one of which is the so-called “Kneipp nursing home.” “Kneipp nursing homes” add complementary and integrative medicine-oriented methods in accordance with Sebastian Kneipp to their routine care. However, Kneipp therapy (KT) is not an elaborated care model in terms of having its own understanding of the needs and interaction between carers and the persons cared for. It is rather an “add on” to pre-existing care models and routines in nursing homes. KT consists of a specific naturopathic approach including elements of hydrotherapy, herbal medicine, mind-body interventions, healthy nutrition, and physical activity. The combination of these elements can be traced back to Sebastian Kneipp, a priest and lay healer in the 19th century, who made this ancient treatment popular back then and up until now [2]. Herbal infusions, wraps, layers, warm or cold baths, brushings, and other aspects of hydrotherapy have traditionally been used in Germany as self-care remedies for minor complaints and are quite popular among older adults: nearly 60% use any kind of complementary medicine [3].

The aim of implementing elements of KT in nursing homes is to stabilize and promote the health and quality

of life of geriatric residents. The KT elements healthy nutrition, physical activity, and mind-body approaches are already considered to be beneficial for health prevention such as the prevention of falls through exercise [4] or frailty through nutritional concepts [5], while the role of hydrotherapy and herbal medicine is unclear. However, the German Kneipp association (one of the largest lay organizations in Germany with approximately 160,000 members) offers a KT curriculum in care for caregivers and therapists within nursing homes. A nursing home can be certified by the Kneipp association if the KT measures are successfully implemented in routine care (<https://www.kneippbund.de/guetesiegel-zertifizierung/>). The first “Kneipp nursing home” started in 2007 in Wolfertschwenden near Bad Wörishofen, where Sebastian Kneipp had opened a famous hydrotherapy center back in the 19th century. The Kneipp association spread the idea of complementary and integrative medicine-oriented care in geriatric nursing homes through their members and the media, and as a result of this, there are now 48 certified nursing homes.

However, the effects and the acceptance of KT within geriatric nursing homes had not been investigated so far. Therefore, we conducted a cross-sectional mixed-methods pilot study aiming to generate hypotheses and identify possible outcomes for caregivers and residents who are frequently involved in KT. Our research focused on mental and physical health conditions, quality of life, and acceptance of KT in both caregivers and residents. We chose broad assessment fields in residents, considering the possible effects of KT on health conditions, assumed from the distinctive elements it consists of. Amongst caregivers, we anticipated that there would be positive (e.g., variety from routine) and negative (e.g., lack of time) outcomes due to the implementation of KT at work. Therefore, we focused on work ability and psychosocial workload and assessed carers with appropriate questionnaires (see Methods section). Preliminary and selected quantitative and qualitative results from the study have already been published [6].

Within this paper, we present the complete quantitative results of this pilot study, including psychosocial workload of the caregivers and details of medication and physical characteristics of residents, such as nutrition status, hand grip, and gait, and risk of falls, which had not been reported before.

## Participants and Methods

The cross-sectional study was conducted between September and December 2011 in the four “Kneipp nursing homes” existing at this time in the German States Bavaria and North Rhine-Westphalia. The nursing homes had to be certified by the Kneipp association and had to offer KT regularly by (parts of) the care teams or therapists.

The caregivers and residents were informed orally and in written form about the study. Those who provided written informed consent and fulfilled the inclusion criteria were included in the study. All assessments and questionnaires were documented in case report forms for each study participant.

The following inclusion criteria for caregivers were defined: age of at least 18 years, regular and routine delivery of KT in the respective nursing home for at least 3 months, and at least 3 years of general professional experience as nurse, nursing auxiliary, or therapist. We defined as inclusion criteria for residents an age of at least 60 years, the ability to answer questions adequately, written and oral informed consent (for those under legal guardianship, guardians had to provide consent), and regular (daily or weekly) individualized KT for at least 3 months.

#### Caregivers

In caregivers, we assessed psychosocial aspects of work, work ability, and health-related quality of life to gather information about their situation at work and their physical and mental condition.

#### Assessment of Psychosocial Workload

The Copenhagen Psychosocial Questionnaire (COPSOQ) is a comprehensive assessment of psychosocial factors at work. We used the standard version with 87 items and 25 scales, comprising aspects of work (so-called domains) such as demands, interpersonal relationships and leadership, influence and development at work, strains (e.g., burnout and stress), and further outcomes (e.g., job and life satisfaction). Each scale is scored with 100 points maximum. Depending on the item, higher values are better or worse [7–10]. Higher ratings are considered to be better, except from the scales “work-privacy conflict,” “mobbing,” “job insecurity,” “burnout,” “intention to leave,” and “cognitive stress symptoms.” A difference of 5 points is considered to be the relevant MID [11].

#### Assessment of Work Ability

The short form of the Work Ability Index (WAI) evaluates work ability and comprises 10 questions, including aspects of physical and psychological work demands, health status, and reserve capacity. The WAI yields a continuous score ranging from 7 to 49 points, where higher scores indicate better work ability. WAI scores can be categorized as excellent (44–49 points), good (37–43 points), moderate (28–36 points), or poor (7–27 points) [12–14].

#### Assessment of Quality of Life

To evaluate overall health-related quality of life, we used the Short Form-12 (SF-12) with its physical and mental component scale [15–18].

In addition, caregivers were asked by standardized questionnaires how long they had been familiar with KT, if they used KT for their own health issues, what kind of KT they delivered and how often, and on their preference for particular forms of KT for self-treatment and for the treatment of residents. Caregivers were asked if KT is supposed to have effects or not for their own health or the health of residents, if and how KT changes the relationship between caregiver and resident, and how KT can be integrated in usual care in terms of feasibility.

All caregivers received questionnaires by letter and returned them to the study secretary by post.

