

## RESEARCH ARTICLE

# Conquering the ‘Fear Fortress’ – Returning to a mathematics exam as a Community Practitioner Nurse Prescriber

Davide Penazzi, School of Natural Sciences, University of Central Lancashire, Preston, UK. Email: dpenazzi@uclan.ac.uk

Charlotte Smith, School of Community Health and Midwifery, University of Central Lancashire, Preston, UK. Email: csmith33@uclan.ac.uk

## Abstract

Building confidence is essential for qualified nurses undertaking numeracy assessments. This qualitative research study explores self-reported levels of confidence in nurses at various stages of the life-course, including when undertaking a numeracy test as part of the Community Practitioner Nurse Prescribing (CPNP) qualification. An hour-long, semi-structured focus group was conducted by the authors, and the resulting data was thematically analysed. The authors explored the experience of CPNP students returning to a learning and exam environment, and how this experience impacted on their confidence. Overall, a high level of confidence in the use of numeracy in clinical practice, but strong test anxiety, was identified in all participants. Participants reported an increase in confidence levels following the successful achievement of the numeracy test, with some going on to display advanced numeracy skills in clinical practice. Teaching staff have a responsibility to support returning learners to build confidence throughout this process and the authors conclude with some suggestions of how to support teaching and learning in this setting.

**Keywords:** Non-Medical Prescribing, Mathematics Anxiety, Test Anxiety, Confidence, Community Nurses.

## 1. Introduction

Community Practitioner Nurse Prescribing (CPNP) is a qualification undertaken by qualified nurses working in community settings. Successful completion of the course allows the qualification holder to prescribe items from a limited formulary for patients in the community (Nursing and Midwifery Council, 2018). Prescribing practice for non-medical health professionals has been proven to be safe, efficient and cost-effective, relieving pressure from GP services and providing specialist knowledge to patient consultations (i5Health, 2015). Assessment of the necessary competencies for successful award of the CPNP qualification is robust and is governed by the professional body, the Nursing and Midwifery Council (NMC). Safe prescribing relies on effective drug calculations as well as skills such as converting units, measurement, and dose, age and weight calculations. Where the NMC allows autonomy in some areas of assessment, it is understandably steadfast in its insistence that all students undertaking the qualification pass a numeracy assessment with 100% (Nursing and Midwifery Council, 2018).

The numeracy assessment at the authors’ Higher Education Institution (HEI) consists of five questions. This perhaps does not sound challenging, and indeed students embarking on the course have significant experience of using numeracy in their workplaces. However, previous studies by the authors have identified high levels of anxiety surrounding the CPNP numeracy test (Smith and Penazzi, 2020). Further exploration suggests that this anxiety relates to the test itself, rather than the numeracy content.

CPNP students are familiar with the numeracy needed in the exam, and, depending on their profession they might be actively using numeracy every day. However, many CPNP students have experienced mathematical anxiety in the past. Thus, the authors want to explore whether the 100% pass rate test for the CPNP exam could induce mathematics anxiety in practitioners who had already been able to overcome past negative mathematics experiences and functionally complete numerical tasks in their job. The literature suggests that calculation errors are not a major cause of prescribing errors (Wright, 2010), which tend to be caused by distraction (e.g. inappropriate use of decimal points), communication issues (e.g. illegible drugs names) and pharmacological knowledge (e.g. the nurse dispense a similar-sounding drug to the prescribed one) (Williams, 2007). Nonetheless these errors occur in the decision-making process, and there is a proven link between mathematical anxiety and reduced ability to make advantageous choices and good decisions (Morsanyi, Busdraghi and Primi, 2014). Renewed maths anxiety in CPNP students thus has the potential to increase medication errors. We thus investigate the following research questions:

- Q1) Why is test anxiety rather than maths anxiety prominent for this demographic?
- Q2) Does successfully passing the test with 100% rate increase or decrease mathematics anxiety when performing drug calculations in the workplace?

The exploration and conclusion of these two questions led to further consideration:

How do we take into account students' clinical experience when preparing students for the CPNP exam?

## 2. Methodology

Ethical approval was obtained from the HEI. Students from two CPNP cohorts were invited to participate in a focus group. A single focus group of five participants lasting one hour was conducted, facilitated by the authors. In order to maintain integrity of academic standards, the focus group was conducted after the CPNP course had been completed and participants had received their results.

Prior to the focus group, participants were provided with a task to complete. They were asked to complete a graph to represent their confidence levels across the lifespan. Key events in the students' lives were highlighted on the graph: Primary school, High school, adulthood and the CPNP course. This would form the basis to start the focus group discussion and approach the questions.

