

# Development and Psychometric Properties of the Measure of Anxiety in Practical Examinations

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## ABSTRACT

**Introduction:** High levels of exam anxiety are evident in healthcare students. Practical exams are an integral part of healthcare profession programs. However, no standardised reliable and valid instrument exists to measure practical exam anxiety in healthcare students.

**Objective:** This study aimed to modify a valid and reliable measure used to examine anxiety in job interviews, for use in practical examinations. We then aimed to examine the psychometric properties of the new modified instrument, now characterized as the Measure of Anxiety in Practical Examinations (MAPE) and determine if any differences in gender, personal history of Generalised Anxiety Disorder (GAD) or family history of GAD impacted MAPE scores.

**Methods:** Exploratory factor analysis using principal component analysis was conducted and Cronbach's alpha examined internal consistency of the instrument.

**Results:** Most A five factor structure was supported (Performance, Appearance, Behaviour, Communication, and Preparedness) which accounted for 60.6 % of the variance in responses. The 25 item modified instrument demonstrated sufficient internal consistency (Cronbach's alpha = 0.93). Females (p = 0.01) and those with a personal history of GAD (0.002) presented with higher MAPE scores.

**Conclusion:** This The MAPE is an acceptable measure of identifying students who present with practical exam anxiety and can help support healthcare profession students to alleviate practical exam anxiety and ensure students' grades more accurately reflect their skill acquisition. Gender and personal history of GAD can also impact practical exam anxiety and should be considered when addressing practical exam anxiety in healthcare profession students.

**Keywords:** Assessment, Examination anxiety, Healthcare Profession Programme, Practical examination anxiety, Practical exam anxiety, Test anxiety.

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## INTRODUCTION

Anxiety is regarded as the most common mental disorder in adults, with 33.7 % of the world's population expected to suffer from anxiety during their lifetime (Bandelow and Michaelis., 2015). Anxiety prevalence is increasing (Calling et al., 2017; Goodwin et al., 2020), and individuals aged 18-25 are most affected (Goodwin et al., 2020). Students enrolled in healthcare profession programs have been found to demonstrate some of the highest prevalence and levels of anxiety in education (Dyrbye et al., 2006; Elias et al., 2011; Hoying et al., 2020). Thus, exam anxiety is an issue of concern in healthcare profession programs. Many factors can impact exam anxiety in healthcare profession programs, including large course loads (Hashmat et al., 2008), perceived preparation (Vaz et al., 2018), gender (females present with a higher prevalence) (Cipra and Müller-Hilke., 2019), self-esteem (Von der Embse et al., 2018) perceived consequences (Von der Embse et al. 2018), lifestyle factors (poor sleep, lack of exercise, poor nutrition and time management) (Hashmat et al., 2008; Vaz et al., 2018), and examination factors (exam format, time limit, testing techniques, environment and clarity of instructions) (Hashmat et al., 2008; Shi., 2012). In addition, a personal or family history of generalized anxiety disorder may also enhance the risk of experiencing exam anxiety (Macauley et

al., 2018; Sridevi., 2013).

While written exam anxiety has been the focus of previous research, 88 % of healthcare students say practical exams cause the most anxiety (Labaf et al., 2014). Exam anxiety can negatively affect student health and exam performance (Lyndon et al., 2014). During evaluative situations, like practical exams, a multifactorial consideration of anxiety is appropriate (McCarthy and Goffin., 2004). Practical exams in healthcare profession programs can include simulated, real-time or standardized patients (Walker et al., 2008) in many different scenarios. The Yerkes-Dodson Law suggests an ideal level of anxiety most likely exists for optimum performance, with too low or too high levels of anxiety having negative effects on performance (Teigen, 1994). Prior research shows a 3-7 % decrease in exam performance in highly anxious students (Frierson and Hoban., 1992).

