Enhancing student nurses' maths confidence and ability via numeracy drop-in sessions

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Abstract

Background: The aim of the study was to explore how maths confidence and anxiety affect the ability to learn maths and to investigate if numeracy drop-in sessions support maths learning and improve confidence.

Methods: A mixed methodology was used, utilising both quantitative and qualitative data collection tools. Registered nurses on a nurse prescribing course participated in the study; data collection was done via a pre and post intervention maths tests, questionnaires and interviews. The data analysis produced three themes, Personal Maths Experience, Effect of Drop-in Sessions and Experience of Sessions.

Findings & Results: For the pre and post intervention maths tests results were compared using a paired two sample t-test the t-stat was greater than the critical t-value showing that maths ability had improved. From the questionnaires and interviews the participants indicated that both their confidence and ability had improved**.**

Conclusions: All participants found the numeracy drop-in sessions beneficial in improving both maths confidence and ability, findings indicated that post-test scores had improved in comparison to pre-test scores.

Introduction

Drug errors are the cause of 25% of all legal proceedings in the NHS (Wright, 2005). According to the NPSA, (2007) calculation errors that result in medication errors cost the NHS more than £750 million pounds per year. Patient safety is paramount, but the NHS cannot ignore the rising costs related to these errors particularly in the current financial climate, where cuts are being made in the NHS to reduce spending (Hunter, 2010). Tang et al. (2007) specified that 65%-87% of medication errors reported occurred during prescribing or administration, the two most common errors being the wrong dose prescribed or the wrong calculated dose being administered. The administration of medicines is a pertinent aspect of the registered nurses' role with up to 40% of their time spent on the core skill (Armitage and Knapman, 2003). The numerical ability of both registered nurses and student nurses is a concern that is widely recorded in nursing research and literature (Kapborg, 1994; Hutton, 1998; Wilson, 2003; Sandwell & Carson, 2005). However numerical ability is not the only factor associated with poor maths skills amongst nurses, as confidence and anxiety are major contributing factors (Ma, 1999; Evans, 2000; Sabin 2001). O'Shea (1999) found that nurses who have poor maths skills will contribute to the increasing risk of medicine errors. Poor numerical ability can ultimately affect the welfare of patients, as nurses' who are unable to calculate medicines correctly will administer incorrect doses to patients leading to harm and in some cases even death. It is clear that improvements in nurses' numerical ability resulting in less medication errors will contribute to the reduction in spending and increase patient safety.

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Background

Mathematical incompetence and poor numerical ability of both student and qualified nurses' has become the subject of many research papers and it is apparent that it is a problem. Initially the focus of the papers was on the mathematical ability of nurses', with some exploring how anxiety can affect confidence and ability of nurses' to perform calculations. More recently researchers have begun to explore what is being done within Higher Education (HE) nursing programmes to help nurses' improve numerical skills. The majority of the research undertaken focuses on pre-registration student nurses', with others looking at the mathematical ability of qualified nurses'. There is very little research undertaken that considers what the NHS and health sector employers are doing to help address the problem. Three themes emerged from the review of the literature Numerical Ability of Nurses', Maths Anxiety and Self Efficacy and Strategies to improve medication calculation skills of nurses'.

Numerical Ability of Nurses'

Numerical ability of nursing students

has been causing concern for the last 25 years (McMullan et al. 2010). Grandell-Niemi et al. (2001) undertook a quantitative study in order to describe the basic mathematical proficiency and medication calculation skills of third year student nurses, upon completion of the programme. Although thirty-eight nursing colleges were invited to participate in the study, only eight institutions agreed to be involved. The findings of this study did not reflect the student's perceptions of their ability, 30% of students made mistakes with general maths and 22% with dosage calculations, only 0.6% of the sample achieved 100% in both of the tests. Conversely there are limitations in this study in that convenience sampling was used, which means that not all of the population related to the study had a chance to participate (Lobiondo-Wood and Haber, 2009), the sample used was also a small sample and the authors do not state if calculators were allowed.