#### Residents

In residents, we explored aspects that are often related to abilities of daily living and quality of life, such as physical fitness and frailty (nutrition status, hand-grip, gait, and balance) and cognition. We assessed quality of life using the Quality of Life in Dementia

(QUALIDEM) instrument and the “Profile of Well-Being” in addition to the SF-12 because these instruments focus on particular social relations and behavioral aspects, which we considered important.

#### Assessment of Nutrition Status

The Mini Nutritional Assessment Short Form (MNA<sup>®</sup>-SF) is one of the recommended assessments in geriatric inpatient settings [19] and identifies older adults who are malnourished or at risk of malnutrition. It comprises 6 questions about nutrition-related aspects in geriatric patients, such as body mass index (BMI), weight loss, nutrition habits, and perceived psychosocial stress or acute disease during the last 3 months. The values between 0–7 represent malnourishment, 8–11 indicate risk of malnutrition, and 12–14 represent normal nutrition [20–22].

#### Assessment of Hand Grip

Hand grip strength is supposed to be positively correlated with general body strength and inversely correlated with risk for falls and bone fracture. It was measured with a hydraulic hand dynamometer (Saehan Model SH5001; Saehan Industries, Eschborn, Germany). During measurement, the resident sits in an upright position holding the dynamometer in the dominant hand with the arm at a 90-degree angle parallel to the body. The resident performs three trials for each hand; the best score is used for the analysis. Hand-grip strength is expressed in kilograms (kg) [23–25].

#### Assessment of Gait and Balance

The modified Tinetti test or Performance-Oriented Mobility Assessment (POMA) is an assessment of gait and balance by observation and testing different movement abilities. It has a maximum score of 28 points (24–27 points: slightly impaired mobility, 20–23 points: increased risk for falls, <20 points: high risk for falls) [26].

#### Assessment of Activities of Daily Living

Activities of daily living were measured with the Barthel Index and the Instrumental Activities of Daily Living (IADL). The IADL comprises eight different activities of daily living. The maximum score for women is 8 points, and for men it is 5 points [27]. The Barthel Index is a recommended assessment often used in health care to refer to daily self-care activities as a measurement of the functional status of a person [28]. Activities of daily living include feeding oneself, bathing, dressing, grooming, and the ability to move; the Barthel Index scores activities of daily living on a scale from 0 to 100 (0 = very dependent, 100 = not dependent) [29, 30].

#### Assessment of Quality of Life

The QUALIDEM is a dementia-specific quality of life instrument, which was developed for use in residential care. We used the version for people with mild to severe dementia, which consists of 37 items divided into 9 subscales regarding care relationship, restless and tense behavior, positive affect, negative affect, positive self-image, social relations, having something to do, feeling at home, and social isolation. It is rated by professional caregivers or proxies. The results can be described as points or percentages of the scale for each item. We decided to use the QUALIDEM because it includes the items “care relationship” and “feeling at home” [31].

The Profile of Well-Being is a tool that reflects the well-being of residents. Caregivers evaluate residents’ well-being subjectively within 14 indicators regarding signs of positive effect, communication, creativity, activity, cooperation, humor, and self-respect [32].

The SF-12 health survey describes the health-related quality of life, including physical and mental health aspects [15–18].

### Assessment of Cognition Impairment

To assess impaired cognition, we performed the Mini Mental State Examination (MMSE), which is a 30-point test measuring arithmetic, orientation, and memory functions. The MMSE contains 19 questions with a maximum score of 30 points. Following Tombaugh and McIntyre (1992), 30–24 points indicate no cognitive impairment, 23–18 mild, and 17–0 moderate to severe cognitive impairments [33].

In addition, the residents were asked by standardized questionnaires about their use, knowledge, meaning, preferences, and perception of KT regarding their well-being. Demographic and additional variables, such as the care level (which defines the grade of care dependency from grade I [less dependent] to III [more dependent]), diagnoses, and medication, were obtained from the nursing records. Predetermined questions about KT were asked of the residents in a standardized way, and the MMSE, Tinetti test, and hand grip test were carried out face-to-face between residents and specially trained study staff. All other assessments were external assessments and performed with the help of the respective caregivers who had to reflect on the situation of their clients to answer the questionnaires.

Data management was conducted according to the ICH-GCP guidelines. All data for residents and caregivers were analyzed descriptively with R, R 2.14 [34], SPSS, and Excel. The results for continuous data are reported as the means and standard deviations or medians, and for nominal data, as absolute or relative frequencies. Data are descriptively reported for the whole sample of caregivers and residents and for the subgroups of different professional fields (therapists, nurses, nursing auxiliaries) in caregivers and for the MMSE categories (mild, moderate, or severe impairment) in residents.

## Results

In 2011, all four certified “Kneipp nursing homes” existing at this time in Germany agreed to participate in the study. All of them were non-profit and public-funded organizations; the caregiver/resident ratio was approximately the same across the nursing homes. Two of the nursing homes were located in rural areas in Bavaria; one of them had 136 residents and 117 employees, and the other one had 44 residents and 35 employees. The two other nursing homes were located in North Rhine-Westphalia; one in the center of a city had 74 residents and 87 employees, and the other in a small town in North Rhine-Westphalia had 63 residents and 70 employees at the time of the study. Every nursing home provided outdoor and indoor facilities for Kneipp hydrotherapy, beds for medicinal herbs, space for exercise and relaxation therapy, and in-house kitchens for meal preparation for the residents.

