Cross-cultural adaptation and validation of the Norwegian Dizziness Catastrophizing Scale in persons with dizziness

Abstract

Background and purpose: Dizziness Catastrophizing Scale (DCS) is a questionnaire covering catastrophizing thoughts related to dizziness. The aims of this study were to cross-culturally adapt the DCS into Norwegian (DCS-N) and to examine the internal consistency, content and construct validity, and test-retest reliability of the instrument.

Method: Patients (18-67 years) with long-term dizziness were recruited from an ear, nose, and throat (ENT) clinic in Western Norway. Validity of the DCS-N was assessed by evaluating data quality (missing, floor and ceiling effects), content validity (relevance, comprehensiveness, and comprehensibility), structural validity (principal component analysis), internal consistency (Cronbach's alpha), and construct validity (predefined hypotheses). Test-retest reliability was examined by intraclass correlation coefficient ($ICC_{1.1}$), standard error of measurement (SEM), smallest detectable change (SDC), and limits of agreement.

Results: In total, 97 women and 53 men, mean age (SD) 46.5 (12.7) with dizziness were included (in the study). A subgroup of 44 patients participated in test-retest assessment. Overall, the DCS-N was easy to comprehend. The principal component analysis supported a one-factor solution and internal consistency was satisfactory (α 0.93). Construct validity was acceptable; all the predefined hypotheses were confirmed. Test-retest reliability demonstrated $ICC_{1.1}$ of 0.90 and a SEM of 4.9. SDC was estimated to be +/-13.6.

Discussion: The DCS-N demonstrated acceptable measurement properties for assessing catastrophizing thoughts in patients with long-term dizziness. Further studies should examine the responsiveness of the DCS-N and a factor analysis should be undertaken in a larger population.

Keywords: Vestibular rehabilitation, psychometric, assessment, outcome measurements

Introduction

Dizziness is one of the most common symptoms in the general population, with a prevalence of more than 20% (Neuhauser, 2016; Teggi et al., 2016). Dizziness may have different aetiologies, and vestibular is one of the most common with a reported prevalence up to 42.1% (Bösner et al., 2018). Most people suffering from acute vestibular disorders have a good prognosis and recover within a few weeks (Eckhardt-Henn, Tschan, Best, & Dieterich, 2009; Strupp & Brandt, 2008). Approximately 30% develops long-term dizziness with additional psychological and physical complaints including anxiety, depression, avoidance behaviour (Eckhardt-Henn, Breuer, Thomalske, Hoffmann, & Hopf, 2003; Popkirov, Staab, & Stone, 2018; Pothier et al., 2018), and musculoskeletal pain (Gustavsen et al., 2021). Further, it is suggested that catastrophic thinking contributes to sustaining symptoms and hamper treatment (Pothier et al., 2018).

Patients with persistent dizziness often have an enhanced experience of physical and emotional complaints, which may be associated with fear and worry about expected or actual symptoms (Pothier et al., 2018). In addition, anxiety and depression may contribute to catastrophizing (Tschan et al., 2013), and have impact on negative beliefs of future events (Quartana, Campbell, & Edwards, 2009). Pain catastrophizing tends to increase fear of pain as well as making patients feel unable to prevent pain-related thoughts either before, during, or after a painful encounter (Quartana et al., 2009). This “pattern” may also apply to dizziness. Patients may feel unable to prevent dizziness-related thoughts which could introduce irrational fear and worry about anticipated or actual problems, and in turn contribute to symptom severity (Pothier et al., 2018). Being aware of this type of negative thoughts could be valuable in the treatment of long-term dizziness and hamper the risk of chronification.

However, catastrophizing is scarcely studied with respect to dizziness (Pothier et al., 2018). An instrument capturing catastrophizing thinking in conjunction with pain, exists (Sullivan,

Bishop, & Pivik, 1995). This instrument has been adapted to reflect catastrophic thinking among patients with dizziness in a Canadian population (Pothier et al., 2018) but so far not in a similar Norwegian population. The aims of this study were therefore to test the internal consistency, content and construct validity, and test-retest reliability of the Canadian DCS after adapting it into Norwegian.

Methods

Participants

The present study included 150 patients referred to an ear, nose, and throat (ENT) clinic. The inclusion criteria were age 18-67 years and persistent dizziness for at least three months. Hospitalized patients and patients with vestibular schwannoma, neurological disorders, or severe orthopaedic conditions (e.g amputations, fractures) that potentially can affect balance were excluded. Participants had to speak sufficient Norwegian to complete the questionnaires. The study was approved by the Norwegian Regional Committee for Medical Research Ethics (REK xxx) and the Data Inspectorate (xxxx). The study is registered in ClinicalTrials.gov (xxx).