To explore participants' responses in more detail, the authors asked questions from an ethically approved selection of semi-structured questions and prompts:

- Would you like to say anything about your timeline? (possible prompts: Why is there a peak/trough at this point in the timeline?)
- Where would you place yourself on the timeline in terms of your confidence in numeracy now?
- How did you feel when you learned the exam had a 100% pass rate?
- How did you feel as you entered the exam?
- How do you feel now you have done the exam?
- How do you think you will use numeracy in practice?

The focus group was conducted in a semi-structured way, and space was allowed for the participants to discuss their experiences outside of the remit of the above questions. The first 30 minutes of the focus group was dedicated to discussion around participants' wider lifespan experience of numeracy. The remaining 30 minutes focussed on participants' experiences as CPNP students and the present time.

The focus group was recorded, transcribed and thematically analysed by each researcher individually using Auerbach and Silversteins' (2003) coding model. This model was selected due to its clear, stepped model and its emphasis on data-checking and triangulation – with two researchers coding the data, this model supported discussion of emergent themes and allowed for new data to be introduced at each stage. The authors then reconvened and compared the coding obtained and identified common themes.

### 3. Q1. Why is test anxiety more prominent than maths anxiety for this demographic?

There is evidence to suggest that maths anxiety is more prominent in the demographic who participated in our research (Tariq, Qualter, Roberts, Appleby and Barnes, 2012; McMullan, Jones and Lea, 2012; Chen, Wang, Kirk, Pethel and Kiefner, 2014). CPNP students tend to be female and aged between 25-55, and this was represented in our focus group. The authors' assumptions in previous research have therefore been that maths anxiety is likely to feature in this demographic. This assumption was supported to an extent by the participants in the focus group.

*"It was horrid. It was a horrible, horrible time and I wish that things would have been different because then I could have done my training earlier..."* (Participant D)

*"...as soon as they mention maths, I could have cried and I could have left right then because it was my worst nightmare"*

However, throughout their timelines and in the data gathered from the focus groups participants tended to express high levels of confidence in their numeracy ability. This was particularly true when discussed in the context of clinical practice, where participants felt confident and competent in undertaking the necessary calculations and computations to do their jobs effectively.

*"I've always had maths skills... I like to do maths when I'm stressed out. I find it relaxing"* (Participant B)

*"I've never been confident with maths... but on the drug calculations, I'm fine!"* (Participant E)

Furthermore, one participant expressed a level of expertise in their clinical numeracy practice.

*"...all my colleagues used to ring me for all the drip rates and setting up IVs [Intra-Venous drips]"* (Participant A)

The concept of 'nursing maths' was mentioned by several participants during the focus group – the idea that there is a specific 'type' of maths that nurses use, which is different to 'regular' maths. Participants expressed confidence in their ability to use 'nursing maths'.

*"...they have that little formula I can follow. I think that takes me back to primary school... I had that little formula [then]"*. (Participant E)

*"I didn't actually make the link between nursing and maths"* (Participant B)

Numeracy exams and tests were not directly referred to in the timeline exercise, or in the focus group questions, yet as participants described their histories, each of them referred to tests or exams across their learning life course. In each case, it seems that the test rather than the numeracy content was the source of anxiety. A question asking what caused confidence in maths to drop or grow elicited the following responses:

*“...the sort of exams as well affects your confidence. The stress of having an exam and wondering how you are going to do when you thought you were OK at (maths)”.* (Participant A)

*“I’ve always enjoyed maths... I didn’t pass my GCSE”* (Participant B)

*“We had to do the test to get onto the course. It was ‘Oh my God, really? And you gotta get a certain percentage right’. That was horrendous. The length of time I had it open on the screen [where the online exam was displayed] before I clicked ‘go’, it took a good half hour to build up the courage to click ‘go’. It was not good”* (Participant D)

What appeared to emerge from the focus group discussion was that the CPNP numeracy test was the focus of anxiety. Even when participants felt confident with their responses in the CPNP numeracy test, the exam format caused them to question themselves:

*“I actually had to check the answers of the maths questions just to make sure I got them right”* (Participant E)

*“I think I felt a bit nervous... I kept going over and over [the answers] and thinking, ‘they’re definitely right’, and I knew they were right as soon as I had done them. But then I was thinking, ‘What if they’re not?’”* (Participant B)

The 100% pass requirement was also mentioned as a barrier to confidence when enrolling in the course.

*“I think it’s hard work when you’ve got to get 100%. I think the stress of an exam and having to get 100%... I’d rather do 100 questions and get 95% than do 5 and get 100%. This is just the anxiety of the exam. It’s so easy to make mistakes”.* (Participant A)

The 100% pass mark is indeed questionable in terms of appropriate assessment. Race (2014) Coben, Hodgen, Hutton and Ogston-Tucks (2008) refer to such practice as ‘high-stakes testing’. However, the need for clinical precision in CPNP practice demands exact results – patient safety is the focus of this qualification, and this overrides student comfort.