To the authors' knowledge, no standardised instrument exists to measure practical exam anxiety in healthcare profession students. The Measure of Anxiety in Selection Interviews (MASI) (McCarthy and Goffin., 2004) is a validated and reliable instrument developed to examine multifactorial dimensions of anxiety relating to a job interview (McCarthy and Goffin., 2004; Santos et al., 2021). The MASI includes five 6-item scales which examine anxiety with regard to communication, appearance, social, performance, and behaviour. This comprehensive assessment of the varying aspects of anxiety is useful, as it can facilitate a clearer insight into the anxiety experienced by the individual, which can consequentially inform potential supportive mechanisms to address the anxiety, unlike a unidimensional assessment of anxiety such as the Visual

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Analogue Scale of Anxiety (Hornblow and Kidson., 1976). As practical examinations are a similar evaluative situation to a job interview, modifying the MASI instrument (McCarthy and Goffin., 2004) to a practical examination context may be a worthwhile endeavour. However, the factor structure and internal consistency of the tool may differ if it is adapted to a different context.

Athletic training/therapy is a global healthcare profession and is well established in the USA, Canada and Ireland (Frank et al., 2019). Similar to many other healthcare profession programs, practical examinations are a central component to assessment. Thus, this study aimed to modify the MASI for use in practical examinations and examine the psychometric properties of the new modified instrument.

The newly modified instrument, now called the Measure of Anxiety in Practical Examinations (MAPE), was administered to students in a healthcare profession program, namely athletic training/therapy students. A secondary aim was to examine if differences between gender, personal or family history of generalised anxiety disorder (GAD) was observed.

## METHODS

A cross-sectional study design was implemented. Current adult athletic therapy or athletic training undergraduate or entry level graduate students in Ireland, Canada and the US who had completed at least one practical examination were eligible to complete the survey. An anonymous survey was utilized. The authors modified the Measure of Anxiety in Selection Interviews (MASI) (McCarthy and Goffin., 2004) by utilizing the terminology “practical examination” and “examiner”, instead of “job interview” and “interviewer”. The statements were adapted to be appropriate for a clinical practical examination. Four of the 30 statements were removed as they were considered not applicable to a practical examination scenario. These statements were from the appearance and social anxiety scales of MASI and included “I worry that my handshake will not be correct”, “before a job interview I am so nervous that I spend an excessive amount of time on my appearance”, “I become very uptight about having to socially interact with a job interviewer”, and “I worry about whether job interviewers will like me as a person”.

Furthermore, the categorisation of three appearance statements was changed after the statements were adapted to the practical examination scenario, as appearance was deemed to no longer classify them appropriately. “I worry the interviewer will focus on my least attractive features” was adapted to “I worry that the examiner will focus on what I do not know” and added in the performance scale. Similarly, “if I do not look my best I find it hard to be relaxed” became “if I make a mistake in a practical exam, I find it hard to be relaxed” and was moved to the performance scale. “I find it hard to relax if my hair is not perfect for a job interview” was adapted to “I find it hard to relax if I do not feel that I am prepared for the practical exam” and placed in the behavioural scale.

Twenty-six statements were included in the final version and are presented in Table 1.

**Table 1.** The modified instrument utilised in the survey

| <b>Communication Anxiety</b>  |
|---|
| I become so apprehensive in practical examinations that I am unable to express my thoughts clearly              |
| I get so anxious while taking practical examinations that I have trouble answering questions that I know        |
| During practical examinations, I often go blank   |
| I feel that my verbal communication skills are strong   |
| During practical examinations, I find it hard to understand what the examiner is asking me                      |
| I find it easy to communicate my clinical reasoning during a practical examination                              |
| <b>Appearance Anxiety</b>   |
| I often feel uncomfortable about my appearance when I am taking a practical examination                         |
| <b>Social Anxiety</b>   |
| While taking a practical examination, I become concerned that the examiner will perceive me as socially awkward |
| I get afraid about what kind of personal impression I am making during practical examinations                   |
| During a practical examination, I worry that my actions will not be considered clinically appropriate           |
| I worry about whether the patient thinks that I am unable to perform the clinical skills                        |
| <b>Performance Anxiety</b>  |
| In practical examinations, I get very nervous about whether my performance is good enough                       |
| I am overwhelmed by thoughts of doing poorly when I am in practical examination situations                      |
| I worry that my practical examinations performance will be lower than that of my peers                          |
| During practical examinations, I am so troubled by thoughts of failing that my performance is reduced           |
| During a practical examination, I worry about what will happen if I don't pass                                  |
| While taking a practical examination, I worry about whether I am a good clinician                               |
| If I make a mistake in a practical exam, I find it very hard to be relaxed                                      |
| In a practical exam, I worry that the examiner will focus on what I do not know                                 |
| <b>Behavioural Anxiety</b>  |
| During practical examinations, my hands shake   |
| My heartbeat is faster than usual during practical examinations   |
| It is hard for me to avoid fidgeting during a practical examination   |
| Practical examinations often make me perspire (e.g., sweaty palms and underarms)                                |
| My mouth gets very dry during practical examinations  |
| I often feel sick to my stomach before/during practical examinations  |
| I find it hard to relax if I do not feel that I am prepared for the practical exam                              |