Procedures

All the included patients filled in demographic and information related to dizziness during their first visit at the ENT clinic. Test-retest reliability was examined in a subgroup of 59 patients and the DCS-N was administered twice digitally 10-14 days apart. Forty-four patients responded and were included in the analysis. Content validity was examined in a subgroup of 15 patients. The patients were interviewed about how they perceived the relevance, comprehensiveness, and comprehensibility of each question in DCS-N.

Main outcome

The Dizziness Catastrophizing Scale (DCS) consists of 13 item concerning patients'

catastrophic thinking related to dizziness at the time of assessment (Table 4). The original Canadian scale (Pothier et al., 2018) was adapted from “Pain Catastrophizing Scale” (PCS) (Sullivan et al., 1995) by replacing the word “pain” with “dizziness” (Pothier et al., 2018).

The Canadian DCS has proved to be a valid and reliable measure for catastrophic thinking in patients with dizziness and an exploratory dimension reduction analysis revealed a single latent component of DCS. Each item is scored using a 5-point Likert Scale, ranging from 0 with “not at all” to 4 with “all the time” with a total score ranging from 0-52 (Pothier et al., 2018). The Norwegian version of DCS was adapted from the Norwegian PCS (Fernandes, Storheim, Lochting, & Grotle, 2012) by replacing the word “pain” with “dizziness” according to the procedure of Pothier et al. (2018). In addition, a minor adjustment was provided for item 10 to adapt it into the Norwegian language without compromising the meaning and content.

Other variables

The Standardized Nordic Questionnaire (SNQ) measures the localisation of musculoskeletal pain or discomfort by the following question: “Do musculoskeletal troubles occur in a given situation, and if so, in what part of the body are they localized?” (Kuorinka et al., 1987). The respondent is asked to identify pain or discomfort in 10 different body sites: head, neck, shoulders, elbows, wrist/hands, upper back, lower back, hips, knees, and ankle/feet during the last 7 days, with a “yes” or “no” response for each pain site. Localization and number of pain sites (NPS) are registered. Pain intensity during the last seven days is reported on a 11-point (0-10) numeric rating scale (NRS) where 0 equals “no pain at all” and 10 equals “worst imaginable pain. A score ≤ 5 is considered mild, 6-7 is moderate and ≥ 8 is severe interference with functioning (Boonstra et al., 2016). Satisfactory validity and reliability have been demonstrated for patients with musculoskeletal symptoms (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011; Von Korff, Jensen, & Karoly, 2000).

The Dizziness Handicap Inventory (DHI) (Jacobson & Newman, 1990) has been translated into Norwegian (Tamber, Wilhelmsen, & Strand, 2009). The instrument consists of 25 items measuring self-perceived handicap associated with dizziness. Each item is scored 4 (yes), 2 (sometimes) or 0 (no) points. The total sum score varies between 0-100, with higher scores indicating more severe handicap. DHI has shown to be valid and reliable in a Norwegian population. In the present study, a cut-off point of 29 was used, indicating whether or not a person experiences handicap associated with dizziness (Tamber et al., 2009).

The Vertigo Symptom Scale – short form (VSS-SF) measures perceived severity and frequency of dizziness symptoms (Yardley et al., 1998) and has been translated into Norwegian (Wilhelmsen, Strand, Nordahl, Eide, & Ljunggren, 2008). The form consists of 15 items, each scored on a 5-point scale (range 0-4) with a total scale score ranging from 0-60, with higher scores indicating more severe dizziness. Severe dizziness has been defined as ≥ 12 points on the total scale (Yardley et al., 2004). VSS-SF can be divided into two subscales: 8 items relating to vertigo-balance (VSS-V) and 7 items relating to autonomic-anxiety (VSS-A) symptoms (Yardley et al., 2004). Satisfactory reliability and validity has been demonstrated in a Norwegian population (Wilhelmsen et al., 2008).

Data analysis

Qualitative analysis

Content validity was examined qualitatively by interviewing 15 of the participants about the relevance, comprehensibility and comprehensiveness of the DCS-N (Terwee et al., 2018). The semi-structured interview guide was developed before the first interview. The participants were encouraged to read through the questions both before and during the interview. Follow up questions were asked if the participants' answers were short (or with "yes" or "no",) to get more detailed information. The interviews were audio-recorded and transcribed verbatim. A thematic analysis inspired by Clarke and Braun (2017) was performed. Each interview was read several times and a list of themes based on the patients' comments was constructed. Further, the themes were compared for similarities,

reread, and reformulated into categories before analyses (Clarke & Braun, 2017).

Quantitative analysis

IBM SPSS Statistics, version 28.0.1.0 was used for statistical analysis. Normality was assessed by Kolmogorov-Smirnov statistic, histograms, and q-q plots. Inspection of histograms and q-q plots showed an almost normal distribution of the scores, and parametric statistics (mean, standard deviation (SD), Pearson correlation coefficients (r)) was therefore used for demographic data and construct validity analyses (Pallant, 2005, p. 82).

