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Knowledge and attitude of nursing students regarding older adults' sexuality: A cross-sectional study

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ABSTRACT

Background: Although older adults are sexual, sexuality is infrequently discussed with them by health care professionals. Nursing students, as future professionals, can make an important contribution by developing competences in discussing intimacy and sexuality with older adults to increase quality of life and to prevent sexual problems. In order to improve these competences, current levels of knowledge and attitude need to be explored.
Objectives: To investigate i) knowledge and attitudes of nursing students regarding intimacy and sexuality of older adults, ii) the difference in knowledge and attitudes of nursing students in different years of study and iii) frequency of discussing intimacy and sexuality with older adults.
Design: Cross-sectional.
Settings: A University of Applied Sciences in the Netherlands.
Participants: Nursing students, ≥16 years who were able to read and write in Dutch.
Methods: The Ageing Sexual Knowledge and Attitudes Scale was used among nursing students. Furthermore, demographic information and frequencies were collected. Data was analyzed using SPSS.
Results: In total, 732 students participated. The mean knowledge-score was 43.9 (SD = 8.9), the mean attitude-score 64.3 (SD = 16.0). Unlike attitude, the level of knowledge differed significantly per year of study: first year students had the lowest and third year students the highest knowledge. Most students stated they 'never' (54.1%) or 'once' (13.2%) discussed intimacy and sexuality with older adults. Reasons to avoid talking about intimacy and sexuality were feelings of 'not being the right person' (17.3%) and 'incompetence' (14.0%).
Conclusions: Nursing students had moderate knowledge and positive attitudes toward older adults' intimacy and sexuality. The knowledge-level differed per year of study, the attitude level did not. Only a minority discussed intimacy and sexuality with older adults. Moderate knowledge and positive attitudes do not mean that intimacy and sexuality is discussed. To ensure students feel responsible and competent, interventions should focus on continuous knowledge dissemination, role clarification and role modelling.

1. Introduction

Sexuality and sexual health are important aspects of quality of life in humans. The World Health Organization defines sexuality as "a central aspect of being human throughout life and encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction" (World Health Organization, 2017). Although sexuality is often associated with younger adults, research shows that older adults (65 years or older) remain sexually interested and enjoy an active sex life (Aguilar, 2017; DeLamater, 2012; Freak-Poli et al., 2017;

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Herbenick et al., 2010; Kalra et al., 2011; Lindau et al., 2007; Træen et al., 2018).

From the perspective of older adults, sexual activity is seen as an important component of a close emotional relationship in later life (Gott and Hinchliff, 2003). Older adults stated that their sex life was moderately to extremely important (Gott and Hinchliff, 2003). Reasons older adults engage in sex vary according to Gewirtz-Meydan and Ayalon (2018) from maintaining overall functioning, to feeling young, attractive and desirable. Unfortunately, half of the sexually active older adults, included in a large study in 2007, reported at least one sexual problem (Lindau et al., 2007). Despite the fact that sexual problems are frequent among older adults (DeLamater, 2012; Lindau et al., 2007), they are infrequently discussed with health care professionals (Harding and Manry, 2017; Lindau et al., 2007; Mahieu and Gastmans, 2015; Muliira and Muliira, 2013).

As a result of nurses' intensive involvement in hands-on care, they may have a major impact on older adults' behavior through their interaction with them and their ability to access intimate information (Mahieu et al., 2016). Therefore, nurses are in an ideal position to assess normal and pathological aging changes, and to prevent or discuss sexual problems (Wallace, 2008).

However, research in Sweden showed that only 20% of nurses in medical and surgical wards took time to discuss sexual concerns, and 40% of the nurses felt confident in their ability to address patients' sexual concerns (Saunamäki et al., 2010). Barriers to address patients' sexuality in nursing practice included patients' expectations, time availability, personal comfort, confidence in the ability to address issues related to human sexuality (Magnan et al., 2005), and advanced high age of the patient (Klaeson et al., 2017; Krouwel et al., 2015; Van Ek et al., 2018).