### Caregivers

The screening identified 39 caregivers out of a group of 309 staff members (drawn from all professional fields in the nursing home) as eligible for study participation because they were trained and regularly applied KT to residents for at least 3 months (Fig. 1). Nine caregivers could not be included because they were not available

**Table 1.** Characteristics of the caregivers

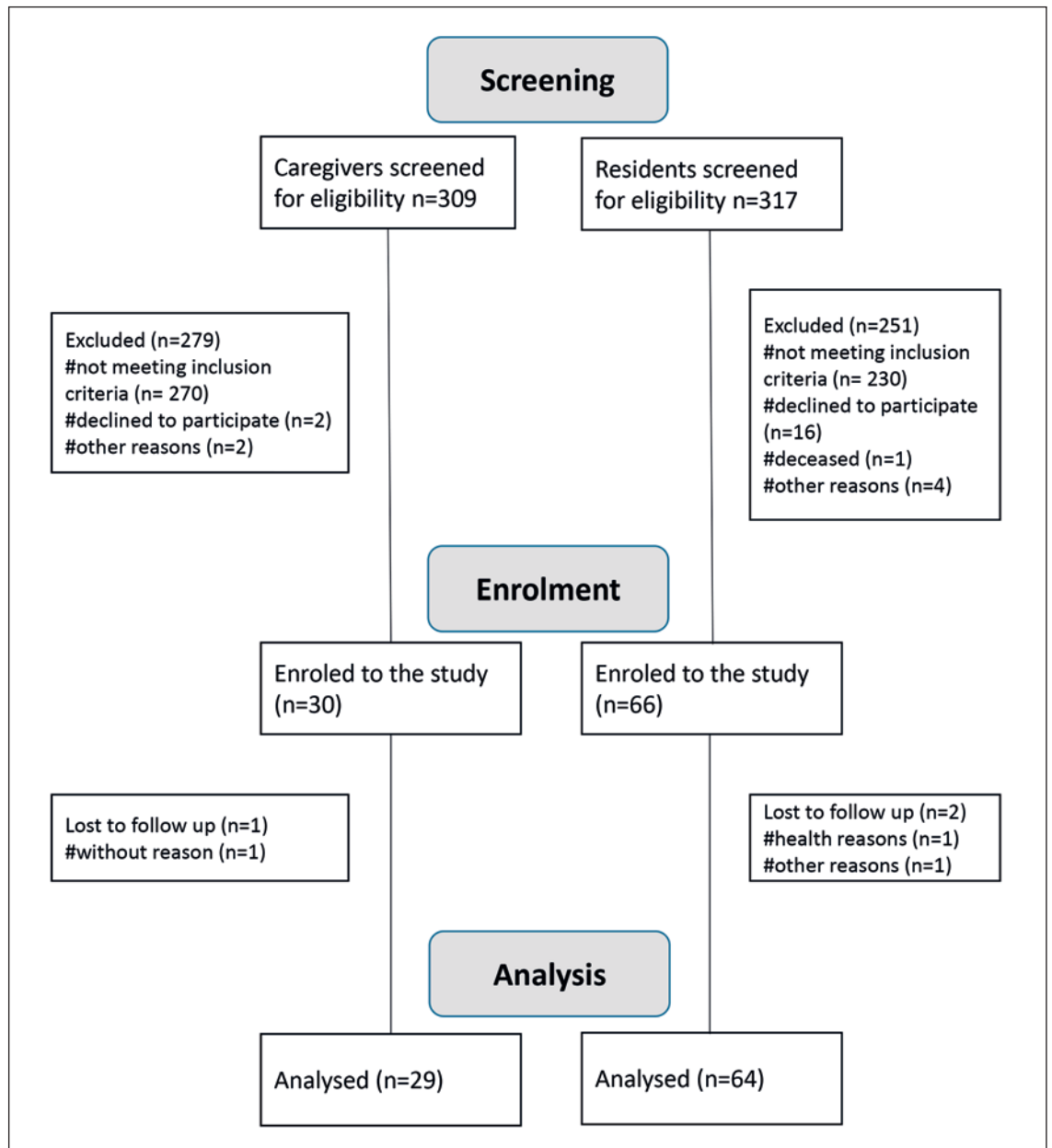
Age, years	42.0 ± 11.7
Gender: female	29 (100)
BMI	27.3 ± 5.9
Smoker	9 (31.0)
≥10 cigarettes a day	4 (13.8)
Working as a caregiver, years	10.0 ± 8.3
Occupational field	
Nurses	12 (41.4)
Nursing auxiliaries	8 (27.6)
Therapists	6 (20.7)
Others	3 (10.3)
Occupation	
Full-time	16 (55.2)
Part-time	12 (41.4)
Hourly	1 (3.4)
Shift work	
No	9 (31.0)
Two shifts	13 (44.8)

Data are presented as mean ± standard deviation or *n* (%).

(*n* = 7) at the time of evaluation or refused study participation (*n* = 2). One of the thirty included caregivers did not return the assessment forms. Therefore, the data provided by 29 caregivers were analyzed. All caregivers were female and, on average, 42 ± 11.7 (SD) years old. The caregivers had been working an average of 10 ± 8 years in their professions, of which 55% worked full-time, 41% part-time, and two-thirds shift work. Of these, 41% were nurses, 28% nursing auxiliaries, 21% therapists, and 10% other (*n* = 2 nursing heads, *n* = 1 domestic aid) (Table 1).

Regarding the psychosocial workload, the COPSOQ yielded the highest scores (with the mean >75) for the scales “meaning of work” (85.1 ± 13.2 points), “sense of community” (81.8 ± 17.5 points), and “role clarity” (81.9 ± 11.1 points). Mean scores <25 points were identified for “job insecurity” (17.0 ± 15.9 points), “mobbing” (15.2 ± 21.9 points), “intention to leave” (12.5 ± 14.4 points), and “cognitive stress symptoms” (22.6 ± 14.3 points). The WAI showed an average of 37.4 ± 5.1 points, reflecting “good” work ability. The SF-12 of the caregivers showed an average of 49.2 ± 8.0 for the physical component summary scale and 54.1 ± 6.6 for the mental component summary scale (Table 2).