Structural validity of DCS-N was examined by Principal component analysis (PCA) (Pallant, 2020). Components were extracted with an eigenvalue higher than one. Data quality was assessed by inspecting internal missing values, and highest and lowest scores on each item. Floor and ceiling effects on the total score was also assessed. Within person mean was used to calculate missing values. Internal consistency was assessed by the Cronbach's alpha coefficient (α). A Cronbach's α between 0.70 and 0.95 was considered acceptable (Terwee et al., 2007). Floor and ceiling effects were present if more than 15% of the included sample scored the lowest or the highest score, respectively (Terwee et al., 2007).

Construct validity was explored by testing predefined hypotheses of expected correlations between DCS-N and the other relevant questionnaires. Assumptions for the hypotheses are listed in Table 1. Construct validity was considered acceptable if at least 75% of the hypotheses were confirmed (Table 1) (Mokkink et al., 2017, p. 31). A correlation of $r < 0.30$ was considered low, $0.30 \geq r < 0.60$ moderate and $r > 0.60$ high (Andresen, 2000; Fernandes et al., 2012).

Reliability was assessed by intraclass correlation coefficients ($ICC_{1.1}$), with a 95% confidence interval (CI), using the one-way random model (Shrout & Fleiss, 1979). ICC values >0.70 was considered acceptable reliability (de Vet, Terwee, Mokkink, & Knol, 2011, p. 300; Terwee et

al., 2007). Measurement error was assessed by Standard Error of Measurement (SEM), which indicates the precision of the individual measurements (Dontje, Dall, Skelton, Gill, & Chastin, 2018). SEM was used to calculate the Smallest Detectable Change (SDC) for one individual ($SDC_{ind} = 1.96 \times \sqrt{2} \times SEM$) (Beckerman et al., 2001; Terwee et al., 2007), which corresponds to the smallest within-person change in score that, with $p<0.05$ can be interpreted as a real change, above measurement error, in one person (Terwee et al., 2007). Limits of Agreement was used to illustrate the mean difference between test and retest, and upper- and lower limit of agreement (de Vet et al., 2011, pp. 113-114).

TABLE 1. Hypotheses of construct validity

	Hypotheses	Underlying assumptions	Expected results
1.	It was expected that a score above 29 on the DHI will be associated with a significant higher score of the DCS compared to a score below 29 on the DHI (p-value)	It is thought that dizziness catastrophizing may influence the degree of self-perceived handicap due to dizziness	$p \leq 0.05$
2.	It was expected that the score on DCS will show a moderate positive correlation with DHI	DHI also measures other aspects of dizziness	$r_p > 0.30$
3.	A moderate to low correlation was expected between DCS and increasing number of pain sites of the SNQ	Patients with long-term dizziness may develop secondary complaints such as musculoskeletal pain in more than one body part	$r_p < 0.30$
4.	We expected a moderate to low correlation between DCS and SNQ pain intensity, measured with NRS	They measure different construct, but at the same time, they may also affect each other	$r_p < 0.30$
5.	It was expected that DCS would have a higher correlation with VSS-A compared to VSS-V.	Dizziness catastrophizing was suspected to have more complaints regarding anxiety than balance	$r_p > 0.40$

Abbreviations: DCS, Dizziness Catastrophizing Scale; DHI, Dizziness Handicap Inventory; VSS-V, Vertigo Symptom Scale-Vertigo-Balance; VSS-A, Vertigo Symptom Scale-Autonomic-Anxiety; SNQ, Standardized Nordic Questionnaire; r_p, Pearson correlation; r_s, Spearman correlation; P-value ≤ .05

Results

Demographic and clinical characteristics

Demographic and clinical data are presented in Table 2. The participants showed moderate level of catastrophic thinking (21.2) and dizziness-related handicap (38.0), while dizziness symptoms were severe (> 12). Pain intensity was moderate (4), and the mean number of pain sites was 3.7.

TABLE 2. Demographics and self-report outcomes in the patient sample, n=150

Characteristics	Respondents (n)	Results
Sex n (%)		
Female	97	97 (65)
Male	53	53 (35)
Age, mean (SD)	150	46.5 (12.7)
Duration of dizziness, months median (IQR)	150	21.5 (8.0-53.5)
DCS, mean (SD)	146	21.2 (11.9)
DHI, mean (SD)	142	38.0 (20.1)
VSS-SF, mean (SD)	142	17.1 (9.5)
NPS, mean (SD)	146	4.5 (2.5)
NRS, mean (SD)	146	4.0 (2.3)

Abbreviations: DCS: Dizziness Catastrophizing Scale; DHI: Dizziness Handicap Inventory; VSS-SF: Vertigo Symptom Scale Short Form; NPS, Number of Pain Sites; NRS, Numeric Rating Scale; IQR, Interquartile range