2. Background

As knowledge is a factor that influences recognition of problems by nurses (Haesler et al., 2016), knowledge of intimacy and sexuality of older adults is important in identifying sexual problems. Attitude, defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly and Chaiken, 2007, p. 582), is thought to directly influence behavior. A higher level of knowledge regarding intimacy and sexuality of older adults is associated with a higher positive attitude toward intimacy and sexuality in later life (Fennell and Grant, 2019; Mahieu et al., 2016). Multiple studies investigated the knowledge and attitudes of nurses regarding intimacy and sexuality of older adults (Bauer et al., 2013; Bouman et al., 2006; Mahieu et al., 2016). Older nurses felt more confident in their ability to address patients' sexual concerns and had more positive attitudes toward discussing sexuality than younger nurses (Bauer et al., 2013; Bouman et al., 2006; Mahieu et al., 2016; Saunamäki et al., 2010). Furthermore, nurses with additional training or education had more positive attitudes toward discussing sexuality than those without (Bauer et al., 2013; Bouman et al., 2006; Mahieu et al., 2016; Saunamäki et al., 2010). As undergraduate nursing students are often young and unexperienced, their knowledge regarding intimacy and sexuality is, in general, narrow (Blakey and Aveyard, 2017). Despite positive attitudes, students often feel uncomfortable addressing intimacy and sexuality and are reluctant to initiate a conversation (Blakey and Aveyard, 2017). Since nursing students are future practitioners, failing to recognize problems or to address intimacy and sexuality in older adults might influence the quality of care provided and their interactions with older adults.

Sexual healthcare education can help nursing students explore their own values and feelings and enhance their knowledge on older adults' sexuality. This may lead to better exploration, diagnosis and treatment of sexual problems, resulting in better quality of health care and quality of life (Bauer et al., 2013; Livni, 1994; Mahieu et al., 2016). In order to improve skills of nursing students in discussing intimacy and sexuality, education should include these aspects of human life and aging. Earlier studies on this topic are outdated (Quinn-Krach and Van Hoozer, 1988), investigated only first year nursing students (Gewirtz-Meydan et al., 2018) or did not address older adults (Blakey and Aveyard, 2017; Huang et al., 2013; Sung et al., 2015). In addition to this gap in knowledge, a systematic review showed inconsistencies between the belief of health care professionals that sexual health is important and the practice of taking a sexual history (Haesler et al., 2016). Unfortunately, research about discussing intimacy and sexuality in later life is underexposed. Haesler et al. (2016, p. 71) state that "more robust exploration of health professionals' knowledge of and attitudes toward sexuality of older people is warranted".

Therefore, the purpose of this study was threefold. First, we wanted to gain insight in the knowledge and attitudes of nursing students regarding intimacy and sexuality of older adults. Second, we aimed to investigate the difference in knowledge and attitudes of nursing students in different years of study. Third, we wanted to know the frequency of nursing students discussing intimacy and sexuality with older adults.

3. Methods

3.1. Design and study population

A descriptive cross-sectional design was used. Nursing students, 16 years and older, who were enrolled in a University of Applied Sciences in the north-eastern part of the Netherlands were used as a sample. In this University, structural lessons regarding intimacy and sexuality are embedded in the four years nursing curricula and specifically during the second year, nursing students are taught about intimacy and sexuality in later life.

The on-line survey was administered between February and April 2019. Nursing instructors were approached in person and by emails to distribute the link to the on-line survey during their class time. Scheduled data collections took place in existing lessons. This type of data collection leads in a similar inquiry to a high response rate (Gewirtz-Meydan et al., 2018).

3.2. Ageing Sexual Knowledge and Attitudes Scale

The survey administered to participants included three sections. The first section covered socio-demographic information such as gender, age, relationship, marital status and religion.

The second section covered the level of knowledge and attitudes, using the Ageing Sexual Knowledge and Attitudes Scale (ASKAS). The ASKAS can be used for assessing the attitudinal aspects of sexuality of older adults and the individual's knowledge about age-related changes in sexual functioning. The original English ASKAS contains 60-items. The reliability of the scale has been found to be within acceptable limits. The scale's validity was demonstrated by its sensitivity to educational interventions (White, 1982). The translated Dutch version, the ASKAS-D3, contains 51-items and showed good estimates of content validity, face validity, user-friendliness and internal consistency (Cronbach's α knowledge-subscale = 0.80, Cronbach's α attitude-subscale = 0.88) (Mahieu et al., 2013). The questionnaires contained 26 questions on knowledge using a true/false/don't know response. A correct, wrong and 'don't know' answer were equated with a score of 1, 2, or 3 respectively. The range was 26–78, with a low score indicating high knowledge. Twenty-five questions assessed participants' attitudes using a seven-point Likert scale, indicating the extent of agreement or disagreement. The range was 25–175, with a low score indicating a positive attitude (Mahieu et al., 2013). As no predefined cut-off points were available for the ASKAS, we used other studies to define low, moderate, average, or high/positive knowledge and attitudes (Gewirtz-Meydan et al., 2018; Mahieu et al., 2016).