Other relevant questions included in the survey were demographical information, including gender, age and country of institution. A definition of GAD from the Anxiety and Depression Association of America was provided and whether the participants currently have GAD or have a family history of GAD was queried.

Ethical approval was granted by the university's Research Ethics Committees. Students were required to read a plain language statement and provide informed consent prior to completing

the survey. The survey was piloted on 10 Irish athletic training/therapy students and suggestions for minor wording changes were incorporated. On average, the survey took  $7.0 \pm 2.8$  minutes to complete. The final survey was distributed via Google Forms and was open for 4 weeks from February-March 2020 and again for Irish students only for 2 weeks in February 2022. The survey was implemented on a further group of students in February 2022 to ensure sufficient subject-to-item ratio. However, due to the COVID 19 restrictions implemented by educational institutions in March 2020 that impacted how practical classes and practical examinations were conducted, this additional data collection did not occur until all additional COVID 19 practical classes and practical examination restrictions were not in place in a sample of students assessed for one complete semester.

Convenience sampling was utilized. A recruitment email was sent to academics in 34 athletic training/therapy accredited institutions (28 US out of 332, 3 Irish out of 3 and 3 Canadian out of 8 accredited athletic training/therapy institutions). The Canadian institutions required ethical approval in their individual institution. Only one received ethical approval in time for initial survey distribution. The survey was subsequently distributed to students in 32 institutions (28 US, 3 Irish and 1 Canadian). A reminder email was sent two weeks following initial distribution.

Data was analysed using Statistical Package for the Social Sciences (SPSS; Version 24.0). Descriptive statistics for MAPE were examined, including the mean, median, standard deviation, skewness and kurtosis. Factor structure of the MAPE was examined with an exploratory factor analysis (EFA) using principal components analyses. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were utilised to explore the factorability of the data. Items were considered appropriate for factor analysis with a significant Bartlett's test of sphericity ( $p \leq 0.05$ ) and  $KMO \geq 0.60$  (Tabachnick and Fidell., 2007). The current sample size ( $n = 271$ ) allowed for a subject-to-item ratio greater than 10:1, which is recommended for a strong factor analysis (Osborne and Costello., 2004). As an approximately normal distribution was observed, a maximum likelihood factoring method (Fabrigar et al., 1999) was used with oblique rotation (direct oblimin), which allows factors to correlate, as was expected in the current data set. The number of factors retained was determined via examination of the Eigen values and scree plot. Specifically, Eigen values greater than 1.0 and factors that occurred before the point of inflexion in the scree plot were retained in the factor model. Items with a primary factor loading  $> 0.4$  (Johnson and Morgan., 2016) and no or few cross-loadings (0.4 or higher) on two or more factors (Hooper., 2012) were included. Items not meeting these requirements were deleted. Reliability of the final MAPE and factors with  $\geq 10$  items were examined using Cronbach's alpha analyses for internal consistency, with the alpha value interpreted as excellent (0.90 and above), high (0.70 - 0.90), moderate (0.50 - 0.70) or low reliability (0.50 and below) (Hinton et al., 2014). For factors with  $< 10$  items, reliability was examined using mean inter-item correlations, with optimal mean inter-item correlation values ranging from 0.2 to 0.4 (Briggs and Cheek., 1986). Normality was examined and data was found to be normal. An independent