Content validity

About half of the participants indicated that the questionnaire (DCS-N) was relevant, but not particularly suited for their situation. They commented that the relevance depended on the type of dizziness. For instance, question 6 (When I am dizzy, I become afraid that the

dizziness will get worse) was mentioned to be more related to seizure-based than constant dizziness. A few also expressed that DCS-N tended to facilitate a feeling of fear when reading through the questions. Words like “dramatic” and “desperate” were perceived as negatively loaded and frightening. Most participants reported that the questions overall were understandable and easy to read, although some were difficult to interpret (2,3,5,7 and 12) (Table 3). The participants expressed that the DCS-N covered important aspects. However, they missed questions regarding how dizziness affects everyday life, pain, function, and social participation. Some participants pointed out that some questions were repeated such as question 8 (When I am dizzy, I anxiously want the dizziness to go away) and 11 (When I am dizzy, I keep thinking about how badly I want the dizziness to stop).

Data quality

Missing values were spread over all 13 items. In total, four out of 150 patients did not answer the DCS-N at all. DCS-N total score ranged from 0 to 50. Floor effects was demonstrated in 10 out of 13 items, while no floor or ceiling effects were demonstrated in DCS-N total score. Data quality is presented in Table 3.

TABLE 3. Internal missing values and N (%) scoring in the lowest and highest response categories (n=146). Factor loading for each item is presented in brackets

	Dizziness Catastrophizing Scale	Range	Internal missing	Mean (SD)	Lowest N (%)	Highest N (%)
	Total score (0-52)	0-48		21.6 (12.9)	3 (2.0)	0
1	I worry all the time about whether the dizziness will end [.763]	0-4	4	1.6 (1.2)	30 (20.5)	12 (8.2)
2	I feel I can’t go on [.712]	0-4	4	1.7 (1.20)	32 (21.9)	8 (5.5)
3	It’s terrible and I think it’s never going to get any better [.829]	0-4	5	1.2 (1.2)	58 (39.7)	6 (4.1)
4	It’s awful and I feel that it overwhelms me [.776]	0-4	5	1.5 (1.3)	44 (30.1)	7 (4.8)
5	I feel I can’t stand it anymore [.816]	0-4	5	1.2 (1.2)	61 (41.8)	6 (4.1)

6	I become afraid that the dizziness will get worse [.775]	0-4	4	2.0 (1.2)	16 (11)	16 (11)
7	I keep thinking of other events of dizziness [.718]	0-4	4	1.2 (1.2)	51 (34.9)	8 (5.5)
8	I anxiously want the dizziness to go away [.702]	0-4	4	2.4 (1.4)	18 (12.3)	38 (26)
9	I can't seem to keep it out of my mind [.841]	0-4	5	1.4 (1.2)	45 (30.8)	8 (5.5)
10	I keep thinking about how much trouble my dizziness gives me [.776]	0-4	4	1.6 (1.2)	31 (21.2)	8 (5.5)
11	I keep thinking about how badly I want the dizziness to stop [.763]	0-4	4	2.3 (1.3)	15 (10.3)	33 (22.6)
12	There's nothing I can do to reduce the intensity of dizziness [.506]	0-4	4	1.7 (1.2)	24 (16.4)	14 (9.6)
13	I wonder whether something serious may happen [.745]	0-4	4	1.4 (1.3)	44 (30.1)	12 (8.2)

Factor analysis and internal consistency

PCA revealed a one-factor solution which accounted for 56.5% of the variance. The item loadings ranged from 0.506 (item 12) to 0.841 (item 9). Internal consistency by Cronbachs's α was 0.93. Inter-item correlations ranged from 0.28-0.73. If items were deleted, Cronbach's α differed from 0.93 to 0.94 indicating that some items might be redundant.

Construct validity

Moderate correlations were confirmed between DCS-N and DHI ($r = .43$, $p<.001$), and between DCS-N and VSS-SF autonomic-anxiety scale ($r = .46$, $p<.001$). The correlation between DCS-N and VSS-SF vertigo-balance scale ($r = .32$, $p<.001$) was lower. DCS-N and SNQ pain sites ($r = .16$, $p=.05$) and DCS-N and pain intensity ($r = .11$, $p=.19$) showed low correlations as expected. We found significant differences in DCS-N between those scoring >29 versus those scoring ≤ 29 on the DHI (mean difference -9.1, 95%CI -12.9 – -5.3, $p<.001$). All hypotheses were confirmed (see Table 1).