As student nurses are in a learner role it could be deemed as acceptable that they need help with medicine calculations. Conversely as registered nurses' are qualified and practicing within the healh service, it is an expectation that they are competent at doing calculations relating to their role (Sherriff et al. 2011), unfortunately there is evidence to the contrary. A quantitative study by Lerwill, (1999) investigated the ability and attitudes to mathematics of fifty-four health care professionals (sixteen male, thirty-eight female, mean age thirty-eight years), from three different cohorts who were undertaking a top-up degree. The average score achieved by the sample was 60.7%; the not attempted questions rate was 19.9%. A score of 60.7% appears to be a satisfactory score, however on further breakdown of the findings it would appear that 22% of the professionals scored less than 50%. Neither of these scores would be sufficient for the Nursing and Midwifery Council (NMC) who require a pass of 100% before completion of nurse training or nurse prescribing courses (NMC, 2006). Limitations to this study is that it does not fully idenitfy the methodology used, is only a small sample and does not indicate what the roles of the participants were.

Registered nurses' (RNs) also displayed poor numerical skills in a study undertaken by McMullan et al. (2010). A cross-section correlation study was performed using both student and registered nurses in a UK university. The sample consisted of two hundred and tweny-nine second year student nurses and a convenience sample of forty-four RNs on the nurse prescribing course, mainly from primary care settings. The mean score of the RNs on the arithmetic test was 63.6%, with a pass mark of 80%, 68% of the RNs would have failed, it was noted that no difference in ability was indicated between age and number of years qualified. In the drug calculation test the mean score was 40% and 95% would have failed if the pass mark had been set at 80%. The student nurses were slightly worse, with 83% failing the arithmetic test and 99% failing the drug calculations. The findings suggest RNs and student nurses were statistically worse when performing drug percentages and infusion rate calculations, this reflected findings in other studies (Oldridge et al. 2004; Brown, 2006).

Maths Anxiety of Nurses'

Ma, (1999) defines maths anxiety as the general lack of comfort that someone suffers when they are asked to perform mathematically, it may also be a feeling of helplessness or tension when one is asked to deal with numbers or shapes. People may experience physical discomfort, dry mouth, sweating hands, and psychological symptoms including temporary memory loss or sense of failure or dread (Sredl, 2006). Elicock, (2012) established that a quarter of the population in the UK suffered with maths anxiety which equates to approximately 2 million children in England.

A quantitative study was undertaken by Bull, (2009) to identify if maths anxiety interfered with math cognition. The sample consisted of fifty-three student nurse's from a pre-registration nursing course in an HEI in the UK, the mean age of the sample was twenty-five years, with the majority being female (n=57). Findings suggest that students experienced both physical and psychological reactions in relation to their anxiety, four students refused to do the test, as they felt physically sick.

There were a significant number of participants who experienced maths anxiety and this can have a detrimental effect on their ability, however there are limitations to this study in that a small convenience sample was used (Lobiondo-Wood and Haber, 2009).

These findings are mirrored in a more recent quantitive study commenced by McMullan et al. (2012) which explored the influence of maths anxiety on drug calculation ability using a convenience sample of two hundred and twenty-nine second year British student nurses in a UK HEI. Ultimately the findings suggest that students who failed the numeracy tests were significantly more anxious and less confident in performing maths and drug calculations which is mirrored in the findings of the above study. Again limitations to this study are convenience sample of one UK HEI, although the findings are reflected in other studies (Glaister, 2007; Andrew et al. 2009).