The final part of the survey contained seven non-validated questions about the frequency of discussing intimacy and sexuality with older

adults. Questions included were: 'How many times did you discuss intimacy and sexuality in the past year?' and 'Who introduced the topic?'. To test face validity, the questions were checked by experts in the field and by a panel of nursing students prior to data collection. Minor adjustments were made.

3.3. Data analysis

Data were analyzed using SPSS, version 24.0 (IBM corp., Released 2016). Descriptive summary statistics were used for levels of knowledge and attitudes, frequencies and demographic data. For the knowledge subscale, the homogeneity of variance assumption in the different years of study was not met. Therefore, Welch's Analysis of Variance (ANOVA) with Games-Howell Post-hoc test for difference between years of enrollment was performed (Shingala and Rajyaguru, 2015). For the attitude subscale, a one-way ANOVA was used with Tukey's post-hoc test, as all assumptions were met. Statistical significance was defined as $p < 0.05$ for two-sided tests with confidence intervals at 95%. A predefined syntax was used. Missing data during data collection was minimized by assigning mandatory questions. However, not all students completed the whole survey. If the knowledge or attitude subscale had missing values, no summary score could be calculated. This was considered by performing a full case analysis per subscale.

A sample-size calculation for the main aim, gaining insight in the knowledge and attitudes, was performed (Charan and Biswas, 2013). The minimum number of nursing students needed was 347.

3.4. Ethical issues

The participating University obtained ethical approval for this study from its independent ethical commissions. This study was not subject to Medical Research Involving Human Subjects Act, as students were not asked to act or to change behaviors and the questions were not of a drastic nature (CCMO, n.d.). Therefore, the study was conducted according to the principles of the Declaration of Helsinki (World Medical Association, 2018) and guidelines for Good Clinical Practice (ICH, 2016).

Several precautions were taken to ensure participants were well informed. An announcement on the virtual learning environment was made and a written information letter was sent by email. Participation was voluntary. Consent was given in the survey.

Data will be stored for ten years in a secured data repository (SURF, n.d.). Since the researchers had no personal information about the students, the general characters could not be linked to individual students. The nursing students gained study points for their quality register after completing the survey. Participation remained voluntary, as students could also gain study points in other ways.

4. Results

4.1. Participants

Out of a potential research sample of 1494 nursing students, 732 participated in this study with a response rate of 49.0%. Table 1 shows an overview of the participants' characteristics. The nursing students' sample was primarily female (90.7%). Participants' ages ranged from 16 to 51 years, with a median of 20 years. The majority had no experience in caring for older adults or had approximately one year of experience (32.2% and 40%, respectively). An education course addressing intimacy and sexuality was taken by 62.8% of the participants during the past years. Most participants were in their first year of study (38.5%).

4.2. Knowledge of nursing students

Participants had a mean knowledge-score of 43.9 (SD = 8.9; ASKAS-range = 26–78 see Table 2). The mean knowledge-score of first year students (mean = 46.7, SD = 9.2) was significantly higher ($p < 0.01$) compared to second year (mean = 41.9, SD = 7.8), and third year students (mean = 40.6, SD = 7.4), indicating a lower level of knowledge. The mean knowledge-score of third-year students (mean = 40.6, SD = 7.3) was significantly lower ($p < 0.01$), meaning a higher level of knowledge, compared to fourth-year students (mean = 45.3, SD = 10.2). The mean knowledge-score of second-year students was significantly lower ($p < 0.05$), meaning a higher level of knowledge, compared to fourth-year students.

Table 1
Baseline characteristics of the study population.