Test-retest reliability

The reliability of the DCS-N total score had an almost excellent agreement with $ICC_{1.1}$ value of 0.90. SEM was 4.9 and SDC_{ind} was +/- 13.6 points, indicating that a real change in DCS must exceed +/- 13.6 points (Table 4). The limits of agreement revealed a mean difference between test and retest of 0.25 (SD = 7.01) and the upper- and lower limit of agreement were 13.98 (95% CI) and –13.48 (95% CI) which is comparable to SDC_{ind} (Figure 1).

TABLE 4. Test-retest reliability of the Dizziness Catastrophizing Scale, n=44

Dizziness Catastrophizing Scale	
Test, mean (SD)	19.9 (19.7)
Retest, mean (SD)	19.7 (12.9)
Mean Difference (SD)	0.3 (7.0)
$ICC_{1.1}$ (95% CI)	0.90 (0.81, 0.94)
SEM	4.9
SDC_{ind}	13.6

Abbreviations: $ICC_{1.1}$, intraclass correlation coefficient model 1.1; SEM, standard error of measurement; SDC_{ind}, smallest detectable change for one individual.

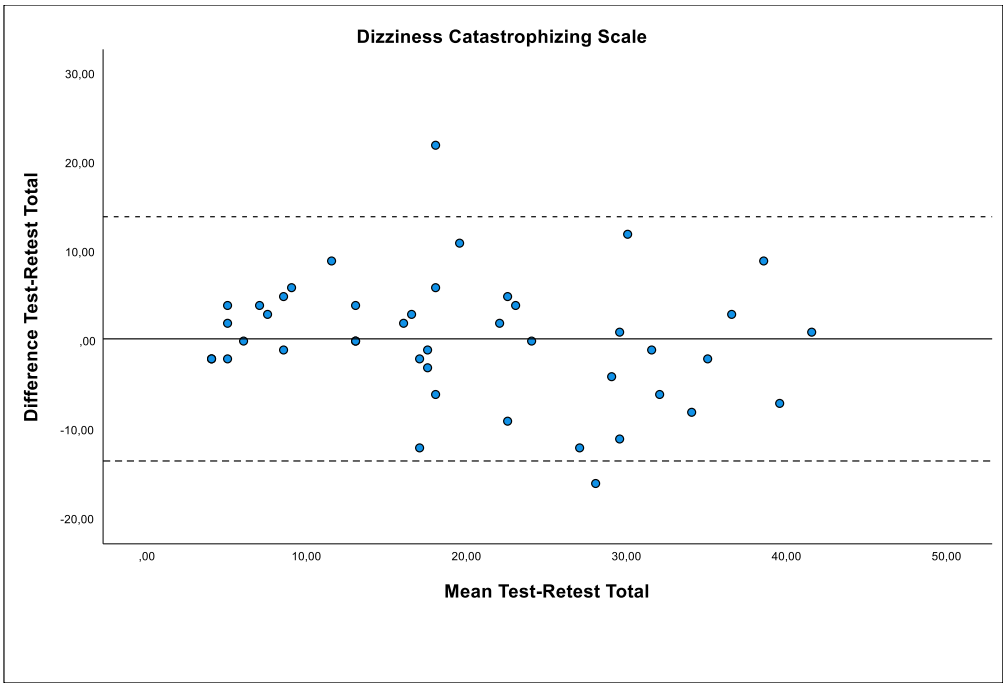

FIGURE 1. Bland Altman plot of test-retest assessment of the Dizziness Catastrophizing Scale (N=44)

Discussion

This study demonstrated that the Norwegian DCS (DCS-N) overall was relevant, comprehensive, and comprehensible, and that it held acceptable psychometric properties when used in a sample of patients with long-term dizziness. Principal component analysis supported a one-factor solution, and internal consistency of the DCS was high.

The content validity analysis revealed that DCS-N overall was relevant, comprehensible, and comprehensive. However, some difficulties regarding specific words or statements were mentioned, and relevance of some questions and negatively loaded questions were highlighted. The presence of irrelevant questions may decrease internal consistency, unidimentionality and interpretability of a questionnaire (Terwee et al., 2018). Conversely, we found a high Cronbach's α supporting homogeneity among items, and the factor analysis supported a one-factor structure similar to the original study (Pothier et al., 2018). Some participants mentioned that a few of the questions had similar meaning (item 8 and 11). A high Cronbach's alpha and inter-item correlations support this. The inter-item correlation

between item 9 and 11 was high, further supporting that these two items measure the same. We found floor effects in 10 out of 13 items. However, the floor effect disappeared when using the total score, indicating that the DCS-N may capture both improvement and deterioration in patients with dizziness. Some participants expressed that they missed questions about how dizziness affects everyday life about function, pain, and social participation. Missing concepts may decrease validity and lead to biased responses or low response rates (Terwee et al., 2018). However, these aspects are not directly related to catastrophizing and is covered by other instruments such as DHI, VSS and SNQ.

