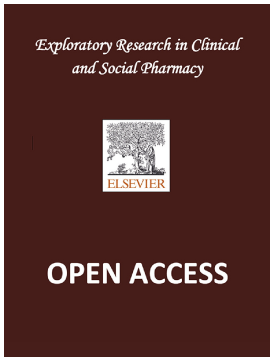

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Assessing the psychometric properties of Connor-Davison Resilience Scale 25 (CD-RISC 25) in pharmacy students and academics in the Eastern Mediterranean Region

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Abstract

Background:

Resilience is a complex concept that is defined and influenced by the context of individuals, organisations, societies and cultures. The Connor-Davidson Resilience Scale (CD-RISC) is a widely used validated tool to evaluate psychological resilience. CD-RISC is a self-administered scale of twenty-five items, each rated by a 5-point Likert scale. The scale evaluates overall personal resilience through assessing five main resilience-related constructs; personal competence, trust in one's instincts, positive acceptance of change, control and spiritual influences. As per the scale's developers, higher scores reflecting greater level of resilience. This particular tool has not previously been tested with a pharmacy student or academic population sample.

Objective:

This study aims to assess the factor structure, validity, and reliability of the CD-RISC-25 in a sample of pharmacy students and academics from faculties drawn across the Eastern Mediterranean Region (EMR).

Methods:

A cross-sectional study was carried out between October 2020 and January 2021 sampling pharmacy students and academics across the EMR who were invited to complete the self-administered CD-RISC 25 questionnaire. Confirmatory factor analysis using principal components analysis with oblique rotation was conducted on sample responses (n=616). The internal consistency and reliability for each identified factor and from the CD-RISC scale was evaluated by using Cronbach's alpha coefficient.

Results:

Five factors were isolated accounting for 51.5% total cumulative model variance. Identification of factors showed high convergence with previous work on the CD-RISC resilience tool. The current study in our sample found a five–factor structure which differed from the original scale reliabilities. This study did identify a five-factor solution with differing item factor loadings. The reliability analysis on the CD-RISC-25 items in our study sample revealed an overall Cronbach Alpha value of 0.89; however, three items showed corrected Item-total correlations of <0.3. Our analysis, in this respondent sample, suggested a re-adjustment of the scale inclusions to improve overall scale stability and performance.

Conclusions:

The current research findings propose a modified five-factor structure to resilience, with a 22-item unidimensional model of CD-RISC scale.

Keywords

Psychological resilience, CD-RISC, confirmatory factor analysis, Eastern Mediterranean Region, Pharmacy Education

Introduction

Health was defined by the World Health Organization (WHO) In 1948 as “a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity”;[1] with mental health integral to an individual's overall health. Due to the heightened awareness and acknowledgement of mental illnesses’ negative impact on physical health, social and economic status of individuals, teams and systems at large, mental health is a major concern in modern societies.[2] For instance, depression and anxiety disorders alone cost the global economy US$1 trillion per year.[3] Associated with the global economic burden are inseparable links with increased incidence of suicide and disability; physical health comorbidities (e.g., communicable and non-communicable diseases); financial hardship; issues of access to medicines and health services; human rights violations, discrimination and stigma; and mortality.[4] Nevertheless, despite an upsurge of interest in mental health in recent years, it remains a neglected part of global efforts to improve health.[5,6]

Mental health is a multidimensional state of health encompassing various aspects such as physical, psychological, social, cultural, and spiritual factors. These interconnected elements contribute to a sense of balance both within individuals and in their interactions with their environment.[7] Accordingly, an individual's mental health is affected by and dependent on the surrounding environment and circumstances. Resilience, which has been associated with mental health, evaluates how well a person adapts when faced with adversity, trauma, tragedy, threats, or major sources of stress.[8] In their systematic review and meta-analysis, Hu et al. have identified that resilience-related traits are inversely associated with negative indicators such as depression, anxiety, and negative emotions. Conversely, these traits are positively linked to positive indicators of mental health, including life satisfaction, subjective well-being, and positive emotions.[9]