Characteristic	n (%)
Participants	732
Age (median, IQR)[a]	20 (19–21)
Gender	
Female	664 (90.7%)
Relationship	
Yes	379 (51.8%)
Marital status	
Unmarried	667 (91.1%)
Cohabiting	53 (7.2%)
Married	9 (1.2%)
Registered as partners	2 (0.3%)
Divorced	1 (0.1%)
Religion	
Christian/Catholic	286 (39.1%)
Muslim	26 (3.6%)
Jewish	1 (0.1%)
No religion	412 (56.3%)
Other	7 (1.0%)
Year of study	
Year 1	282 (38.5%)
Year 2	253 (34.6%)
Year 3	118 (16.1%)
Year 4 (or above)	79 (10.8%)
Years of experience in elderly care[b]	
No experience	236 (32.2%)
±1 year	293 (40.0%)
±2 years	46 (6.3%)
±3 years	43 (5.9%)
±4 years	35 (4.8%)
>4 years	51 (7.0%)
Prior sexual education	
Yes	460 (62.8%)

n: number; IQR: interquartile range.
[a] Age is non-parametric.
[b] Missing: n = 28, 3,8%.

Table 2
Attitudes and knowledge of nursing students toward sexuality in older adults by year of study

	Mean (SD)	Difference between year of study	
		Statistic	Multiple comparison
Knowledge (total)[a]	43.9 (8.9)	Welch = 21.5**	Year 1 vs 2**
Year of study 1	46.7 (9.2)		Year 1 vs 3**
Year of study 2	41.9 (7.8)		Year 1 vs 4[NS]
Year of study 3	40.6 (7.4)		Year 2 vs 3[NS]
Year of study 4	45.3 (10.2)		Year 2 vs 4*
			Year 3 vs 4**
Attitude (total)[b]	64.3 (16.0)	F = 0.3[NS]	
Year of study 1	64.9 (15.9)		
Year of study 2	64.2 (16.0)		
Year of study 3	63.2 (15.5)		
Year of study 4	64.3 (17.0)		

NS: not significant.
[a] ASKAS range knowledge: 26–78. A low score means a high level of knowledge.
[b] ASKAS range attitude: 25–175. A low score means a positive attitude.
* $p < 0.05$.
** $p < 0.01$.

4.3. Attitudes of nursing students

Participants had a mean attitude-score of 63.4 (SD = 16.0; ASKAS-range = 25–175; see Table 2). No significant differences were found in attitudes and the years of study (p = 0.81).

4.4. Discussing intimacy and sexuality

In total, less than half of the nursing students with experience in aged care stated they talked about intimacy and sexuality with older adults (n = 215, 45.9%). If a conversation took place, nursing students or a colleague initiated the topic (n = 110, 27.7% and n = 106, 26.7%, respectively) followed by older adults themselves (n = 104, 26.2%). Reasons to talk about intimacy and sexuality were the wish of the older adults (n = 91, 26.1%), or seeing or hearing intimacy and sexuality (n = 90, 25.8%). According to nursing students, when talking about intimacy and sexuality, the reaction of the older adults was mainly positive: many older adults discussed the topic with ease (25.7%; n = 83), or seemed relieved (17.6%; n = 57). Negative reactions were mentioned less often by the nursing students (n = 78, 24.1%). Nursing students avoided the discussion of the topic when feeling they were not the right person (n = 150, 17.3%) or when feeling incompetent (n = 121, 14.0%). A minority of nursing students stated they should have discussed it more often (n = 177, 38.1%; see Table 3).

Table 3
Frequency and other characteristics on discussing intimacy and sexuality.