Strategies to improve medication calculation skills of nurses'

Ramjan (2011) commenced a study to investigate the use of a de-contextualised and contextualised maths test, to compare the preferences and performance of five hundred and sixty-seven student nurse's in year two of a BA Programme, across four campuses in an Australian University. On average student's scores improved from test one to test two, 50% had their second test score increase by nought to two marks higher than their first test, the average for test two was higher than for test one by one and a half marks. Nevertheless the researcher acknowledges that it is unclear whether the increase in marks is due to the images or if the students had practiced in between. Conversely four hundred and thirty-four (80%) of the participants said they preferred test two as it was more relevant to nursing, as nursing was not just maths. The findings of this study cannot be generalised as it was undertaken in Australia in only one HEI and is subjective to student preference, however these findings are reflected in an earlier study on qualified nurses by Wilson, (2003).

From the research it is apparent that e-learning packages and visual cues improve ability and self-efficacy of nurses' yet a quasi-experimental quantitative study by Wright, (2008) considered how a variety of approaches to teaching numeracy affected ability. A sample of one hundred and seventy-three student nurse's from a UK HEI were given a calculation test on IV additives that contained ten questions, students were expected to pass the test at 100%. The students were then separated into two groups, a control group (n=92) where participants were given lectures on drug calculation skills and intervention group (n=80) where students received a variety of teaching and learning strategies (practical skills session, online maths tutorial, face to face maths tutorials, workbooks, drug calculation books available from the library). The findings indicate that there was a difference between the two groups, the intervention group had greater retention of knowledge and skills. The findings suggest that both methods are beneficial, however a test to ascertain baseline ability would have identified the individual participants innate ability in both groups as this could have affected the results, it is important to note that Wright (2008) continues to research this.

Aim

The aim of the study is to explore how confidence and anxiety affect the ability to learn maths, perform drug calculations and to investigate if numeracy drop-in sessions support learning of maths and drug calculations. The objectives of the study are to :

- Identify if confidence and anxiety affect the ability to learn maths and drug calculations
- Evaluate the effectiveness of numeracy drop-in sessions in relation to maths confidence and skills
- Enhance maths teaching and learning with a nursing education programme.

Methodology

The study is a mixed method design, the pre and post intervention maths tests used quantitative data, the questionnaires used quantitative and qualitative data, whereas the interviews used qualitative data. This design was chosen as only undertaking the quantitative aspect of the study would provide data relating to the nurses' maths ability, this would leave the research question unanswered in the main, as the aspects relating to the drop-in sessions improving confidence would not be covered by the data collected. In order to protect the students who were to be investigated and to avoid coercion issues, a group within the school that had no involvement with me had to be chosen; therefore I had to change my sampling technique to convenience/purposive (Polit & Beck, 2010). After discussion with a colleague who leads a post-registration nurse prescribing course, she suggested that the students enrolled on the course would be appropriate participants, as the course contains numeracy and is assessed summatively by a numeracy exam, which students must pass at 100% (NMC 2006). Historically students on the course found the numerical element difficult and the pass rate for the examination was consistently poor, she felt the study to be mutually beneficial as the students would get extra help with numeracy via the drop-in sessions. Ethical approval was received and all participants were invited to join the study via an information sheet and consent form. Thirteen out of 39 nurses agreed to participate in the study and completed the pre and post intervention maths test, in order to provide richer data and to reduce bias 3 out of the 13 were interviewed, a 10% sample from questionnaires is considered an appropriate number (Olney and Barnes, 2006).

Pre and Post Intervention Maths Test

The tests were designed by the researcher, the tests were used to initially diagnose the maths ability of the participants, and the content of them were based on the numerical component and summative examintion of the course. As part of the study was to ascertain if maths ability had improved post-intervention, it was imperative that the pre and post intervention tests were identical, as to have different questions post-intervention could lead to the second test being easier or harder, leading to false results (Cohen et al. 2007). The maths tests comprised of a variety of maths questions from addition to long division, as the participants were qualified nurses it also contained drug calculations. It was designed to establish the maths ability of the participants before the numeracy drop-in sessions, the post-intervention maths test result was compared with the pre-test to ascertain if ability had improved following attendance at the drop-in sessions. Completion of both tests was undertaken in a class room in the HEI, without the use of calculators under exam conditions. The NMC, (2010) recommends that calculators should not be used to substitute arithmetical ability and skill. Mcmullan, (2010) states that by becoming reliant on calculators nurses are becoming deskilled in mental arithmetic and are unable to conceptualise the drug calculations as they give the user a false sense of security.