Many students undertaking this qualification have extensive experience of using numeracy within their roles. However, the participants’ responses suggest that for them, formal testing in these skills is a distant, and sometimes upsetting, memory which is difficult to reconcile with their practice experience.

#### **4. Q2. Does successfully passing the test with 100% rate increase or decrease mathematics anxiety when performing drug calculations in the workplace?**

Participants expressed both increased confidence and relief after passing the exam.

*“So elated it was unreal, ‘cause I don’t normally get 100% on anything. So, the fact that I’ve passed them without having to put myself through it again the second time, well, you saw the reaction when you told us that we’d passed. It was... it was a good day.”* (Participant D)

*“I felt relieved and confident in my skills”.* (Participant B)

Participants expressed confidence in their numeracy abilities after the test. Themes which emerged were increased confidence in calculations skills and in their ability to apply these skills to learning new procedures.

*“Before I used to work... work it out and then I second guessed myself for the rest of the day. Maybe going ‘round and ‘round in the head, saying, “well yeah, I have. I’ve worked it out right on it. That’s right”, but you still end up second guessing yourself. Well, now I don’t really do that.”* (Participant D)

*“I’m my own worst enemy as well. So, I always second guess myself and think ‘no, you’ve not done it right’, but now I’ve proved myself by completing that exam and get them all right, ‘no, actually, I can!”* (Participant E)

*“I’ve recently done a ‘syringe driver’. We were mixing drugs together and one was a little bit more of a complex calculation. I thought ‘no I can do this, I’m not going to get stressed’ and it gave me the courage”.* (Participant E)

Here participants show the ability to manage or stop the onset of anxiety, and to make effective decisions. The positive effect of the success at the test also seems to have raised participant self-esteem and self-care.

*“[I have] start[ed] to talk to myself a little bit better. I would never say some of the things I said to myself to a friend. But now I started talking to myself as if I’m a friend”* (Participant E)

*“it is helpful to think, “Oh yeah, this is good. I know this that I can do that” and not just look back. [...] I’ve had this rough start and then I feel like I’ve shut it up now and I’m proud of myself and I want to kind of help others.”* (Participant C)

Perhaps most importantly in terms of numeracy confidence, positivity was expressed in relation to numeracy learning in colleagues and mentees.

*“I’ve got an associate nurse [and] I’m her mentor for the rest of her training, [...] she told me she was worried about maths and I said ‘well, that makes two of us’. So [I printed the tutorial questions given in class and told her] that we will go through them and I will show it out how she can achieve the right answers, now. Before I couldn’t have done that, [...] I would have said: ‘go find out yourself”* (Participant D)

*“[With colleagues] I’d share my experiences. [...] I think sharing those stories of how difficult things are and how you come out the other side is really important. And I’d probably notice if somebody was trying to avoid it, ‘cause I know what the avoidance skills are”* (Participant C)

Participants were united in reporting that successfully passing the numeracy test was effective in managing or overcoming their maths anxiety.

## 5. Discussion

The exploration and conclusion of these two questions encourages consideration of the following enquiry: how do we take into account students’ clinical experience when preparing students for the CPNP exam?

The authors’ teaching focussed on using the students’ experience in practice as a base to acknowledge their existing abilities and build on their numeracy confidence. Classroom discussions brought up stories of practitioners having to solve similar problems in real life, making evident the link between being a CPNP and answering a mathematical question. The less-familiar exam setting



which involved interpreting a written question unrelated to a specific patient prompted discussions on how to read mathematical questions, methods to ensure a correct answer was obtained and strategies to overcome anxiety. In the classroom students were encouraged to present to their peers how they reached their answer, in order to reinforce that there are multiple ways of obtaining a solution. Students reported that this was reassuring, and exposure to other methods gave them a way of checking solutions. Most students were comfortable with the mathematical content (percentages, conversions, calculations etc); these were discussed in detail only if students needed some clarification. Workshops structured in this way are also more similar to the learning methods adopted in clinical practice, where learning through peer observation, demonstration and discussion is commonplace.

The study alerted the authors to the tension between the anxiety participants experienced prior to undertaking the test, and the increase in numeracy confidence they expressed on successful achievement. On considering classroom interventions to help students resolve this tension, the authors caution against setting a “practice” numeracy test as a stand-alone intervention, to artificially make students overcome mathematical anxiety. Students know that they can “*wing it and get it through*”, as (Participant C) describes, not gaining the needed confidence for entering the nurse degree despite having obtained the needed GCSE C in Maths entry grade “*But still would say my skills are pretty pants, like, even though I resat my GCSE and got a C, I don't think that shows my knowledge.*” Any “practice” test or other formative activity needs to be embedded into a more holistic program which bridges the gap between clinical practice and assessment, in order that the latter can be seen by the students as a powerful addition to their “professional toolkit” that can be used to more confidently perform their duties and when mentoring junior colleagues.