Evidence for construct validity of the DCS-N was supported as all the predefined hypotheses were confirmed. The results demonstrated that catastrophizing was moderately correlated with dizziness-related handicap (DHI). This findings is supported by Pothier et al. (2018) even though their participants had higher scores on both DCS (24.5 vs 21.2) and DHI (51.5 vs 37.8) than in our study. We found a positive correlation between catastrophizing and musculoskeletal pain. This finding is supported in another study examining psychometric properties of the Pain Catastrophizing Scale (PCS) in patients with low back pain (Fernandes et al., 2012). However, our study found low correlation between DCS-N and pain intensity, measured with NRS ($r = .11$) while Fernandes et al. (2012) found moderate correlations between PCS and NRS back pain ($rho = 0.31$). A cut-off point of 29 on the DHI is found to discriminate between persons that do, or do not, experience handicap associated with dizziness (Tamber et al., 2009). Therefore, we hypothesized that participants with dizziness (DHI>29) scored significantly higher on DCS-N compared to those without dizziness which was confirmed. As expected, we found a significant positive correlation between DCS and VSS-A. Previous findings suggest that catastrophic thoughts are related to psychological factors such as anxiety, depression, and emotional distress (Fernandes et al., 2012; Kvåle, Wilhelmsen, & Fiske, 2008; Pothier et al., 2018), which is in line with our findings.

Our results showed a high ICC (0.90) indicating good to excellent reliability. The results are in line with results from the previous study by Pothier et al. (2018). In addition, Fernandes et al. (2012) found similar reliability of the PCS tested in patients with low back pain, further

supporting our results. Measurement error in our study was 13.6 indicating that a real change in DCS-N must exceed +/- 13.6 points. The finding is similar as in Fernandes et al. (2012) who found a SDC of 12.8.

Since the literature on dizziness catastrophizing is scarce, a validation of DCS-N may contribute to increased understanding and knowledge about complaints in these patients who often struggle with physical and psychological complaints (Sullivan & D'Eon, 1990). Our results are in accordance with findings from others, suggesting that there is an association between catastrophizing and other symptoms such as anxiety, depression, and emotional distress (Hashimoto et al., 2022; Pothier et al., 2018; Sullivan et al., 2001). In addition, catastrophizing contributes to increased pain experience and is related to psychological aspects of pain experience (Sullivan et al., 2001). However, our study showed low correlation between dizziness catastrophizing and increased pain. This indicates that catastrophizing thoughts and worries in patients with dizziness are more related to dizziness-related function and symptoms than to pain intensity and number of pain sites. In comparison, catastrophic thoughts in a patient with chronic back pain are likely to be more related to pain intensity and the number of pain points, as anticipated. Further, Sullivan et al. (2001) suggests that if catastrophic thinking can be avoided, it may result in lower levels of emotional distress. Thus, examining the patients' way of thinking in relation to dizziness is important to improve both examination and treatment for this population.

Our results provide knowledge about a topic that has been scarcely studied (but includes aspects that may apply to patients with dizziness). A strength in our study is that we included 150 participants versus 50-99 as recommended when assessing construct validity and test-retest reliability (Terwee et al., 2007). Test re-test reliability was however, assessed in a smaller subgroup. The DCS was administered to 59 patients, but despite several requests only 44 participants responded on both test occasions making these results underpowered. The data quality war satisfactory. Missing values on the single items were low (3%), indicating that the items were relevant for the participants. The factor structure was examined by PCA, which is an item reduction method, and was computed without regard to

any underlying structure caused by latent variables and a more exploratory analysis may be warranted (Costello & Osborne, 2005). Analysis of internal consistency also indicated high interitem correlations and item redundancy. Exploratory factor analysis in bigger samples may meet these problems.

Clinical Implications for Physiotherapy Practice

Patients with persistent dizziness often present with additional physical and emotional complaints and distress, which may be associated with a maladaptive thought process that involves irrational fear and worry about anticipated or actual symptoms. Our results suggest that assessment of catastrophizing in clinical setting is important as it was associated with dizziness-related handicap and pain. Physiotherapists should therefore be aware of dizziness catastrophizing and address such thoughts when treating patients with persistent dizziness. The present study indicated that the Norwegian version of DCS can be recommended as a reliable and valid tool useful in clinical practice to monitor the patient's catastrophizing. Future studies should investigate the responsiveness of DCS-N to be able to use the instrument as an outcome measure.