Questionnaire

The second aspect of data collection was completion of a questionnaire to ascertain data on maths experience, anxiety, ability, confidence and views on the numeracy drop-in sessions. The questionnaire was structured using a likert scale, using only four options from strongly agree to disagree, the removal of the fifth option which is a neutral choice was purposely removed as, Rugg and Petre, (2007) suggest that if a neutral option is available, respondents may choose it to ease decision making, rather than think about their opinion. In order to elicit more detail and so as to produce richer data some of the questions asked for written explanations, this is a common approach in mixed methods research (Andrew and Halcomb, 2009). The questionnaire consisted of fifteen statements, statements were structured in order relating initially to maths experience, anxiety and confidence, nursing and maths, use of calculators and experience of drop-in sessions. Question 14, asked about maths qualification obtained and 15 the respondents age, as all of the participants were female, a question relating to gender was not required. Due to the timescale of the study the questionnaires were completed at the end of the final drop-in session in a classroom in the HEI, this ensured that the participants were given time to complete them and that they would be finished. To avoid the respondents feeling pressured by the researchers presence, (Polit and Beck, 2010) the researcher waited outside the classroom, but was close enough should the respondents have needed clarification (Bailey, 1997).

Interviews

Semi-structured interviews enable the researcher to verbally question participants using pre-set questions from a schedule and to probe the answers where appropriate (Parahoo, 2006). The questions were devised prior to the interview by the researcher using an interview schedule, which is a broad set of questions, it allows the researcher to change the order and wording if the participant requires it and to ask additional questions if needed. Open ended questions were used throughout the interview, this allowed for unanticipated responses to emerge and for the participants to talk and elaborate on their experiences. The interviews took place in a private room within the HEI, as

the participants were already attending for other purposes, they felt this was preferable than going to their place of work, they were interviewed once for no longer than an hour by the researcher, the interviews were recorded.

Data Analysis

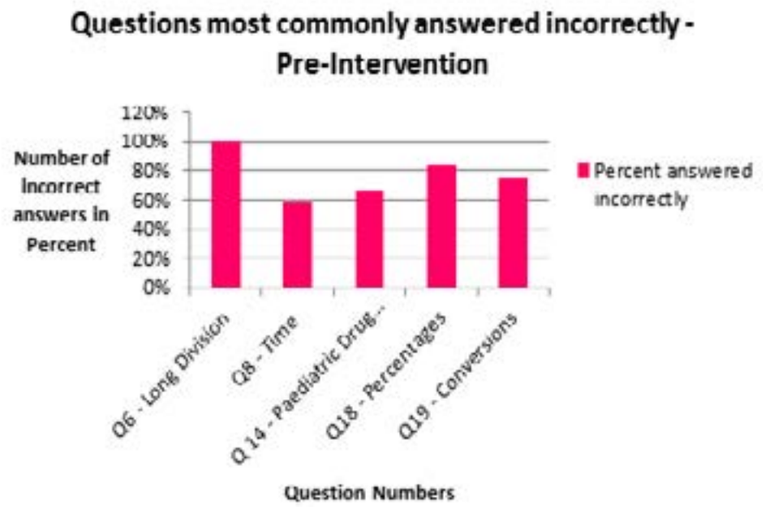
Pre and post intervention test scores and the questionnaires were analysed using descriptive statistics. Both test results were recorded on an excel spreadsheet and the mean score was analysed using SPSS version 19, using a Two-Sample Paired t-test to ascertain if ability had improved following the numeracy drop-in sessions. The questionnaire responses were collated and most frequent responses were recorded on table format and transferred into percentages, this is common in descriptive statistics. The interviews were transcribed by the researcher verbatim immediately following the interviews, the transcripts were sent to the interviewed participants to validate that they had been correctly transcribed. The transcripts were then coded using a line by line analysis, similar data was then grouped enabling three themes to be generated.