## 6. Conclusion

Confidence levels in numeracy appear to be directly impacted on by test situations, throughout the learning lifespan. Even where participants express confidence and competence in their numeracy ability, test situations appear to create an obstacle which – albeit temporarily – quashes this confidence. However, on conquering the obstacle and passing the test, anxiety vanishes, and confidence is restored, and even increased. We thus conclude by comparing the experience of CPNP students in the numeracy test to the analogy of ‘Fear Fortress’:

*“A hypothetical castle in a forest near Saragossa, Fear Fortress represents that terrible obstacle which fear conjures up, but which vanishes into thin air as it is approached by a stout heart and clear conscience”.* (Room and Brewer, 2002)

The authors realised that teaching and learning strategies which focused more on the development of confidence and strategies to overcome the “fear fortress” were more effective to our participants than strategies which focus entirely on explanation of mathematical concepts.

Ultimately, the following suggestions were identified for teaching and learning practice:

- Adopting a “clinical focus” to examples used in the classroom;
- Acknowledging students’ existing knowledge and skills as the basis for building confidence;
- Keeping in mind a “growth mindset” ethos – that is to say, looking beyond the passing of the exam and recognising that some students have the capacity to develop advanced numeracy skills;

In practice, CPNPs use numerical skills in a wide range of situations, many of which are not reflected in the assessment – for example, wound measurement, IV calculations, syringe driver calculations. Supporting CPNP students to build their confidence in numeracy is essential for patient safety,

empowers practitioners to apply their skills to new learning experiences, and encourages networks of practitioner-led learning in clinical practice.

## 7. References

Auerbach, C. and Silverstein, L.B., 2003. *Qualitative data: An introduction to coding and analysis*, Vol. 21. NYU press.

Chen, Y., Wang, J., Kirk, R., Pethtel, O. and Kiefner, A., 2014. Age Differences in Adaptive Decision Making: The Role of Numeracy. *Educational Gerontology*, 40(11); pp.825-833. <https://doi.org/10.1080/03601277.2014.900263>

Coben, D., Hodgen, J., Hutton, M. and Ogston-Tuck, S., 2008. High stakes: Assessing numeracy for nursing. *Adult Learning*, 19(3-4), pp.38-41. <https://doi.org/10.1177/104515950801900308>

i5 Health, 2015. Non-medical prescribing - an economic evaluation. *Health Education North West*. <http://www.i5health.com/NMP/NMPEconomicEvaluation.pdf> [Accessed October 2020]

McMullan, M., Jones, R. and Lea, S., 2012. Math anxiety, self-efficacy, and ability in British undergraduate nursing students. *Research in nursing & health*, 35(2), pp.178-186 <https://doi.org/10.1002/nur.21460>

Morsanyi, K., Busdraghi, C. and Primi, C., 2014. Mathematical anxiety is linked to reduced cognitive reflection: a potential road from discomfort in the mathematics classroom to susceptibility to biases. *Behavioral and Brain Functions*, 10(1), pp.1-13 <https://doi.org/10.1186/1744-9081-10-31>

Nursing and Midwifery Council, 2018. *Standards for Prescribing Programmes*. London, Nursing and Midwifery Council, Available at: <https://www.nmc.org.uk/globalassets/sitedocuments/education-standards/programme-standards-prescribing.pdf> [Accessed September 2020]

Race, P., 2014. *Making learning happen: A guide for post-compulsory education*. Sage.

Room, A. and Brewer, E.C., 2002. *Brewer's dictionary of modern phrase & fable*. Sterling Publishing Company, Inc..

Smith, C. and Penazzi, D., 2020. Triggering language and maths anxiety in non-medical prescribing students. *Journal of Prescribing Practice*, 2(5), pp.226-232 <https://doi.org/10.12968/jprp.2020.2.5.226>

Tariq, V., Qualter, P., Roberts, S., Appleby, Y., and Barnes, L., 2012. Mathematical literacy in undergraduates: role of gender, emotional intelligence and emotional self-efficacy. *International Journal of Mathematical Education in Science and Technology* 44(8), pp.1143-1159 <https://doi.org/10.1080/0020739X.2013.770087>

Williams, D.J.P., 2007. Medication errors. *Journal-Royal College of Physicians of Edinburgh*, 37(4), p.343.

Wright, K., 2010. Do calculation errors by nurses cause medication errors in clinical practice? A literature review. *Nurse education today*, 30(1), pp.85-97 <https://doi.org/10.1016/j.nedt.2009.06.009>