Resilience is often viewed as a dynamic, contextual process that focuses on adaptation to life stressors or change which could potentially be improved or strengthened.[10] According to the Resilience and Healthy Ageing Network, resilience is "the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma”. The capacity for adaptation and "bouncing back" in the face of adversity is facilitated by the assets and resources present within the individual, as well as their life and environment.[11] It is speculated that cross one’s life course, the experience of resilience will vary.[11]

Recognising that mental health challenges are prevalent in higher education settings, both among academics and students due to factors like living away from family and academic pressures, it has been observed that possessing a high level of resilience can assist in overcoming challenges, managing wellbeing and successfully completing academic programmes.[10] For example, the global impact of the COVID19 pandemic which has resulted in widespread closures of educational institutions and expedited shift to online education have triggered concerns about the ability of students and academics to adapt to dramatic shifts in social, economic, and educational endeavours.[12] Therefore, it is of value to investigate the resilience and coping mechanisms of students and educators in academic settings as they are confronted with new realities such as imposed by COVID19.

Similar to other regions, the WHO Eastern Mediterranean Region (EMR), which comprises twenty-one countries and the occupied Palestinian territory (including East Jerusalem),[13,14] has witnessed changes in social, political and educational environments due to COVID19. The education of health professionals, including pharmacy, was adversely impacted with thousands of health professional institutions in the EMR abruptly closed to safeguard the wellbeing of students and staff.[15] Health professional institutions in EMR faced various challenges in managing the continuity of learning including abrupt closure, new teaching and learning tools, clinical training, online assessment and faculty development and training.[15] Additionally, the region faces numerous geopolitical, economic, and social challenges which represents a unique context to investigate resilience and the implementation of recommended psychometric tools.[15]

In the literature across various disciplines, scholars and researchers in psychology and social sciences have contributed to the development of diverse scales and instruments aimed at assessing and measuring resilience.[16] Among these instruments is the Connor-Davidson Resilience Scale (CD-RISC). CD-RISC is one of the most widely used tools to measure psychological resilience.[17] In their methodological review, Windle et al. concluded that the CD-RISC scale was among the top three resilience scales to receive the best psychometric quality ratings.[16]

The CD-RISC was introduced as a valid and reliable tool to assess resilience in a variety of populations and communities. According to its creators, Connor & Davidson, the CD-RISC-25 assesses resilience through twenty-five items grouped into five main concepts (i.e., factors/constructs) related to "personal competence, high standards, and tenacity"; "trust in one's instincts, tolerance of negative affect, and strengthening effects of stress"; "positive acceptance of change and secure relationships"; "control"; and "spirituality".[18]

While the CD-RISC scale achieved high quality of its psychometric properties and was used in assessing resilience among different societies and demographic,[19] previous research attempting to replicate the factor structure of the CD-RISC have not always supported the five-factor structure.[20–22] Moreover, CD-RISC has yielded varying factor structures when used in populations with different ethnic and cultural backgrounds, demographics, and trauma exposures.[21] Accordingly, establishing precise dimensions for this measure and the nature of the resilience construct remains in need of further exploration.[21]

This study aims to evaluate the psychometric properties of the CD-RISC-25 scale in a sample of pharmacy students and academics in the EMR region. The evaluation targets pharmacy academics and students in the region, as pharmacy, as a discipline, represents a field of study based on theoretical and practical courses. Moreover, the EMR region includes countries with a high density of pharmacy workforce per 10,000 population.[23]

Methods

Research design and study population

Between October 2020 and January 2021, this cross-sectional study was carried out targeting pharmacy students and academics in the EMR region. Enrolled students and working academics at the time of this study were all considered eligible to participate.

Sample size and Sampling methods

When conducting confirmatory factor analysis (CFA), the sample size should be carefully considered to assure the model's stability and reduce errors in correlation coefficients and factor loading.[24] The general assumption is that a large sample size would generate and result in a more stable and accurate model.[24] However, there is no consensus on the acceptable sample size for CFA.[25] The commonly recommended ratios are 10:1 to 20:1.[25–27] Moreover, according to Comrey and Lee (1992), a sample of 500 or more should be achieved for factor analysis studies.[28] Based on these recommendations, and since the Connor-Davidson Resilience Scale (CD-RISC) instrument[18] consists of 25 items measuring five main constructs, a minimal sample of 500 participants was needed for this study. Given that this study's main aim was to provide a snapshot of resilience among pharmacy students and academics, simple random sampling was considered the most convenient sampling approach.