Results

Pre and Post Intervention Maths Test

The sample for the pre and post-intervention maths test consisted of 13 registered nurses on a nurse prescribing course, all participants were female. The completion rate of the pre-intervention maths test was 92% (n=12) and the post-intervention maths test 100% (n=13), as this involved comparitive analysis the post-intervention result of candidate number forty was disregarded. Out of the twenty questions participants had the greatest difficulty in long division, percentages, conversions, paediatric drug calculations and time (see figure 1).

Figure 1



The post intervention maths scores identified that the maths ability of the sample had improved following attendance at the drop-in sessions, in comparison to the pre-intervention scores, with scores ranging from 9.5 – 20, with a mean score of 16.5/20 (82.5%) see figure 2.

The SPSS, Version 19 was used to ascertain and compare the mean scores for the pre and post-intervention maths tests, the pre-intervention mean was 65% compared to 82.6% post-intervention, see figure 3.

Figure 2: Pre and Post-intervention Score Comparison

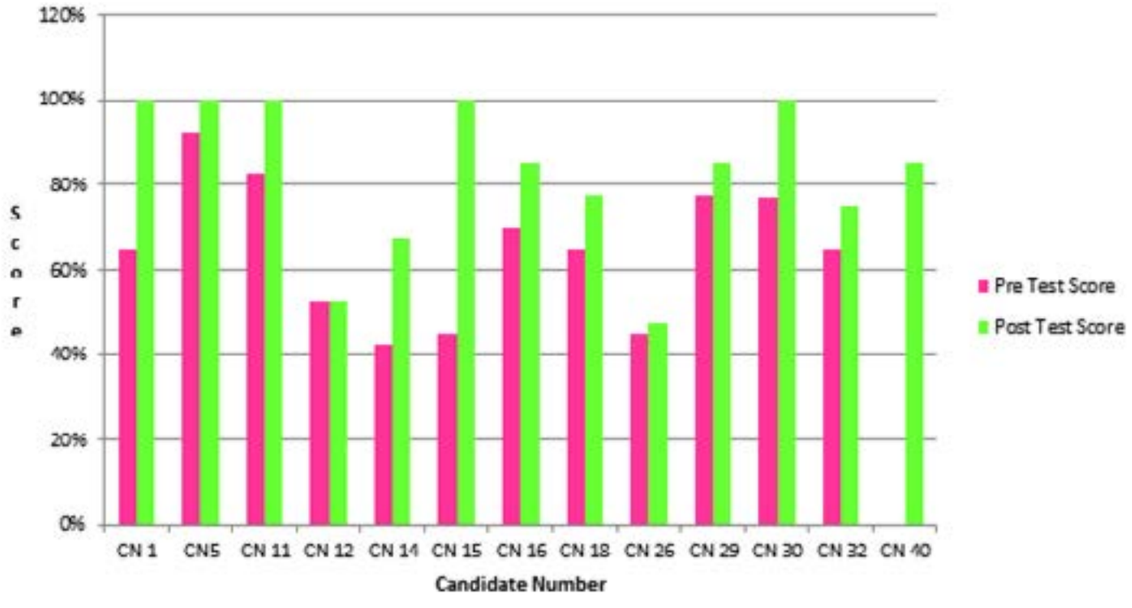


Figure 3: Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean
Pre Test Score	12	50.0	42.5	92.5	780.0	65.000
Post Test Score	13	52.5	47.5	100.0	1075.0	82.692
Valid N (list wise)	12					

Discussion

Theme 1 – Personal Maths Experience (Pre-intervention).