samples t-test was conducted to examine the effect of gender on total MAPE scores. Effect sizes were calculated using Cohen's d and determined according to Cohens' classification as small = 0.2, medium = 0.5 and large = 0.8 (Cohen., 1988). A two-way ANOVA was conducted to determine the effects of personal history of GAD and family history of GAD on total MAPE scores. Effect size of the ANOVA was determined using partial eta squared ( $\eta^2$ ) and interpreted as small = 0.01, moderate = 0.06, and large = 0.14 (Cohen., 1988). Significance for statistical tests was  $p < 0.05$ .

## RESULTS

### Descriptive statistics

The mean, median, standard deviation, skewness and kurtosis of the MAPE score from the sample are reported in Table 2. The median value across all 26 items of the measure ranges from 2 (disagree) to 4 (agree).

**Table 2.** Descriptive statistics of measure of anxiety in practical examinations (n=271)

| Item   | Median | M   | SD  | Skewness | Kurtosis |
|--|--------|-----|-----|----------|----------|
| 1 I become so apprehensive in practical examinations that I am unable to express my thoughts clearly               | 3      | 3.2 | 1.1 | -0.1     | -1.1     |
| 2 I get so anxious while taking practical examinations that I have trouble answering questions that I know         | 4      | 3.5 | 1.1 | -0.6     | -0.6     |
| 3 During practical examinations, I often go blank  | 4      | 3.5 | 1.1 | -0.4     | -0.7     |
| 4 I feel that my verbal communication skills are strong  | 2      | 2.4 | 0.9 | 0.3      | -0.5     |
| 5 During practical examinations, I find it hard to understand what the examiner is asking me                       | 2      | 2.5 | 1.0 | 0.7      | 0.0      |
| 6 I find it easy to communicate my clinical reasoning during a practical examination                               | 3      | 3.1 | 0.9 | -0.1     | -0.7     |
| 7 I often feel uncomfortable about my appearance when I am taking a practical examination                          | 2      | 2.5 | 1.2 | 0.5      | -0.9     |
| 8 In a practical exam, I worry that the examiner will focus on what I do not know                                  | 4      | 3.8 | 1.0 | -0.8     | 0.2      |
| 9 If I make a mistake in a practical exam, I find it very hard to be relaxed                                       | 4      | 4.0 | 1.0 | -0.8     | 0.0      |
| 10 I find it hard to relax if I do not feel that I am prepared for the practical exam                              | 4      | 4.3 | 0.8 | -1.5     | 2.7      |
| 11 While taking a practical examination, I become concerned that the examiner will perceive me as socially awkward | 2      | 2.6 | 1.3 | 0.5      | -0.9     |

|    |   |   |     |     |      |      |
|----|---|---|-----|-----|------|------|
| 12 | I get afraid about what kind of personal impression I am making during practical examinations         | 3 | 3.2 | 1.2 | -0.2 | -1.0 |
| 13 | During a practical examination, I worry that my actions will not be considered clinically appropriate | 3 | 2.8 | 1.1 | 0.1  | -0.9 |
| 14 | I worry about whether the patient thinks that I am unable to perform the clinical skills              | 4 | 3.3 | 1.1 | -0.4 | -0.7 |
| 15 | In practical examinations, I get very nervous about whether my performance is good enough             | 4 | 4.0 | 0.9 | -0.9 | 0.6  |
| 16 | I am overwhelmed by thoughts of doing poorly when I am in practical examination situations            | 4 | 3.5 | 1.2 | -0.3 | -1.0 |
| 17 | I worry that my practical examinations performance will be lower than that of my peers                | 4 | 3.7 | 1.1 | -0.6 | -0.6 |
| 18 | During practical examinations, I am so troubled by thoughts of failing that my performance is reduced | 3 | 3.1 | 1.2 | 0.1  | -0.9 |
| 19 | During a practical examination, I worry about what will happen if I don't pass                        | 4 | 3.4 | 1.2 | -0.4 | -0.9 |
| 20 | While taking a practical examination, I worry about whether I am a good clinician                     | 4 | 3.6 | 1.0 | -0.6 | -0.2 |
| 21 | During practical examinations, my hands shake   | 3 | 3.1 | 1.2 | -0.1 | -1.0 |
| 22 | My heartbeat is faster than usual during practical examinations                                       | 4 | 4.1 | 0.9 | -1.3 | 2.0  |
| 23 | It is hard for me to avoid fidgeting during a practical examination                                   | 3 | 3.3 | 1.2 | -0.2 | -1.0 |
| 24 | Practical examinations often make me perspire (e.g., sweaty palms and underarms)                      | 4 | 3.8 | 1.2 | -0.7 | -0.4 |
| 25 | My mouth gets very dry during practical examinations  | 3 | 3.0 | 1.2 | 0.1  | -1.1 |
| 26 | I often feel sick to my stomach before/ during practical examinations                                 | 3 | 3.2 | 1.3 | -0.1 | -1.1 |