Measurement Tool

A self-administered questionnaire instrument was used to measure resilience among pharmacy students and pharmacy academics. Targeted population resilience was measured using the CD-RISC scale.[18] The scale measures five constructs related to resilience: Construct one: "personal competence, high standards, and tenacity"; Construct two: "trust in one's instincts, tolerance of negative affect, and

strengthening effects of stress"; Construct three "positive acceptance of change and secure relationships"; Construct four: "control"; and Construct five: "spirituality". The full version of the instrument consists of 25 items; each item was assessed through a five-point Likert scale as follows: not true at all (0), rarely true (1), sometimes true (2), often true (3), and true nearly all of the time (4), the total possible scores range from 0–100.[18]

Data Collection Procedure

Data were collected from October 2020 to January 2021 using an online self-administered survey platform.[29]. Distribution was to gatekeepers, and heads of pharmacy schools/faculties, with requests to disseminate to pharmacy students and academics. National pharmacy student associations, the International Pharmaceutical Students' Federation, the International Pharmaceutical Federation (FIP) Early Career Pharmaceutical Group (ECPG) and members from FIP's Academic Pharmacy Section members were also targeted for distribution. FIP was asked to advertise and promote the study on its newsletters and social media channels. Targeted participants were provided with an invitation letter, a participant information sheet and a self-consent form, explaining the study purpose, research team contacts, and ethical approval information. The survey was distributed in Arabic, English, French, Urdu and Persian. The time to complete the survey was approximately ten to fifteen minutes.

Data analysis

Data were subjected to quality assurance and cleaning before statistical treatment using Statistical Package for Social Sciences (SPSS) software version 27 (2019).

Confirmatory factor analysis was carried out using principal components analysis (PCA)[30] with Oblique rotation (Oblimin)[31] and enforcing a five-factor solution.

Kaiser-Meier-Olkin (KMO) Measure of Sample Adequacy and Bartlett's Test of Sphericity were used to assess the suitability of the data for factor analysis.[32] Several different factor solutions have been explored in the current study and a 5-factor description has been judged as best fit. The internal consistency and reliability for each construct and for the CD-RISC scale were evaluated by using Cronbach's alpha coefficient; values between 0.7 and 0.9 were considered acceptable.[33]

Ethical consideration

This study was approved by Research Ethics Committee at University College London (UCL); Ethics Identifier Number 2781/001.

Results

Factor Analysis and Scaling

In total, 904 eligible participants agreed to participate in this study, of which 616 provided complete responses for analysis. A total of 120 (19.48%) of the study sample were academics and 496 (80.52%) were undergraduate students.

KMO and Bartlett's testing[32] showed sufficient item correlation for a PCA; KMO value was 0.93, with Bartlett's test $p < 0.05$. Survey items were subject to PCA (n= 616 cases) with oblique rotation (Oblimin). Five factors were isolated accounting for 51.5% total cumulative model variance. Identification of factors showed high convergence with previous work on the CD-RISC resilience tool.[18]

Factor 1 (hardiness) accounts for the majority (30.84%) of explained variance of the present 5 factor structure. It extracts most of the items from the original 5 factor (factor 1), excluding item 16 but with

the addition of items 21 and 22. Factor 2 extracts a total of three mixed-up items each belonging to a different factor in the original 5 factor structure, and it reflects coping and self-regulation.[34] Factor 3 extracts item 2 in addition to all the items from factor 5 in the original 5 factor research, which reflects connections and spirituality. Factor 4 corresponds to tolerance, and it extracts the majority of items from the original factor 2.[18] Factor 5 extracts most of the items from factor 3 in the original 5 factor structure, and it reflects positive acceptance of change.