The participants were asked about their maths confidence in the questionnaires and interviews 60% (n=3) stated they had low confidence in maths. The pre-intervention maths score did not reflect this though, participants 1 and 29 stated they were not confident with maths but both achieved good scores 65% and 77.5%, this suggests they may have greater ability than they think. These findings are similar to a study by Wright (2008) where students who had low maths confidence did not do as bad as they thought. The test score for candidate 15 was 45% this low score reflects the impact of low confidence on her ability. Many research studies emulate this finding that low confidence can have a detrimental effect on ability (Ma, 1999; Andrew et al, 2009; Bull, 2009). Candidate 32 when asked about her personal maths confidence in the interviews echoed her response in the questionnaire:

"I am very confident with maths, and because I am confident, I enjoy doing it"

Whereas candidate 30 stated in the questionnaire she was confident but when discussed in the interview it became apparent that she was not as confident as candidate 32:

"On a basic level on a relaxed day, I feel ok with it"

This reveals that maths confidence can mean different things to different people, confidence can be in the complete subject of maths, or it can be the basic maths that participants are familiar with that makes them confident, but they deem themselves under confident when taken our of their comfort zone. Andrew et al (2009) support this as they found that students are more confident with basic maths formulas than in calculations that require multiple steps.

When exploring maths anxiety, questions were asked in relation to being scared of maths. Participants responded positively in the main to the statement 'maths does not scare me' (60%, n=3), although 40%, n=2, did not. It is unfortunate that these two candidates declined to be interviewed, as the extent of their maths anxiety is unclear. A blank mind relating to maths can be a symptom of maths anxiety (Ma, 1999), it is interesting to note that all of the participants in the questionnaire agreed that 'their minds went blank and they cannot think clearly when doing maths". This could be interpreted that all of the participants experienced maths anxiety; conversely the interview responses were different in that two of the candidates displayed no anxiety towards maths:

"It just doesn't scare me as such"
"Maths doesn't frighten me at all"

Candidate thirty expressed that she was confident with maths, but in the interview she described feelings of maths anxiety:

"That first day when you gave us the exam, I thought 'oh my god' and I got really clammy and sweating thinking 'oh I can't do it"

It is unclear from the questionnaire and interview responses whether the participants truly understood what maths anxiety meant and whether this 'blank mind' related to test anxiety as opposed to maths anxiety. It would appear from candidate twenty-nine's interview that what she experienced was test anxiety as the fear was experienced immediately before the test (Zeidner, 1998) and when asked about maths confidence she stated she was "ok", and her pre-intervention test score of 77.5% does not compare to the popular belief that maths anxiety leads to poor maths ability (Bull, 2009; McMullan et al, 2012). In the questionnaire participants were asked to respond to the statement, 'maths tests scare me', However 80% (n=4) of the candidates agreed with the statement, from the questionnaire alone it is impossible to ascertain if it was the subject maths or the test which was scary, therefore this was explored further in the interviews. All of the candidates interviewed stated that it was the word test they found scary not maths:

"Test is scarier, it's the test that throws

Figure 4

t-Test: Paired Two Sample for Means	Post Test	Pre Test
	Variable 1	*Variable 2*
Mean	82.5	65
Variance	361.3636364	260.2272727
Observations	12	12
Pearson Correlation	0.626261052	
Hypothesized Mean Difference	0	
df	11	
t Stat	3.933660409	
P(T<=t) one-tail	0.001168667	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	0.002337334	
t Critical two-tail	2.20098516	

people's confidence and panics them"

Therefore the researcher would suggest that 80% (n=4) suffered with test anxiety, findings concurrent with a study by Walsh, (2008), whereas it would appear that candidate fifteen has maths anxiety, as in the questionnaire she stated "I just panic where math is concerned", this is typical of maths anxiety (Ma, 1999).