M= mean; SD= standard deviation

**Factor model and structure**

Examination of the factorability of the MAPE identified a KMO value of 0.92 and a significant Bartlett's test of sphericity (Chi square = 3472.8, p < 0.001), which indicated the items were appropriate for factor analysis. The results from the EFA supported a five-factor solution, which accounted for 60.6 % of the variance. The five factors were composed of 25 of the original 26 items of the MAPE (Table 2). One item (item 8 - In a practical

exam, I worry that the examiner will focus on what I do not know) was excluded from the model due to low factor loading (< 0.4). Rotated factor structure and item loadings for the retained items are evident in Table 3. The first factor identified 10-items related to Performance (36.9 % of the variance, Eigen value = 9.6; Cronbach's alpha = 0.92). The second factor, Appearance, was identified with 5-items (7.4 % of the variance, Eigen value = 1.9; mean inter-item correlation = 0.42). Behavioural Anxiety emerged as the third factor, with 6-items (6.9 % of the variance, Eigen value = 1.8; mean inter-item correlation = 0.48). The fourth factor identified 3-items related to Communication Anxiety (5.5 % of the variance, Eigen value = 1.4; mean inter-item correlation= 0.24), while the final factor, Preparedness, identified a single-item factor (4.0 % of the variance, Eigen value = 1.0; reliability not applicable for single item factors). Internal consistency for the 25-item MAPE was demonstrated (Cronbach's alpha = 0.93).

**MAPE total score differences**

A statistically significant difference in total MAPE score was evident for gender p = 0.01, d = 0.33 with females (88.3 ± 17.5) scoring significantly higher than males (82.8 ± 17.5). No significant interaction effect between personal history of GAD and family history of GAD or main effect for family history of GAD was evident. However, those with a personal history of GAD demonstrated significantly higher MAPE scores (92.9 ± 16.1) than those without (84.5 ± 16.8, p = 0.002, ηp2 = 0.035).

**Table 3.** MAPE factors and rotated item loadings (n = 271)

| Item              | Performance   | Loading |
|-------------------|---|---------|
| 1                 | I become so apprehensive in practical examinations that I am unable to express my thoughts clearly              | 0.64    |
| 2                 | I get so anxious while taking practical examinations that I have trouble answering questions that I know        | 0.64    |
| 3                 | During practical examinations, I often go blank   | 0.53    |
| 9                 | If I make a mistake in a practical exam, I find it very hard to be relaxed                                      | 0.51    |
| 15                | In practical examinations, I get very nervous about whether my performance is good enough                       | 0.40    |
| 16                | I am overwhelmed by thoughts of doing poorly when I am in practical examination situations                      | 0.65    |
| 17                | I worry that my practical examinations performance will be lower than that of my peers                          | 0.56    |
| 18                | During practical examinations, I am so troubled by thoughts of failing that my performance is reduced           | 0.79    |
| 19                | During a practical examination, I worry about what will happen if I don't pass                                  | 0.71    |
| 20                | While taking a practical examination, I worry about whether I am a good clinician                               | 0.44    |
| <b>Appearance</b> |   |         |
| 7                 | I often feel uncomfortable about my appearance when I am taking a practical examination                         | 0.54    |
| 11                | While taking a practical examination, I become concerned that the examiner will perceive me as socially awkward | 0.72    |
| 12                | I get afraid about what kind of personal impression I am making during practical examinations                   | 0.76    |
| 13                | During a practical examination, I worry that my actions will not be considered clinically appropriate           | 0.70    |