Adjustments were considered to improve the reliability of the extracted factors in this sample. The reposition of items between the different constructs was based on the highest level of factor loading for each item; given that there was evidence of cross-loadings of some CD-RISC items on different factors (>0.3). Item-16 was transferred from hardiness to control, items 21 and 22 were transferred from control to hardiness, item-14 transferred from tolerance to control and, lastly, item-2 was transferred from positive acceptance to spirituality. Factor 1, 2, 4 and 5 exhibited an acceptable alpha value (~7 or above). However, it was noted that the alpha value for factor 3 was 0.40, which is considered unacceptable.[33]

Reliability analysis on all 25 items of the CD-RISC-25 (summative resilience) yielded an Alpha value of 0.89 indicating high reliability but with some item redundancy. However, three items (2, 3 and 20) showed corrected Item-total correlation value equals to 0.3 or less (data not tabulated) generally reflecting lower contributions to overall reliability. **Table I** explains the modification of the CD-RISC scale. **Table II** and **Table III** show the reliability and scaling diagnostics on the extracted factors.

Table I- The Restructuring of the CD-RISC Scale (n=616)

No.	Construct	No. of Items in the Original Scale	Items in the Original Scale	No. of Items in Adjusted scale	Items in the Adjusted Scale
1.	Personal competence, high standards, and tenacity "Hardiness"	8	10,11,12,**16**, 17, 23, 24, 25	9	10,11, 12, 17, **21**, **22**, 23, 24, 25
2.	Trust in one's instincts, tolerance of negative affect, and strengthening effects of stress "Tolerance"	7	6, 7, **14**, 15, 18, 19, 20	6	6, 7, 15, 18, 19, 20
3.	Positive acceptance of change and secure relationships "Positive Acceptance"	5	1, **2**, 4, 5, 8	4	1,4,5,8
4.	Coping/Self-regulation "Control"	3	13, **21**, **22**	3	13, **14**, **16**
5.	Spirituality "Spirituality"	2	3, 9	3	3, 9, **2**

Note. Bold items were relocated to improve the model fitness

Table II- Reliability and Scaling Diagnostics on the Extracted Factors (n=616)

Scaling Diagnostics						
	Identified Construct	No. of Items*	Scale Range			Cronbach's α
			Min	Max	Mid-point	
1.	Personal competence, high standards, and tenacity "Hardiness"	9	2.383	3.250	2.951	0.858
2.	Trust in one's instincts, tolerance of negative affect, and strengthening effects of stress "Tolerance"	6	2.224	2.864	2.473	0.667

3.	Positive acceptance of change and secure relationships "Positive Acceptance"	4	2.578	3.138	2.805	0.672
4.	Coping/Self-regulation "Control"	3	2.063	2.449	2.294	0.676
5.	Spirituality "Spirituality"	3	2.698	3.386	3.131	0.405

* In the adjusted scale
α: Alpha; Min: Minimum; Max: Maximum

Table III- Reliability Analysis of the Extracted Factors (n=616)

Construct	Items	Corrected Item-Total Correlation	α if Item Deleted
Hardiness	**Item 24**-You work to attain your goals	0.712	0.831
	Item 11-You can achieve your goals	0.654	0.837
	Item 12-When things look hopeless, I don't give up	0.619	0.840
	Item 21-Strong sense of purpose	0.602	0.841
	Item 25-Pride in your achievements	0.579	0.844
	Item 22-In control of your life	0.584	0.843
	Item 17-Think of self as strong person	0.587	0.843
	Item 10-Best effort no matter what	0.435	0.856
	Item 23-I like challenges	0.508	0.852
Coping/Self-regulation	**Item 14**-Under pressure, focus and think clearly	0.545	0.504
	Item 16-Not easily discouraged by failure	0.491	0.578
	Item 13-Know where to turn for help	0.432	0.653
Connections/ Spirituality	**Item 2**-Close and secure relationships	0.170	0.501
	Item 3-Sometimes fate or God can help	0.280	0.250
	Item 9-Things happen for a reason	0.303	0.217
Tolerance	**Item 20**-Have to act on a hunch	0.314	0.651
	Item 18-Make unpopular or difficult decisions	0.411	0.619
	Item 19-Can handle unpleasant feelings	0.476	0.595

	Item 6-See the humorous side of things	0.369	0.634
	Item 15-Prefer to take the lead in problem solving	0.374	0.632
	Item 7-Coping with stress strengthens	0.428	0.613
Positive Acceptance	**Item 8**-Tend to bounce back after illness or hardship	0.394	0.647
	Item 5-Past success gives confidence for new challenge	0.478	0.589
	Item 1-Able to adapt to change	0.456	0.603
	Item 4-Can deal with whatever comes	0.490	0.582

Resilience Score

The mean overall resilience CD-RISC score of the academic and the student sample were 66.74 (SD 10.29) and 58.81 (SD 13.41) respectively. The results of the independent samples t-test showed that the mean resilience score of the academic was significantly higher than the student score (P<0.05). Table IV summarises participants' CD-RISC score.