Personal Maths Ability

The pre-intervention scores identified that the maths ability of the sample were relatively poor with scores ranging from 8.5 – 18.5 out of 20, with a mean score of 13 (65%). These findings are not unique as many of the studies in the literature review presented similar results (Hutton, 1998; Grandell-Niemi et al, 2001; Polifroni et al, 2003; McMullan, 2010). These scores do not reflect the views of the participants as 60% (n=3) believed that they were good at maths. The main areas of difficulty encountered by the participants in the pre-intervention test were long division (100% error rate), percentages (83% error rate), conversions (75% error rate), paediatrics (67% error rate) and time (58% error rate). The first four are regarded by Hutton, (1998); Brown, (2006) and Sherriff et al, (2011) to be the calculation skills required for medicines, however they are frequently the areas nurses' struggle with. The fifth, time is not generally an issue for nurses' and it is perceived that the construction of the question may have led to some confusion. These results indicate that basic mathematical principles are the basis of nurses' difficulties.

The participants in the main (60%, n=3), believed they had good maths ability, but test scores varied with the lowest being 45% for candidate fifteen, who deemed she had low ability, to 65% and 77.5% for the remaining participants. The responses in the interviews of candidates twenty-nine and thirty-two corroborated with these results:

"Average, I am not high flying"
"I have good abilities"

Except candidate thirty deemed she was good at maths in the questionnaire but in the interview:

"Always used to be my lowest mark, I struggled with maths and got through"

In further exploration of this anomaly she discussed her experience of maths during her secondary education:

"Part of it was to do with my teacher…., I was forever helping him out"

Eastwood et al, (2011) and McMullan et al, (2012) advocate that school experiences are a major contributor affecting participants confidence and ability of maths, however her pre-intervention score was 77.5% suggesting good ability.

Theme 2 – Effect and Experience of Drop-in Sessions

All of the participants felt it was important to take advantage of this opportunity; this is supported by Maag, (2004) who found in her study that a one off hour-long session was insufficient to correct the math problems of the sample. When asked why they had chosen to attend them, the responses were similar:

"To improve result from initial test"
"Refresh and practise"
"Build my confidence up"
"Help prepare for the exam at the end"

The importance of revising and practising skills for registered nurses is stressed by McMullan, (2010) because limited use of certain numerical skills on a daily basis leads to them becoming rusty and loss of expertise. Hutton, (1998) suggests that revision is most helpful to nurses'; this was reiterated by candidate thirty as the main reason for attending:

"I needed the practise so I came to do what I needed; to be sure I was as good as I can".

In the questionnaire responses 80% (n=4) agreed that their confidence had improved as a result of the numeracy drop-in sessions, this was echoed in the interviews:

"My confidence has improved"
"Yes my confidence has improved, that's why I kept coming back, once you become familiar your confidence grows and anxiety level drops"
"Definitely my confidence has improved"

McMullan et al, (2012) claims that there are pedagogical remedies to improve maths confidence, e.g., providing positive encouragement and constructive feedback in a safe environment. As a sufferer of low maths confidence, I wanted to create a supportive learning environment that allowed errors to be made without fear of humiliation; this is considered a must in increasing low maths confidence (Bull, 2009).

In the paired two-sample t-Test the t-stat was 3.933, as this is greater than the critical t-value 1.795, from the one-tailed test, maths ability of the participants had improved. However Harmon, (2010) postulates that the two-tailed test is more stringent, and therefore more accurate. The critical t-value in the two-tailed test was 2.200 which is lower than 3.933, indicating with 95% certainty that the numeracy drop-in sessions had improved mathematical ability. In comparison of the pre and post-intervention scores 92% (n=11) had improved their pre-intervention result, 8% (n=1) had achieved the same score. The mean increase in scores from pre to post-intervention was 3.5 marks, the biggest improvement was from 9/20 (45%) pre, to 20/20 (100%) post. These findings are very similar to studies by Wright, (2006) and McMullan et al, (2010). However it could be argued that these results are not a reflection of the drop-in sessions but due to the participants knowing they would be tested and preparing for the end of course exam, meaning they had spent more time revising (Wright, 2008).