References

Andresen, E. M. (2000). Criteria for assessing the tools of disability outcomes research. *Archives of Physical Medicine and Rehabilitation, 81*, 15-20. doi:10.1053/apmr.2000.20619

Beckerman, H., Roebroeck, M. E., Lankhorst, G. J., Becher, J. G., Bezemer, P. D., & Verbeek, A. L. M. (2001). Smallest real difference, a link between reproducibility and responsiveness. *Quality of Life Research, 10*(7), 571-578. doi:10.1023/A:1013138911638

Boonstra, A. M., Stewart, R. E., Köke, A. J., Oosterwijk, R. F., Swaan, J. L., Schreurs, K. M., & Schiphorst Preuper, H. R. (2016). Cut-Off points for mild, moderate, and severe pain on the numeric rating scale for pain in patients with chronic musculoskeletal pain: Variability and influence of sex and catastrophizing. *Frontiers in Psychology, 7*, 1466. doi:10.3389/fpsyg.2016.01466

Bösner, S., Schwarm, S., Grevenrath, P., Schmidt, L., Hörner, K., Beidatsch, D., . . . Haasenritter, J. (2018). Prevalence, aetiologies and prognosis of the symptom dizziness in primary care - a systematic review. *BMC Family Practice, 19*(1), 33. doi:10.1186/s12875-017-0695-0

Clarke, V., & Braun, V. (2017). Thematic analysis. *The Journal of Positive Psychology, 12*(3), 297-298. doi:10.1080/17439760.2016.1262613

Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation, 10*. doi:doi.org/10.7275/jyj1-4868

de Vet, H. C. W., Terwee, C. B., Mokkink, L. B., & Knol, D. L. (2011). *Measurement in medicine: A practical guide*. Cambridge: Cambridge University Press.

Dontje, M. L., Dall, P. M., Skelton, D. A., Gill, J. M. R., & Chastin, S. F. M. (2018). Reliability, minimal detectable change and responsiveness to change: Indicators to select the best method to measure sedentary behaviour in older adults in different study designs. *PloS One, 13*(4), e0195424. doi:10.1371/journal.pone.0195424

Eckhardt-Henn, A., Breuer, P., Thomalske, C., Hoffmann, S. O., & Hopf, H. C. (2003). Anxiety disorders and other psychiatric subgroups in patients complaining of dizziness. *Journal of Anxiety Disorders, 17*(4), 369-388. doi:10.1016/S0887-6185(02)00226-8

Eckhardt-Henn, A., Tschan, R., Best, C., & Dieterich, M. (2009). Somatoforme Schwindelsyndrome. *Der Nervenarzt, 80*(8), 909-917. doi:10.1007/s00115-009-2736-y

Fernandes, L., Storheim, K., Lochting, I., & Grotle, M. (2012). Cross-cultural adaptation and validation of the Norwegian pain catastrophizing scale in patients with low back pain. *BMC Musculoskeletal Disorders, 13*(1), 111. doi:10.1186/1471-2474-13-111

Ferreira-Valente, M. A., Pais-Ribeiro, J. L., & Jensen, M. P. (2011). Validity of four pain

intensity rating scales. *Pain, 152*(10), 2399-2404. doi:10.1016/j.pain.2011.07.005

Gustavsen, I. Ø., Wilhelmsen, K., Goode, A. P., Nordahl, S. H. G., Goplen, F. K., Nilsen, R. M., & Magnussen, L. H. (2021). Dizziness and physical health are associated with pain in dizzy patients—A cross-sectional study. *Physiotherapy Research International, 26*(4). doi:10.1002/pri.1923

Hashimoto, K., Takeuchi, T., Ueno, T., Suka, S., Hiiragi, M., Yamada, M., . . . Hashizume, M. (2022). Effect of central sensitization on dizziness-related symptoms of persistent postural-perceptual dizziness. *Biopsychosocial Medicine, 16*(1), 7. doi:10.1186/s13030-022-00235-4

Jacobson, G. P., & Newman, C. W. (1990). The development of the dizziness handicap inventory. *Archives of Otolaryngology–Head & Neck Surgery, 116*(4), 424-427. doi:10.1001/archotol.1990.01870040046011

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., & Jørgensen, K. (1987). Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics, 18*(3), 233-237. doi:10.1016/0003-6870(87)90010-x

Kvåle, A., Wilhelmsen, K., & Fiske, H. A. (2008). Physical findings in patients with dizziness undergoing a group exercise programme. *Physiotherapy Research International, 13*(3), 162-175. doi:10.1002/pri.402

Mokkink, L. B., Prinsen, C. A., Patrick, D. L., Alonso, J., Bouter, L. M., de Vet, H. C., & Terwee, C. B. (2017). *COSMIN methodology for systematic reviews of patient-reported outcome measures (PROMs)*. Retrieved from https://www.cosmin.nl/wp-content/uploads/COSMIN-syst-review-for-PROMs-manual_version-1_feb-2018.pdf

Neuhauser, H. K. (2016). The epidemiology of dizziness and vertigo. In J. M. Furman & T. Lempert (Eds.), *Handbook of Clinical Neurology* (Vol. 137, pp. 67-82): Elsevier.

Pallant, J. (2005). *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS* (2 ed.): Allen & Unwin.

Pallant, J. (2020). *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS* (7 ed.): Open University Press.