Table IV-The Descriptive Data of the CD-RISC score

Sample	Number	Mean	Standard Deviation
Pharmacy Academics	120	66.74	10.29
Pharmacy Students	496	58.81	13.41
Total	616	62.78	5.61

Discussion

Aligning with this study, earlier research has demonstrated robust psychometric properties for the instrument; however, the original factor structure[18] was not replicated in any of these studies.[35–38] To the best of the research team's knowledge, this is the first study to assess the validity and reliability of CD-RISC 25 among academics and pharmacy students in the EMR region. It is worth noting that earlier research projects that investigated the psychometric properties of the CD-RISC 25 have targeted different cultures and population groups. For example, a noticeable amount of previous research was conducted on special population groups, e.g., entrepreneurs, military veterans, adolescents, trauma survivors, and patients with major health conditions.[19,21,35,36,39–41] Others were conducted among the general population.[42–44]

The current study collected a total of 616 responses and therefore achieved the minimum recommended sample size for conducting factor analysis.[28] While this study was able to identify a five-factor solution, the item factor loadings were different from those found in the original scale.[18] We propose a new 5-factor structure to resilience from our sample with a 22-item unidimensional model of CD-RISC scale which incorporates different aspects of resilience building on the proposed structure by Connor and Davidson (2003).[18] Consistent with previous research,[18,45] evidence of cross-loadings of

some items on different factors was shown in the current study sample. Educational psychologists have argued that some correlation among factors is expected in behavioural measurements.[31] When compared to item factor membership in the original scale, a total of 5 items in the current study were repositioned between constructs guided by the highest level of factor loading, and thus improving the reliability of the extracted factors.

The overall alpha coefficient for the CD-RISC scale as a whole in the current research was 0.89, and it demonstrates high reliability. However, items 2 (“Close and secure relationships”), 3 (“Sometimes fate or God can help”) and 20 (“Have to act on a hunch”) showed a poor reliability as their correlation with the overall total was 0.3 or less. Accordingly, these items were removed due to their poor reliability and their effect on the scale overall stability and performance. It is worth noting that these three items in the original Connor-Davidson Resilience Scale demonstrated lower item-total scale corelation comparing to other items (ranging between 0.3 and 0.4).[18]

As a psychological concept, resilience is a multidimensional and changes overtime.[18,46] Resilience is affected and dependent on a number of factors such as age, gender, cultural background and context.[18] Previous research proposes that resilience factors varied significantly across different populations and contexts.[47,48] Consistent with our study findings, a five-factor structure to resilience was identified in two previous research with large samples, one targeted Iranian general population and the other recruited Chinese adolescents post-earthquake.[41,42] However, with exception to the low factor loading of item 2 and 20 in the Iranian study, both studies demonstrated item factor loading that is similar to the original scale.[41,42] Contrary to our findings as well as the original scale model, other previous research have identified a four-factor[49,50], a three-factor[36,51], two-factor[21,35] and one factor[43] structures to CD-RISC 25.