Therefore the participants were asked if they thought their maths ability had improved, 80% (n=4) agreed that it had, the responses in the interviews mirrored the questionnaires:

"The exam results help verify that my ability has improved"
"It's improved"
"My ability has definitely improved"

The reasons for them improving, increased practise, revision of skills, working together, was common in other studies (Hutton, 1998; Wright, 2005; Sherriff et al, 2011). The greatest improvement was where students had achieved 100% post-intervention; this would deem them competent (Brown, 2006; Jukes & Gilchrist, 2006). However only 42% (n=5) achieved this post-intervention which is concerning when the NMC (2006) stipulate nurse prescribers should pass the numeracy component of the course at 100%, indicating further research is necessary.

Summary

From the findings it is clear that the numeracy drop-in sessions did increase nurse's maths confidence and ability. From the themes it is apparent that the numeracy drop-in sessions are an effective teaching strategy, but levels of maths anxiety need to be taken into account, as do the type of formulas to be included in the sessions. In my opinion the numeracy drop-in sessions will continue but changes will be made in light of this study.

Limitations

Limitations to the study are the small sample size, undertaken in a single HEI in the UK, all of the participants were female and the age range was limited, these limitations may prevent the findings being generalised, but the teaching strategy could be adopted by other HEI's.

Conclusion

It was interesting to note that the participants had varying degrees of maths ability depending on their schooling and life experience; however none of the participants pre-intervention and only five post-intervention achieved the 100% pass mark required by the NMC (2006). As discussed, without a standardised assessment tool and pass grade in numerical competence of nurses' it is difficult to ascertain if the participants are competent with maths. These findings are similar to other studies that have researched maths ability (Lerwill, 1999; Grandell-Niemi, et al, 2001; Eastwood et al, 2011). The maths anxiety of the participants was difficult to ascertain, this could be down to my data collection tool, or the lack of understanding of maths anxiety on the participants part. Self-confidence amongst the sample varied, and low self-confidence did not always affect ability, results that are congruent with a study by Wright, (2008).

It is pleasing to note that all of the participants found the drop-in sessions beneficial in both improving maths confidence and ability and that 92% improved their post-intervention test score. Although not all of the students on the nurse prescriber's module passed the exam at 100% on first attempt, it would appear that the number of students passing at first attempt has increased following the numeracy sessions. In light of this, the sessions have now become a regular feature within the nurse prescribing module and have even be reported as best practice in the North West Nurse Prescribers Network. However as a result of undertaking the study there are some recommendations for change to make regarding numeracy drop-in sessions.

The study sampled thirteen registered nurses on a course in the School of Health; however the number of pre and post-registration students within the school is 5761, with 1830 being pre-registration student nurses'. All of these students will undertake medicine calculations within their role and in light of studies relating to nurses' maths ability (Grandell-Niemil, et al, 2001; McMullan, 2010) it seems implausible that they would not experience similar difficulties. The findings from the pilot study retrieved similar results, it seems logical then to perform a larger researcher study with a greater sample size and a mixture of pre and post-registration student nurses'. This would lead to a more varied age range and would add the male perspective to the research.

Researching the numeracy drop-in sessions after adding context to the sessions, by use of drug charts and equipment, would allow comparison of the findings from this study with the findings of the new format to ascertain if the ability of the students and those achieving 100% had increased, and if the new format enabled the students to recognise the unrealistic errors made. It would also be interesting to look at the exam scores of the prescribers after they had attended the sessions to see if the pass rate had improved. The maths anxiety was difficult to assess in this study, which was due to the data collection tools, it would be useful to use a recognised maths anxiety scale, like the maths attitude scale or the maths anxiety rating scale as this would help me to assess the gravity of the issue within my sample.

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