Because of the heterogeneity of the occupational categories and work strains, we decided to perform a subgroup analysis for the caregivers from the main occupations: geriatric nurses (*n* = 12), therapists (*n* = 6), and nursing auxiliaries (*n* = 8). The COPSOQ ratings of the therapists yielded better results in 15 out of 25 scales in comparison with the nurses and nursing auxiliaries (more than 5 points difference are considered to be relevant [11]). The items for the domain work demands, the scales “job satisfaction,”



**Fig. 1.** Study participants flow chart.

**Table 2.** Caregivers' SF-12 and WAI scores

	Total		Therapists		Nurses		Nursing auxiliaries	
	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD
SF-12								
Physical component scale	28	49.2±8.0	6	54.9±2.7	11	49.1±6.9	8	44.0±10.5
Mental component scale	23	54.1±6.6	6	54.8±6.9	11	52.2±7.7	8	56.9±5.7
WAI	28	37.4±5.1	5	40.1±3.3	10	37.1±4.4	6	33.7±7.2

SF-12, Short Form-12; WAI, Work Ability Index; SD, standard deviation.

**Table 3.** Caregivers' COPSOQ scores

Domains and scales	Total		Therapists		Nurses		Nursing auxiliaries	
	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD	<i>n</i>	mean ± SD
<b>Demands</b>								
Quantitative demands	29	50.6±21.4	6	44.8±26.6	12	54.7±21.8	8	43.8±19.5
Emotional demands	29	51.1±22.0	6	45.8±24.0	12	47.2±22.0	8	55.2±21.3
Demands for hiding emotions	29	32.3±25.8	6	16.7±23.3	12	31.3±25.3	8	35.9±18.2
Work-privacy conflict*	29	33.3±25.4	6	23.3±31.3	12	42.5±24.2	8	26.3±18.1
<b>Influence and development</b>								
Influence at work	29	43.3±25.2	6	69.8±21.4	12	34.4±14.2	8	30.5±25.5
Degree of freedom of work	29	49.6±14.8	6	59.4±14.7	12	50.5±11.1	8	35.7±10.0
Possibilities for development	29	70.5±21.9	6	84.4±13.0	12	68.2±19.8	8	57.8±26.0
Meaning of work	29	85.1±13.2	6	84.7±14.4	12	84.7±14.1	8	85.4±13.9
Workplace commitment	29	63.8±19.9	6	62.5±22.0	12	69.8±0.1	8	53.1±18.3
<b>Interpersonal relations and leadership</b>								
Predictability	29	62.5±18.9	6	79.2±12.9	12	55.2±17.2	8	56.3±18.9
Role clarity	29	81.9±11.1	6	85.4±12.3	12	77.6±10.8	8	82.8±9.3
Role conflicts	29	36.9±21.4	6	30.2±18.7	12	40.6±28.1	8	32.1±11.7
Quality of leadership	29	67.6±22.1	6	77.1±19.6	12	59.4±20.6	7	68.8±23.9
Social support	28	70.9±23.4	6	79.2±27.3	12	66.5±22.4	7	66.1±22.8
Feedback	26	50.0±26.6	6	64.6±33.9	12	37.5±25.6	8	50.0±20.0
Social relations (quantity)	28	50.9±19.2	6	54.2±17.1	12	42.0±18.8	8	62.5±20.0
Sense of community	28	81.8±17.5	6	86.1±15.5	11	82.6±13.7	8	72.9±22.2
Mobbing*	27	15.2±21.9	6	12.5±20.9	11	22.7±28.4	8	9.4±12.9
<b>Additional scales</b>								
Job insecurity*	28	17.0±15.9	6	16.7±19.2	11	11.9±15.7	8	23.4±11.5
<b>Strains (effects, outcomes)</b>								
Intention to leave*	28	12.5±14.4	6	8.3±12.9	11	13.6±17.2	8	15.6±12.9
Job satisfaction	29	68.7±11.6	6	70.9±15.1	12	67.3±11.9	8	66.3±6.0
General health	29	74.1±17.4	6	86.7±10.3	12	69.2±19.3	8	68.8±17.3
Personal burnout*	29	40.1±16.8	6	27.1±16.8	12	50.0±16.1	8	37.5±12.0
Cognitive stress symptoms*	29	22.6±14.3	6	14.6±12.3	12	27.6±15.9	8	20.3±12.8
Satisfaction with life scale	29	72.8±19.0	6	75.1±16.4	12	73.4±18.8	8	72.2±20.6

A 5-point difference is regarded as clinically relevant [35]. COPSOQ, Copenhagen Psychosocial Questionnaire; SD, standard deviation. \* Lower ratings are considered to be better.

“work ability,” “general health status,” “satisfaction of life,” “burnout,” and “cognitive stress symptoms” were highest in this group. The group of nurses showed the highest scores for the scales “quantitative work demands,” “work privacy conflict,” “role conflicts,” “mobbing,” “burnout,” and “cognitive stress symptoms.” The nursing auxiliaries showed the highest scores for “emotional demands” and “demands for hiding emotions at work.” They had lower scores for “degree of freedom of work,” “influence at work,” and “possibilities for development” (Table 3).

The mean of the SF-12 physical component scale was approximately 10 points higher in therapists ( $54.9 \pm 2.7$ ) compared to nursing auxiliaries ( $44.0 \pm 10.5$ ). In addition, the WAI showed the largest difference between these groups (therapists  $40.1 \pm 3.3$ , nursing auxiliaries  $33.7 \pm 7.2$ ) (Table 2).