	n (%)
Talked about topic with older adults in the past year[a]	
Never	253 (54.1%)
1 time	62 (13.2%)
2 times	40 (8.5%)
3 times	41 (8.8%)
4 times	25 (5.3%)
5–7 times	16 (3.4%)
8–10 times	7 (1.5%)
>10 times	12 (2.6%)
Every time I interview an older adult	12 (2.6%)
Initiator conversation[b]	
Nursing student themselves	110 (27.7%)
Older adult	104 (26.2%)
Partner of older adult	30 (7.6%)
Family of older adult	17 (4.3%)
A colleague	106 (26.7%)
A doctor	22 (5.5%)
Other	8 (2.0%)
Reason to initiate conversation[b]	
Wish older adult	91 (26.1%)
Wish partner older adult	37 (10.6%)
Wish family older adult	21 (6.0%)
Order doctor	13 (3.7%)
Guideline/statement	56 (16.0%)
Seeing or hearing intimacy	90 (25.8%)
Other	41 (11.7%)
Reaction of older adult[b]	
With ease	83 (25.7%)
Relieved	57 (17.6%)
Neutral	61 (18.9%)
Discomfort	56 (17.3%)
Very discomfort	14 (4.3%)
Angry	8 (2.5%)
Didn't want to talk	15 (4.6%)
Other	29 (9.0%)
Reason to not discuss topic[b]	
I always talk about it	86 (9.9%)
I didn't feel competent	121 (14.0%)
Older adult had no partner	61 (7.1%)
I felt ashamed	60 (6.9%)
It's private	91 (10.5%)
My religion prohibits	3 (0.3%)
Not my priority	28 (3.2%)
Older adult was too ill	52 (6.0%)
I was too busy	20 (2.3%)
I was not the right person	150 (17.3%)
Age difference	54 (6.2%)
Privacy issues	55 (6.4%)
Other	84 (9.7%)
Should you have discussed intimacy and sexuality (more often)?	
No	288 (61.9%)
Yes	177 (38.1%)

[a] When people had no experience in elderly care, these questions were not shown (n = 236, 32.2%). Therefore, the questions do not add up to the total of participants included in the inquiry.
[b] Multiple answers possible.

5. Discussion

The aim of this study was to examine the current level of knowledge and attitudes of nursing students toward intimacy and sexuality in older adults. Nursing students had moderate knowledge and positive attitudes toward intimacy and sexuality in later life. The level of knowledge differed per year of study: first-year students had the lowest and third-year students had the highest knowledge. The attitudes did not differ between the years of study. Most students indicated they did not or only occasionally discussed the topic with older adults.

A moderate knowledge of nursing students regarding intimacy and sexuality of older adults in the present study is consistent with other findings (Di Napoli et al., 2013; Jones and Moyle, 2016; Mahieu et al., 2016). As most nursing students stated they had taken intimacy and sexuality courses, it is possible that these courses did not provide adequate information. A review describing intimacy and sexuality courses for professionals showed that the main focus of the courses was contraception and sexually transmitted diseases (Karimian et al., 2018). Of the 38 included courses in the review, only two contained the topic of ageism (Karimian et al., 2018). This absence of specific information regarding older adults' intimacy and sexuality may affect nurses and nursing students' attitudes and knowledge.

The level of knowledge was higher as the students progressed in education, with an exception of the last year of study. An explanation could be that the University recently introduced an integrated intimacy and sexuality curriculum. Fourth-year students had less integrated courses about intimacy and sexuality compared to first, second and third-year students. Thus, an integrated approach to the topic seems important in education. Two studies consolidate this positive effect of education (Jones and Moyle, 2016; Sung and Lin, 2013). Sung and Lin (2013) showed a significant beneficial effect of sexual healthcare education in the experimental group on knowledge, attitudes and self-efficacy of nursing students related to sexual healthcare in general compared to the control group. Jones and Moyle (2016) showed the importance of delivering education to nursing staff and improving knowledge and attitudes on older adults' sexuality, using a pre-post design. Limitations in both studies were the small sample sizes and short intervals between pre-and post-tests.

Participants had a rather positive attitude toward sexuality in later life, which is supported by studies investigating nurses' attitudes regarding older adults' intimacy and sexuality (Mahieu et al., 2011; Mahieu et al., 2016) or nursing students' attitudes regarding intimacy and sexuality in general (Blakey and Aveyard, 2017; Huang et al., 2013). Unlike knowledge, the level of attitudes did not significantly differ per year of study. This indicates that, in our study, sexual education throughout the years of study had minor impact on attitudes. There is no consensus about the influence of sexual education on attitudes: one study confirms our finding (Gewirtz-Meydan et al., 2018), and several studies do not (Bauer et al., 2013; Jones and Moyle, 2016; Mahieu et al., 2016). Hence, role models are important during education and internships, as nursing students will be confronted with positive views on intimacy and sexuality (Blakey and Aveyard, 2017).