Popkirov, S., Staab, J. P., & Stone, J. (2018). Persistent postural-perceptual dizziness (PPPD): A common, characteristic and treatable cause of chronic dizziness. *Practical Neurology, 18*(1), 5-13. doi:10.1136/practneurol-2017-001809

Pothier, D. D., Shah, P., Quilty, L., Ozzoude, M., Dillon, W. A., Rutka, J. A., & Gerretsen, P. (2018). Association between catastrophizing and dizziness-related disability assessed with the dizziness catastrophizing scale. *JAMA Otolaryngology–Head & Neck Surgery, 144*(10), 906-912. doi:10.1001/jamaoto.2018.1863

Quartana, P. J., Campbell, C. M., & Edwards, R. R. (2009). Pain catastrophizing: A critical

review. *Expert Review of Neurotherapeutics, 9*(5), 745-758. doi:10.1586/ern.09.34

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428. doi:10.1037/0033-2909.86.2.420

Strupp, M., & Brandt, T. (2008). Diagnosis and treatment of vertigo and dizziness. *Deutsches Arzteblatt international, 105*(10), 173-180. doi:10.3238/arztebl.2008.0173

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: development and validation. *Psychological Assessment, 7*(4), 524-532. doi:10.1037//1040-3590.7.4.524

Sullivan, M. J. L., & D'Eon, J. L. (1990). Relation between catastrophizing and depression in chronic pain patients. *Journal of Abnormal Psychology, 99*(3), 260-263. doi:10.1037//0021-843x.99.3.260

Sullivan, M. J. L., Thorn, B., Haythornthwaite, J. A., Keefe, F., Martin, M., Bradley, L. A., & Lefebvre, J. C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *The Clinical Journal of Pain, 17*(1), 52-64. doi:10.1097/00002508-200103000-00008

Tamber, A. L., Wilhelmsen, K. T., & Strand, L. I. (2009). Measurement properties of the Dizziness Handicap Inventory by cross-sectional and longitudinal designs. *Health Qual Life Outcomes, 7*, 101. doi:10.1186/1477-7525-7-101

Teggi, R., Manfrin, M., Balzanelli, C., Gatti, O., Mura, F., Quaglieri, S., . . . Bussi, M. (2016). Point prevalence of vertigo and dizziness in a sample of 2672 subjects and correlation with headaches. *Acta Otorhinolaryngologica Italica, 36*(3), 215-219. doi:10.14639/0392-100x-847

Terwee, C. B., Bot, S. D. M., de Boer, M. R., van der Windt, D. A. W. M., Knol, D. L., Dekker, J., . . . de Vet, H. C. W. (2007). Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology, 60*(1), 34-42. doi:10.1016/j.jclinepi.2006.03.012

Terwee, C. B., Prinsen, C. A. C., Chiarotto, A., Westerman, M. J., Patrick, D. L., Alonso, J., . . . Mokkink, L. B. (2018). COSMIN methodology for evaluating the content validity of patient-reported outcome measures: A Delphi study. *Quality of Life Research, 27*(5), 1159-1170. doi:10.1007/s11136-018-1829-0

Tschan, R., Best, C., Wiltink, J., Beutel, M. E., Dieterich, M., & Eckhardt-Henn, A. (2013). Persistence of symptoms in primary somatoform vertigo and dizziness. *The Journal of Nervous and Mental Disease, 201*(4), 328-333. doi:10.1097/NMD.0b013e318288e2ad

Von Korff, M., Jensen, M. P., & Karoly, P. (2000). Assessing global pain severity by self-report in clinical and health services research. *Spine, 25*(24), 3140-3151. Retrieved from https://journals.lww.com/spinejournal/Fulltext/2000/12150/Assessing_Global_Pain_Severity_by_Self_Report_in.9.aspx

Wilhelmsen, K., Strand, L. I., Nordahl, S. H. G., Eide, G. E., & Ljunggren, A. E. (2008). Psychometric properties of the vertigo symptom scale – short form. *BMC Ear, Nose and Throat Disorders, 8*(1), 2. doi:10.1186/1472-6815-8-2

Yardley, L., Burgneay, J., Andersson, G., Owen, N., Nazareth, I., & Luxon, L. (1998). Feasibility and effectiveness of providing vestibular rehabilitation for dizzy patients in the community. *Clinical Otolaryngology and Allied Sciences, 23*(5), 442-448. doi:10.1046/j.1365-2273.1998.00179.x

Yardley, L., Donovan-Hall, M., Smith, H. E., Walsh, B. M., Mullee, M., & Bronstein, A. M. (2004). Effectiveness of primary care-based vestibular rehabilitation for chronic dizziness. *Annals of Internal Medicine, 141*(8), 598-605. doi:10.7326/0003-4819-141-8-200410190-00007