When starting their work in the nursing homes, 48% of the caregivers came into contact with KT for the first time; 93% used KT for themselves, mainly with respect to

hydrotherapy or physical activity. Among caregivers, 96% reported subjective positive effects of KT on their well-being and health. Caregivers preferred hydrotherapy (65%) and mind-body methods (44%) for resident care (multiple answers could be given). The majority of the caregivers (90%) stated that their relationship to the residents had improved since implementing KT. Approximately 47% stated an improved relationship to the caregiver team as a result of KT, and 42% stated that KT could be easily integrated into their daily work.

#### Residents

We screened all residents of the four nursing homes ( $n = 317$ ) for inclusion in the study. Of these, 251 residents were not included due to not fulfilling the inclusion criteria ( $n = 230$ ), declining to participate ( $n = 16$ ), having other reasons ( $n = 4$ ), or death ( $n = 1$ ). Finally, 66 residents were included. Two residents dropped out; thus, 64 residents were considered for the analyses (Fig. 1).

**Table 4.** Characteristics of the residents

Gender: female	53 (82.8)
Age	83.2±8.1
60–69 years	5 (7.8)
70–79 years	13 (20.3)
80–89 years	34 (53.1)
90+ years	12 (18.8)
BMI <sup>†</sup>	27.3±5.9
Normal weight, 18.5–24.9	23 (35.4)
Pre-obesity, 25–29.9	23 (35.4)
Obesity class I, 30–34.9	13 (20.3)
Obesity class II, 35–39.9	3 (4.7)
Obesity class III, 40 and higher	2 (3.2)
Education	
Certificate of secondary education	47 (73.4)
Without vocational education	23 (35.9)
German care level	
I	35 (54.6)
II	21 (32.8)
III	4 (6.3)
Without	4 (6.3)
Number of diagnoses	8.1±2.9
Intake of drugs	8.3±3.3
0–3 drugs	5 (7.8)
4–7 drugs	25 (39.1)
8 and more	34 (53.1)

Data are presented as *n* (%) or mean ± standard deviation. <sup>†</sup> As per the German Society for Obesity.

More than two-thirds (83%) of the assessed residents were female with a mean age of 83.2 ± 8.1 years. The average BMI of the residents was 27.4 ± 5.4. None of the residents had a BMI under 18.5, 36% had a BMI between 18.5 and 24.9, and 36% had a BMI between 25.0 and 29.9. Twenty-eight percent of the residents were obese (20% BMI 30–34, 5% BMI 35–39.9, and 3% BMI >40). The residents in our study were distributed along a care continuum (as defined by the German Social Code Book XI until 2017) ranging from 6% at no care level, 55% at care level 1, 33% at care level 2, and 6% at care level 3 (Table 4). The number of diagnoses per resident ranged between 3 and 14, with a mean of 8.1 ± 2.9 diagnoses per resident. The diagnoses most frequently documented were hypertension (56%), musculoskeletal diseases (51%), metabolic diseases such as diabetes (31%), coronary heart disease (25%), dementia (31%), and depression (22%). Residents took an average of 8.3 ± 3.3 different active drugs daily, mainly for cardiovascular diseases (38%), gastrointestinal diseases (14%), psychiatric disturbances (12%), and pain (8%). Herbal medicine preparations comprised only 2.9% of medication. Most of the herbal medications were ginkgo biloba preparations against dementia. For the medical prescriptions, 5.8% (*n* = 30 prescriptions) were identified

**Table 5.** Potentially inappropriate medications in residents\* (*n* = 513 drug prescriptions)

Drug class	Drug substance	<i>n</i> (%)
Antidementia, vasodilators, blood circulation-supporting drugs	Naftidrofuryl	1 (0.2)
Antidepressants	Amitriptyline	4 (0.8)
	Doxepin	2 (0.4)
	Trimipramin	1 (0.2)
Antihypertensive drugs, cardiovascular	Clonidin	1 (0.2)
Muscle relaxants	Baclofen	2 (0.4)
	Tetrazepam	1 (0.2)
Neuroleptic drugs	Levomepromazine	1 (0.2)
Sedatives, hypnotics	Zopiclone	5 (1.0)
	Lormetazepam	2 (0.4)
	Oxazepam	2 (0.4)
	Zolpidem	2 (0.4)
	Diazepam	1 (0.2)
	Doxylamin	1 (0.2)
	Flunitrazepam	1 (0.2)
	Flurazepam	1 (0.2)
Antihistamines, anticholinergic	Dimetinden	1 (0.2)
Cardiac glycosides	Acetyldigoxin	1 (0.2)
Total		30 (5.8)

\* According to the PRISCUS list.

as potentially inadequate medication for older adults according to the PRISCUS list [15]. Sixteen of the 30 prescriptions were sedatives or hypnotics and 7 antidepressants (Table 5).

The residents' MNA-SF mean score was 11.8 ± 2.4. Altogether, reflecting the results of the MNS-SF score, 5% (*n* = 3) of the residents were malnourished, 27% (*n* = 17) at risk of malnutrition, and 68% (*n* = 43) appropriately nourished. Residents' hand grip in men was 26.1 kg for the dominant and 22.2 kg for the non-dominant hand, and in women 16.9 kg for the dominant and 15.7 kg for the non-dominant hand. The Tinetti test showed, with 15.6 ± 8.0 points on average, an increased risk for falls. Twenty-four percent (*n* = 15) of the residents did not use any aids for gait, 2% (*n* = 1) needed a walking aid, 49% (*n* = 31) a wheeled walker, and 27% (*n* = 17) a wheelchair. Four residents of the sample had fallen once during the last 4 weeks. The scores of the IADL showed clearly restricted activities of daily living for all residents: male residents had a mean of 1.8 ± 1.2 and female residents a mean of 2.6 ± 1.7 score points from 5 and 8 possible points, respectively. The mean of the Barthel Index was 60.8 points (SD ±24.4) (13% had a Barthel Index between 0 and 30 [severe disability], 64% between 35 and 80 [moderate dis-