|                      |  |      |
|----------------------|--|------|
| 14                   | I worry about whether the patient thinks that I am unable to perform the clinical skills   | 0.59 |
| <b>Behaviour</b>     |  |      |
| 21                   | During practical examinations, my hands shake  | 0.71 |
| 22                   | My heartbeat is faster than usual during practical examinations                            | 0.68 |
| 23                   | It is hard for me to avoid fidgeting during a practical examination                        | 0.54 |
| 24                   | Practical examinations often make me perspire (e.g., sweaty palms and underarms)           | 0.87 |
| 25                   | My mouth gets very dry during practical examinations                                       | 0.75 |
| 26                   | I often feel sick to my stomach before/during practical examinations                       | 0.55 |
| <b>Communication</b> |  |      |
| 4                    | I feel that my verbal communication skills are strong                                      | 0.72 |
| 5                    | During practical examinations, I find it hard to understand what the examiner is asking me | 0.70 |
| 6                    | I find it easy to communicate my clinical reasoning during a practical examination         | 0.52 |
| <b>Preparedness</b>  |  |      |
| 10                   | I find it hard to relax if I do not feel that I am prepared for the practical exam         | 0.80 |

## DISCUSSION

Excessive exam anxiety can negatively impact students' academic performance (Von der Embse et al., 2018) and interfere with an accurate assessment of their competence in a clinical task (Zhang and Walton., 2018). Thus, managing practical exam anxiety and supporting students where practical exam anxiety negatively impacts their performance is a worthwhile task to ensure students' results are reflective of their true abilities. In order to do this however, we need to be able to identify students that may experience this to a greater extent using a reliable and valid instrument.

The current study found that the newly modified measure of the MASI, the Measure of Anxiety in Practical Examinations or the MAPE, demonstrated sufficient internal consistency and is an acceptable measure to examine practical examination anxiety in a healthcare profession program. This is a critical foundational step which allows us to use a measure to identify and inform how we can support healthcare profession students that experience practical exam anxiety. The final iteration of the MAPE was a five factor instrument, relating to performance (10 items), appearance (5 items), behaviour (6 items), communication (3 items) and preparedness (1 item) and included 25 of the original 26 proposed items. The item "I worry that the examiner will focus on what I do not know", which was an adapted statement from the original MASI, was removed due to low factor loading. In addition, "social anxiety", which was an important factor in the original measure developed for interviews, was removed, and all statements loaded onto the "appearance" factor. This loading change is understandable in a practical examination context, as these items focus primarily on how they appear during a practical exam rather than the social aspect of an interview. An alternative single item factor which focused on student preparedness was instead included. Perceived preparedness for an examination situation is considered a factor that influences exam anxiety in nursing students (Vaz et al., 2018), and medical students

with positive perceptions of their preparedness for an exam performed better (Bauzon et al., 2021). Three items originally placed in the communication factor were loaded alternatively onto the performance factor. These items incorporate statements relating to students being unable to express their thoughts, trouble answering questions they know and going blank, all which can impact a student's performance in a practical exam and therefore is a logical modification.

Female students displayed higher practical exam anxiety than their male peers. Females have been demonstrated to display higher exam anxiety across all education levels, from primary, secondary and university grades (Von der Embse et al., 2018). Social roles, personality differences, conflicting role demands and the healthcare education environment could impact this finding (Brenneisen et al., 2016; Núñez-Peña et al., 2016). In contrast, males may be less likely to admit they are experiencing practical exam anxiety as they may perceive this as threatening their masculinity (Núñez-Peña et al., 2016). Further research is required to examine the reasons for practical exam anxiety variance between genders in healthcare students.