The lack of discussing intimacy and sexuality has been reported before (Blakey and Aveyard, 2017; Haesler et al., 2016; Saunamäki et al., 2010). The main barriers for nursing students to discuss intimacy

and sexuality were the feeling of incompetence and not being the right person. These findings are confirmed by other inquiries (Blakey and Aveyard, 2017; Fennell and Grant, 2019). In a review, Blakey and Aveyard (2017) found that students did not feel equipped and felt uncertain about their role or responsibility. Low confidence levels and low self-rated competence were reported (Blakey and Aveyard, 2017). Other barriers for the lack of discussing intimacy and sexuality in this review were lack of time, no priority given to intimacy and sexuality, age assumptions and embarrassment and fear of being offensive (Blakey and Aveyard, 2017). All these barriers were investigated in this survey, however, students stated that these factors were less important.

Surprisingly, when nursing students discussed intimacy and sexuality with older adults, the reaction of the older adult was mainly positive. This reaction could be highlighted in education programs, as worrying for negative reactions was common (Blakey and Aveyard, 2017).

5.1. Limitations and strengths

To appreciate the findings of this study, some limitations require consideration. First, the design of the study was a cross-sectional self-reporting survey. Self-reporting could lead to response bias or social-desirability bias, where the participants want to 'look good' (Rosenman et al., 2011). Second, analyses are based upon a convenient sample of one University of Applied Sciences in the Netherlands. The median age 20 years (relatively young study population), in a relationship (51.8%) and non-religious (56.3%) or Christians (39.1%). Therefore, the findings may not be generalizable to a more diverse sample or different geographic locations.

A strength of this study is the large sample size, which provided great statistical power to investigate the current level of knowledge and attitudes, as was the main aim of this study. Next to this, using the well-known and validated ASKAS questionnaire makes it possible to compare the results with other inquiries to contribute to a meta-analysis in the future.

5.2. Implications

Sexual health is an important aspect of quality of life in humans. This study shows that having moderate knowledge and positive attitudes does not automatically indicate that nursing students discuss intimacy and sexuality with older adults. Students stated they felt they were not the right person to discuss the topic or felt incompetent. Therefore, continuous education for nursing students in all years of study and training for nurses in health care institutions is recommended (Blakey and Aveyard, 2017; Thys et al., 2019). Despite the fact that the students stated they had completed sexual education, their knowledge was limited. It is possible that this previous education did not provide adequate information. Hence, these trainings should focus on the anatomy and physiology of aging in combination with intimacy and sexuality and familiarization of models and practice the skills in order to gain confidence to discuss the topic (Blakey and Aveyard, 2017; Haesler et al., 2016). As a majority of students stated they should not have discussed intimacy and sexuality more often, a clarification of responsibilities concerning discussing intimacy and sexuality in aged care should be made available. Also, the presence of role models in universities and clinical placements will help students with an example how to discuss intimacy and sexuality (Blakey and Aveyard, 2017).

Future research should explore nursing students' behavior regarding intimacy and sexuality of older adults in practice. Observational research may provide additional information that self-reported research is incapable of providing. As findings of the influence of education on attitudes in the different years of study are contradictive in multiple inquiries, we advise to perform a meta-analysis on this topic. Finally, further research is needed to assess whether and how educational programs improve nursing students' attitudes and knowledge toward older adults' sexuality in different countries.

6. Conclusion

Nursing students had moderate knowledge and positive attitudes toward intimacy and sexuality of older adults. In contrast to attitudes, the level of knowledge differed significantly per year of study. Only a minority of students discussed the topic with older adults. In order to make sure nursing students feel both responsible and competent to discuss intimacy and sexuality, interventions should aim on the continuous education with attention to later life's sexuality, clarification of role responsibilities and adding role models 'on the job'. It is important to take international differences in levels of knowledge and attitudes into account when developing these interventions.

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Ethical approval

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CRediT authorship contribution statement

VW designed the project, collected, analyzed and interpreted the data, and drafted the manuscript. BP contributed to design and the drafting of the methods section. HvO-M co-designed the project and gave feedback during the whole process. HE and JJ contributed to the design of the study. MdO acted as overall supervisor, co-designed and supervised the design of the project, supported the analysis and interpretation of data and contributed to the drafting of the manuscript. All authors contributed to the critical revision of the manuscript, approved the final manuscript for publication and have agreed to be accountable for the final work.

Declaration of competing interest

None applicable.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.nedt.2020.104643.

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