**Table 6.** Residents: assessments in residents

Assessments	
MNA-SF <sup>®</sup> total score	11.8 (2.4)
MNA-SF <sup>®</sup> classification <sup>†</sup>	
Normal nutritional status	43 (68.3)
At risk of malnutrition	17 (27.0)
Malnourished	3 (4.8)
Hand grip, kg	
Female	
Dominant hand	16.9±5.8
Non-dominant hand	15.7±5.8
Male	
Dominant hand	26.1±9.6
Non-dominant hand	22.2±7.4
Tinetti test	15.6±8.0
Increased risk to fall	41 (68.3)
No risk to fall	19 (31.7)
IADL	2.5±1.6
Barthel Index	60.8 (24.2)
Severe disability	8 (12.5)
Moderate disability	41 (64.1)
Nearly no disability	15 (23.4)
QUALIDEM, %	
Care relationship	87.9±16.6
Positive effect	88.4±16.4
Negative effect	79.5±19.0
Restless tense behavior	58.7±15.1
Positive self-image	79.2±26.0
Social relations	78.4±21.0
Social isolation	88.9±18.1
Feeling at home	91.3±18.0
Having something to do	56.8±32.8
Profile of Well-Being	25.2±3.1
SF-12	
Mental component scale	56.9±8.2
Physical component scale	43.2±8.1
MMSE	22.3±6.3
Severe cognitive impairment	15 (28.9)
Moderate cognitive impairment	15 (28.9)
No cognitive impairment	22 (42.3)

Data are presented as *n* (%) or mean ± standard deviation. MNA-SF, Mini Nutritional Assessment – Short Form; IADL, Instrumental Activities of Daily Living; QUALIDEM, Quality of Life in Dementia; SF-12, Short Form-12; MMSE, Mini Mental State Examination. <sup>†</sup> As per Société des Produits Nestlé, S.A., Vevey, Switzerland, trademark owners.

ability], and 23% more than 85 points [nearly no disability]). The highest ratings on the QUALIDEM subscales were collected for “feeling familiar” (91%), “social isolation” (89%), and “positive effect” (88%) (high ratings for “social isolation” means less marked). The Profile of Well-Being showed an average of 25.2 points (SD ±3.1).

The results of the SF-12 showed an average of 43.2 (SD ±8.1) for the physical component summary scale and 56.9 (SD ±8.2) for the mental component summary scale. We assessed the cognition test (the MMSE) in 52 residents with an average of 22.3 points (SD ±6.3). Twenty-nine percent (*n* = 15) of the residents were scored between 0 and 18 points (severe to moderate cognitive impairment), 29% (*n* = 15) between 19 and 24 (mild cognitive impairment), and 42% (*n* = 22) more than 25 points (no cognitive impairment) (Table 6).

A post hoc sensitivity analysis (non-parametric analysis of variance [ANOVA]) for the MMSE categories “no,” “moderate,” and “severe” cognitive impairment showed a concordant correlation between the grade of cognitive impairment and capacities for activities of daily living (IADL, *p* < 0.001), score for the mental component scale of the SF-12 (*p* = 0.0345), and the QUALIDEM item “having something to do” (*p* = 0.0175). All other outcomes were not statistically significantly related to the mental status, but the means in the MMSE category “severe cognitive impairment” were markedly lower for the Barthel Index, the QUALIDEM items “having something to do” and “positive self-esteem,” and the hand grip (Table 7).

All residents received each of the different elements of KT once or twice a week. When asked about what they thought KT consisted of, residents primarily associated KT with hydrotherapy (88%), followed by herbal therapy (53%) and physical activity exercise (45%). Among residents, 43% were aware of KT since adulthood, 26% since childhood, 23% since their move into the nursing home, and 8% could not answer the question. Among residents, 71% preferred hydrotherapy as their primary KT intervention. The majority of residents (89%) perceived KT as a tool for increasing well-being. In particular, hydrotherapeutic measures, such as warm footbaths combined with lavender oil and brush massages, were well known and highly accepted.

## Discussion

The acceptance of KT seemed to be quite good since a great majority of caregivers and residents considered KT to be beneficial for health and well-being. Ninety percent of the caregivers indicate an improved relationship with residents since the implementation of KT.

Workload is high for caregivers in nursing homes in Germany, especially in geriatric care. Thus, it is not surprising that KT as an additional aspect is easy to integrate into the workload by only 42% of carers, although 96% considered KT as beneficial. Overall, the results for the COPSOQ of this cross-sectional study differ from the results of other cross-sectional studies on caregivers in Germany, possibly as a result of a different setting. The as-