Considering the items in the scale overlap more than one construct, the five constructs to resilience in our sample are hardiness, coping and self-regulation, connections and spirituality, tolerance and finally positive acceptance. Factor 1 reflects that students and academics with higher psychological resilience tend to stay strong and in control when facing stressful situations and adversity. These personal traits have been referred to as mental hardiness in the literature.[52] This dimension of resilience pertains to people's presumed capacity (predisposition) to rebound from disruption.[52] Many in our sample live in countries fraught with geopolitical and economic challenges and it is not surprising that this factor extracts the majority of items related to mental hardness, an important pathway to resilience.[47,53] Over three decades of research have established that mental hardiness is a crucial factor in stress resilience.[54] Individuals with high levels of mental hardiness demonstrate greater commitment (a strong sense that life is meaningful and worth living), control (the belief that they can shape and influence their future), and acceptance of challenge (viewing change in life as interesting and valuable).[55] Research has indicated that hardiness can enhance mental health [56] and lessen negative emotions like anxiety related to academic stress [57,58] Therefore, hardiness could have a notably positive effect on the mental health of pharmacy students and academic professionals studying and working in the EMR.
Factor 2 reflects coping and self-regulation (taking any action that alters an emotional experience so one can influence emotion and how one expresses it).[34] Factor 3 in the current sample reflects connections and spirituality. Social connection is the opposite of social isolation, and it is concerned with having the feeling of being part of something larger than oneself, feeling close, welcomed and understood by others.[59] Spirituality, on the other hand, is concerned with the feeling of connection to a higher power.[60] The low alpha value of this factor could be attributed to the low number of questions or poor corelation between the items.[33] It is worth noting that the EMR shares similar cultural and spiritual beliefs shaped by the religious composition of the region. These included emphasizing the sense of support among the community as well as the belief in God will and destiny. This might contribute to fostering resilience and the sense of acceptance when facing hardship or challenges. However, as the majority of EMR region people are believed to be religious and have religion deeply integrated into family structure, relations and day-to-day life. Results showed that, similar to other research in other cultures and regions,[41,43,45] the "connections/spirituality" dimension and its related

items was challenging, and there is a need to enhance its psychometric performance by articulating more specific and cultural-sensitive items within this dimension.
Factor 4 corresponds to tolerance which pertain to the ability to approach and tolerate challenges with composure as coping with stress encourages personal growth. Factor 5 reflects positive acceptance of change that is the capacity of resilient individuals to adapt to adversity and unexpected events. With this personal trait, past successes allow individuals to confidently manage new challenges and difficulties. Understanding what contribute to resilience in the current study sample would enable policymakers design and implement tailored and culturally responsive interventions to support and strengthen resilience of pharmacy students and academics in the EMR.
While this research was the first in the EMR to assess the psychometric properties of the CD-RISC 25 scale, further research is needed to explore the differences in overall resilience and its related dimensions between males and females, junior and senior students, and domestic and expatriate students. Moreover, future research should look at the correlation between resilience and overall mental health status and the correlation between resilience and interpersonal skills such as problem-solving and conflict management. Additionally, future research could have a longitudinal design to observe and assess how students' resilience evolves with time as they proceed with their studies. Lastly, further research might be needed to explore pharmacy students' and academics' understanding of resilience, their coping mechanisms at times of adversity and the type of support they might need from their peers and institutions to cope with life challenges.

Limitations

This study, like any other, has a number of limitations related to its design, sampling approach, data collection, and analysis. The research team acknowledges these limitations and believes these limitations are an integral part of the research process, contributing to the ongoing dialogue and development in this field. First, the psychometric assessment of the CD-RISC 25 scale was carried out during a period of elevated stress, anxiety and vulnerability due to the COVID-19 pandemic outbreak and its associated lockdown procedures and measures. Therefore, future research should be conducted during normal day-to-day life and living arrangements. Second, the primary sampling approach is convenience sampling, targeting pharmacy faculties in the region in connection with FIP or the research team. This might have introduced selection bias to the study ample, and therefore findings may not generalize well to the wider population of pharmacy students and academics across the EMR. Accordingly, further research should consider a broader sample to enhance statistical power and model stability. Third, as the questionnaire was self-administered, the research participants might have provided socially desired and accepted answers or provided inaccurate answers, as the research participants could not seek clarifications or assistance, and some might need to understand some of the used terminology used in the scale. Moreover, while the scale was offered in English as well as in the official language of each country, the interpretation of the statements may be varied. Respondents may have needed to understand the meaning behind certain words. For example, "In dealing with life's problems, sometimes you have to act on a hunch without knowing why", the word "hunch" may cause ambiguity in interpreting the concept of one' possible ability to act based on a feeling or an intuitive guess. Lastly, as with any factor analysis, the selection of variables, the estimation of communality, and the rotation of factors may be affected by sample bias and response rates.

Conclusion

The current research findings suggest a revised 5-factor structure for resilience, utilizing a 22-item unidimensional CD-RISC scale that fits with pharmacy students and academics in the EMR, who possess similar characteristics. These factors were hardiness, coping and self-regulation, connections and spirituality, tolerance and positive acceptance.

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Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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