Just under a quarter of students in the current study (24.7 %) reported that they have GAD and these students displayed greater practical exam anxiety. A personal (Sridevi., 2013) and family (Macaulay et al., 2018) history of anxiety have been found to predict high exam anxiety. Those with GAD, may have greater exam anxiety due to their lower anxiety tolerance in threatening situations, such as practical exams (Howard., 2020). Encouraging students to self-disclose GAD to educators or screening students for the potential presence of GAD may allow for students at risk of experiencing practical exam anxiety to be identified, and appropriate supports put in place. However, students may be unwilling to disclose their diagnosis and in Canada the Private Health Information Act would inhibit programs requiring this information. In addition, screening can lead to over or under identification and there may be difficulties identifying thresholds for when an intervention is warranted (Fazel et al., 2014; Von der Embse et al., 2013). It is also important that if screening takes place, students identified as at risk of suffering from GAD, should be referred to an appropriate medical professional for further support (Weems et al., 2010). Educating students on the symptoms and the benefits of treatment of GAD may also help students recognize if they are having difficulties and encourage students to engage with treatment.

The valid and reliable MAPE tool presented in the current study could play an important role in identifying and supporting students experiencing practical exam anxiety. Previous research has identified that practical exam anxiety can be heightened by the fear, worry and uncertainty that surrounds an evaluation and its outcomes. Additionally, the judgement of the evaluator, as well as worrying about failing in front of others and of being observed as lacking competence, can play a role (Boddicker et al., 2020; Zhang and Walton., 2018). Healthcare professional programs can be intensive; students are required to not only learn theoretical information, but apply this clinically and gain clinical competence across multiple domains. Embedded in the programs are clinical placements (Frank et al., 2019), where students are required to gain clinical experiences at the same

time as didactic content is taught. This can be time intensive and require students to display good time management skills. In fact, high course loads and insufficient time to prepare were highlighted as key contributors to exam anxiety in medical students (Hashmat et al., 2008; Tsegay et al., 2019). Supporting students in managing practical exam anxiety should be a key focus of healthcare professional program educators. Introducing evidence based interventions, such as cognitive behavioural therapy based education programs, may assist students (Hoying et al., 2020). Ensuring a wellness culture exists in the program, where students are encouraged to prioritize their self-care and a healthy lifestyle are important (Hoying et al., 2020). Educators can also implement other strategies, by modifying their curricula or assessment methods, to help limit practical exam anxiety in students. Educators could help ensure students are adequately prepared prior to practical exams, particularly when first introduced to them. Providing information on the time, content, context and demonstrating a run through of the practical exam is key so students are not fearful of the unknown and can practice the assessment method in a formative manner prior to a graded assessment. Our study was not without limitations. Convenience sampling was utilized in this study which may have led to volunteer bias whereby students with an interest or who suffer from practical exam anxiety may have been more likely to complete the survey. More females than males completed the survey. However, females make up a larger proportion of healthcare professionals in Ireland (Health Service Executive., 2020), Canada (Porter and Bourgeault., 2017), and the US (U.S. Department of Health and Human Services et al., 2017). All students were sampled while adapted COVID-19 exam regulations were not in place at their institution minimising the impact these additional requirements may have on students' anxiety.

## CONCLUSION

Practical examinations are a frequent and important component of assessment in healthcare profession programs. As practical exam anxiety could impact a student's performance, and lead to an inaccurate assessment and grade, that does not reflect their true ability, identifying practical exam anxiety is an important task in healthcare education. Identifying exam anxiety after the first practical exam can help educators support and manage students appropriately. The adapted MASI, now termed the Measure of Anxiety in Practical Examinations (MAPE), is an acceptable measure of practical examination anxiety in students. Our findings supported a five factor structure which included performance, appearance, behaviour, communication and preparedness. Gender and personal history of GAD impacted MAPE scores. Ensuring support for female healthcare students and students with GAD to mitigate practical exam anxiety may be warranted.

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## DECLARATION OF INTEREST

The authors declare no conflict of interest.

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## AUTHOR'S CONTRIBUTION

**1 S.C and E.W:** Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work.

**2 S.K and E.M and G.B:** Drafting the work or revising it critically for important intellectual content

**3 K.M and J.C:** Final approval of the version to be published