**Table 7.** Correlation between MMSE and defined characteristics and outcome parameters

	Cognitive impairment (MMSE)			<i>p</i> value
	Severe	Moderate	No	
Age	84.1 (80.2; 88.0)	82.7 (77.4; 87.9)	84.9 (82.2; 87.6)	0.8273
Barthel Index	54.0 (42.6; 65.4)	66.7 (55.0; 78.3)	67.0 (57.1; 77.0)	0.1420
IADL	1.1 (0.5; 1.6)	2.7 (1.9; 3.5)	3.5 (3.0; 4.1)	<0.0001
Profile of Well-Being	24.5 (22.9; 26.2)	26.4 (25.2; 27.6)	26.0 (24.9; 27.1)	0.1570
QUALIDEM care relationship	89.2 (79.0; 99.2)	88.6 (79.0; 98.2)	91.6 (87.1; 96.0)	0.9912
QUALIDEM positive effect	87.4 (76.8; 98.0)	90.0 (79.7; 100.3)	92.2 (86.3; 98.1)	0.5985
QUALIDEM negative effect	78.5 (68.3; 88.8)	75.6 (63.4; 87.7)	84.3 (76.5; 92.2)	0.4003
QUALIDEM restless tense behavior	56.3 (47.8; 64.8)	60.0 (51.1; 68.9)	59.6 (52.5; 66.7)	0.6526
QUALIDEM positive self-image	69.6 (53.9; 85.3)	85.2 (74.6; 95.8)	87.9 (79.0; 96.7)	0.0823
QUALIDEM social relation	81.8 (68.0; 94.2)	82.2 (71.5; 93.0)	81.3 (72.3; 90.4)	0.9676
QUALIDEM social isolation	89.9 (77.7; 100.0)	91.9 (83.3; 100.4)	89.9 (84.0; 95.8)	0.5841
QUALIDEM feeling at home	92.2 (83.8; 100.7)	94.4 (84.9; 103.9)	95.1 (91.4; 98.8)	0.4716
QUALIDEM having something to do	37.8 (19.2; 56.4)	73.3 (55.5; 91.1)	59.8 (46.6; 73.1)	0.0175
MNA <sup>®</sup> -SF	11.5 (10.6; 12.5)	11.9 (10.7; 13.2)	12.3 (11.1; 13.4)	0.1690
Tinetti test	16.4 (11.8; 21.0)	18.1 (14.0; 22.3)	16.4 (13.6; 19.2)	0.5783
SF-12 mental component scale	56.1 (52.3; 59.9)	53.1 (46.0; 60.2)	60.8 (59.1; 62.5)	0.0345
SF-12 physical component scale	44.9 (40.2; 49.6)	45.6 (41.9; 49.2)	40.4 (36.6; 44.2)	0.1431

Data are presented as mean (95% confidence interval). MNA-SF, Mini Nutritional Assessment – Short Form; IADL, Instrumental Activities of Daily Living; QUALIDEM, Quality of Life in Dementia; SF-12, Short Form-12; MMSE, Mini Mental State Examination.

assessment of the psychosocial workload of caregivers attained better ratings for the COPSOQ domains “demands at work” and “interpersonal relations and leadership,” as well as for the domain declared as “strains” (job satisfaction, intention to leave, general health, burnout, cognitive stress, satisfaction with life) compared to the results of a cross-sectional study with 313 caregivers from nursing homes in Germany [35].

Regarding the subgroups of caregivers (therapists, nurses, and nursing auxiliaries), the therapists in “Kneipp nursing homes” showed different results in several items of the COPSOQ in comparison to the nurses and nursing auxiliaries in our sample and compared to available COPSOQ datasets from the questionnaires for nurses, occupational therapists, and physiotherapists from any kind of facility [36]. “Kneipp nursing home” therapists showed fewer “demands at work,” less “strains,” and more “influence and possibilities for development.” Possible reasons may be that therapists in “Kneipp nursing homes” have a special occupational field that allows a more self-determined and resident-centered work. The diversity of Kneipp measures with its distinctive elements of hydrotherapy, herbal medicine, physical activity, healthy nutrition, and mind-body medicine therapies possibly encourages creative and satisfying work. However, it has to be taken in account that we also found fewer shift workers in the group of therapists. Shift work is an important factor that influences quality of life and that can cause several health issues [37–39].

The geriatric nurses of the “Kneipp nursing homes” rated higher in the scales “satisfaction with life,” “personal burnout,” and “quantitative demands” compared to a sample of geriatric nurses from regular German nursing homes [40]. High demands at work may not be perceived as negative as long as they are balanced by a high degree of freedom and social support as discussed in Karasek’s demand-control-support model [41].

Nursing auxiliaries from “Kneipp nursing homes” rated higher in “influence at work,” “degree of freedom at work,” “possibilities for development,” “workplace commitment,” and “sense of community” compared to a sample of nursing auxiliaries from the above-mentioned study [40]. Taking these results into account, the comparison with the COPSOQ results leads to the impression that the psychosocial workload differs regarding the profession and that especially items from the domains “influence and development,” “interpersonal relationship,” and “leading at work” are different compared to other samples. However, the results of the subgroup analysis have to be interpreted with caution since this is only a comparison of means in a very small sample. The results for the 29 participating caregivers indicated on average a “good” work ability (WAI) in the sample comparable to other German nursing homes and health care settings [42, 43], while the health-related quality of life represented by the SF-12 was superior to the German sample for healthy women for both the mental and physical component summary scale [13].

The results for the residents underline that they were clearly restricted in terms of health and activities of dai-

ly living: the IADL and Barthel Index scores were reduced, the risk of falls was high, and hand grip was impaired, all related to the age and gender of residents [44]. In this aspect, our sample is quite comparable to the average of inhabitants of conventional nursing homes.

An increased risk of falls and impaired abilities for activities in the daily living of the elderly are often related to polypharmacy and inappropriate medication [45]. The residents in our study took an average of eight different active drugs per day, which likely implicates a high risk of drug interaction. The WHO defines an 80% risk of interaction if more than 6 different drugs are taken daily [46]. Only 6% of the medication was identified as potentially inappropriate medication (PIM) for the elderly according to the PRISCUS list. These medications mainly included sedatives, hypnotics, and antidepressants. Compared to the prevalence of PIM in German health-insured individuals over 65 years, 6% is relatively low. A study in 2012 found a prevalence (age standardized) of PIM of 32% in women and 23% in men [47]. Another cohort study found a prevalence of 22% of PIM in nursing homes for older adults [48]. Of course, the use of medication depends on physicians, diagnoses, and prescription guidelines, but it cannot be ruled out completely that the use of KT also had an influence on the medication of the residents. KT was used for the management of minor complaints, such as colds, sleeping disorders, and restlessness. The caregivers administer herbs and hydrotherapy in agreement with the residents and the responsible medical doctors. Further studies should explore if this practice is effective, e.g., for drug reduction, especially for sedatives and hypnotics, which are generally not recommended for older adults.

The percentage of residents with mild to severe cognitive impairment (58%) and dementia (31%) was relatively low. A comprehensive sample ( $n = 4,481$ ) of residents from German nursing homes found 67% of the residents were suffering from dementia [49]. In order to be included in our study, residents had to be able to cooperate for the assessments and answer questions adequately. This could possibly have led to the inclusion of less cognitively impaired or demented residents and may pose a selection bias.

The relation between cognition, nutrition, and health status was shown in several studies. A study in 76 German nursing homes with a total of 5,521 participating residents (mean age  $84.9 \pm 9.8$  years) found that greater care dependency was correlated to a BMI of equal to or under 20, and in addition, factors such as dementia, lack of appetite, and polypharmacy were related to the incidence of malnutrition [22]. In our sample, we found a relatively low percentage of malnourished residents; the results of the MNA<sup>®</sup>-SF in our study showed that only 27% of the

residents were at risk of malnutrition and only 5% were malnourished. Additionally, none of the residents had a BMI  $\leq 18.5$ . In contrast, a cross-sectional study in six conventional German nursing homes indicated that 18.2% of the 286 participating residents were classified by the MNA as malnourished and 42% as being at risk of malnutrition [21]. Healthy nutrition and eating is an aspect of the Kneipp concept. It emphasizes a healthy whole food diet with a focus on fresh, seasonal, and regional vegetables, sprouts, herbs, and fruits. The “Kneipp nursing homes” have their own kitchen, which allows them to freshly prepare meals. Further studies are needed to prove if this influences the nutritional status or other health-related aspects such as digestive disorders (e.g., constipation or diarrhea).

The quality of life in residents’ measures revealed remarkable results in the QUALIDEM items representing mood and social relations. They attained higher ratings in comparison to samples of residents in other studies, [50, 51]. The best values were reported in the subcategories “feeling familiar,” “social isolation,” “care relationship,” and “positive effect,” which possibly reflects social and emotional well-being in the nursing home, although residents were physically restricted. This may be related to the fact that the majority of the caregivers (90%) stated that their relationship to the residents had improved since implementing KT.

As the majority of residents (89%) perceived KT as promoting well-being, this attitude may also have had a positive influence on their quality of life. The “Profile of Well-Being” is a rarely used multidimensional instrument for evaluating quality of life by a caregiving team. Compared to residents in shared housing arrangements, well-being scores were high [52]. Also, the results for health-related quality of life measured by the SF-12 were, on average, superior to the German sample aged  $>70$  years (physical component summary scale  $38.8$  [SD  $\pm 10.6$ ], mental component summary scale  $52.3$  [SD  $\pm 9.2$ ]) [15, 16]. However, it has to be noted that there is no comparable data for an externally evaluated SF-12, which may also have had an influence on the distinctive results for the mental component summary scale.

Limitations of this cross-sectional study include the small sample size of nursing homes, residents, and caregivers because only four “Kneipp nursing homes” existed in Germany during the study period and due to the exclusion of residents and caregivers, who did not regularly receive and provide KT, respectively. This indicates, that only a small part of the staff and the residents was in fact involved in KT every day. It can be assumed that all residents of the nursing homes would benefit in a similar way from the food quality as part of the Kneipp care concept, but a frequently applied KT with elements from hydrotherapy or herbal therapies only seemed to be feasible in

a smaller sample of residents. Therefore, the participants of the study may be a selected sample. Hence, the results cannot be generalized to other caregivers and residents of the “Kneipp nursing home,” who are not involved in KT. In addition, the subgroup comparisons we made have to be interpreted very carefully due to the small sample size. The results can, therefore, only be assessed to a limited extent. Furthermore, the results from a cross-sectional study do not allow conclusions regarding causal relations, which is why controlled prospective interventional studies would be the next step to investigate effectiveness and safety.

Nonetheless, the study provides a first impression of the condition of residents and caregivers in “Kneipp nursing homes” who were involved in KT. The fact that the number of “Kneipp nursing homes” in Germany rapidly grows shows that the integration of KT is appreciated by the operators as well as the caregivers, residents, and their relatives. Therefore, the effects of such an integration should be further investigated in larger studies, including longer observational periods.

## Conclusion

The results indicate that integrating KT into these nursing homes was well accepted by residents and caregivers. Caregivers had better scores than those of comparable samples for parts of psychosocial workload and quality of life. The residents showed rather positive scores for aspects of quality of life related to positive affect and social relations. Further prospective comparative studies should explore the effectiveness and safety of KT in nursing homes.

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## Statement of Ethics

The study was performed in accordance with the Declaration of Helsinki and was approved by the ethics commission at the Charité – Universitätsmedizin Berlin (EA1/147/11; June 22, 2011). Trial registration: DRKS00006800. All participants or their legal guardians have given their written informed consent for study participation.

## Disclosure Statement

The authors M.O., B.B., H.F.F., K.S., M.T., and S.B. declare that they have no competing interests. R.S. is the Executive Director of the Centre for Quality in Care.

## Author Contributions

M.O. coordinated and supervised the quantitative study component. M.O. mainly drafted the manuscript, supported by B.B. K.S. performed all geriatric assessments. S.B. was responsible for the data management. H.F.F. planned and conducted the statistical analyses. M.T. participated in the design of the study, and M.T. and R.S. served as advisors to the study. B.B. developed, with M.O., the design of the overall project and the quantitative study and served as the principal investigator throughout all phases of these projects. All authors read and approved the final manuscript.

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