The Dutch Claustrophobia Questionnaire: Psychometric properties and predictive validity

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ABSTRACT

Fear of suffocation and fear of restriction are thought to underlie claustrophobia and can be assessed with the Claustrophobia Questionnaire (CLQ; Radomsky et al., 2001). A first study tested the psychometric properties of a Dutch version of the CLQ. Students (N = 363) completed a Dutch translation of the CLQ and a set of other questionnaires assessing other specific fears, anxiety or depression. Results confirmed the two-factor structure and showed that the Dutch version of the CLQ has good psychometric properties. A second study tested the predictive validity of the Dutch CLQ. Participants (N = 23) were exposed each to nine claustrophobic situations with elements of suffocation, restriction or both. The Dutch CLQ was found to be a significant predictor of fear and respiratory reactivity during claustrophobic exposure. It can be concluded that the Dutch version of the CLQ is a reliable and valid instrument to assess claustrophobic fear.

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Claustrophobia, the fear of enclosed spaces, is a rather common specific phobia with a prevalence of 4% in the general population (Öst, 2007). Two major fear components are assumed to underlie the disorder: fear of restriction and fear of suffocation (Rachman & Taylor, 1993). Restriction is aversive and the fear experienced by claustrophobic patients in an enclosed space may, from an evolutionary perspective, resemble the fear that animals display when they cannot escape from a (potentially) dangerous situation (Rachman, 1997). This fear of restriction is not entirely independent from the other claustrophobic fear component, fear of suffocation. Because people need a constant supply of air to stay alive, possibility of getting an insufficient amount of air is a prominent threat. Following Rachman (1997), fear of suffocation will arise when (a) people think that there is insufficient air supply in the room, (b) access to air is hampered or interrupted externally, e.g., by breathing through a mask, and (c) there is sufficient air present in the room, but the air is thought to be blocked by a physiological malfunction, for example insufficient airflow through the trachea. Also a misinterpretation of bodily signals may trigger fear of suffocation (Rachman, 1997).

The two-dimensional structure of claustrophobia was confirmed by Rachman and Taylor back in 1993 (Rachman & Taylor, 1993). Participants were asked how much fear they would experience in each of 36 claustrophobic situations. A principal component analysis confirmed that two factors, interpreted as fear of restriction and fear of suffocation, were underlying self-reported claustrophobic fear. Based on this study, Rachman and Taylor (1993) developed the ‘The Claustrophobia Questionnaire’ (CLQ). Radomsky, Rachman, Thordarson, McIsaac, and Teachman (2001) further developed the CLQ and reduced it to 26 items. They applied a principal component analysis with direct oblimin rotation, resulting in a two-factor solution with 26 items, 14 items for the suffocation scale and 12 items for the restriction scale. Both factors were moderately correlated (r = .53) and accounted for 44% of the total variance in self-reported fear. Also normative data, internal consistency, discriminant validity and test–retest reliability of the 26-item CLQ were investigated. Radomsky et al. (2001) concluded that the CLQ has strong psychometric properties: it discriminates between healthy and claustrophobic individuals, it has a good internal consistency with Cronbach αs of .95, .85 and .96 for the CLQ total score, the suffocation scale and the restriction scale, respectively, and the test–retest reliability is high (r = .89 for the suffocation scale, r = .77 for the restriction scale and r = .89 for the total CLQ). Finally, they showed that the CLQ predicts subjective fear, bodily sensations, and apprehensive cognitions during exposure to a small enclosed space. Also several other studies have confirmed the predictive validity of the CLQ (e.g., Harris, Robinson, & Menzies, 1999; McGlynn, Karg, & Lawyer, 2003; McGlynn, Smitherman, Hammel, & Lazarte, 2007; McIsaac, Thordarson, Shafran, Rachman, & Poole, 1998).
However, only a limited number of studies have addressed the question whether the suffocation and restriction scales of the CLQ can differentially predict fear experienced in restriction and suffocation situations, respectively. Whereas several studies show that the suffocation scale is predictive of anxious responding to laboratory challenges inducing breathlessness (e.g., Efert, Zvolensky, Sorrell, Hopko, & Lejuez, 1999; Eke & McNally, 1996; Rassovsky, Kushner, Schwarze, & Wagensteen, 2000; Shiperd, Beck, & Ohtake, 2001) less is known on the specific predictive validity of the restriction scale. In a study by Van Diest et al. (2005) participants completed a Dutch ad-hoc translation of six items loading high on the restriction scale and six other items loading high on the suffocation scale of the English version of the CLQ (Radomskey et al., 2001). Next, participants had to imagine three standardized fear scripts, one depicting a situation with aspects of both restriction and risk of suffocation, one referring to restriction only, and one referring to neither claustrophobic fear components. Interestingly, participants’ scores on the restriction scale predicted subjective fear, but not respiratory reactivity to imagined restriction; scores on the suffocation scale were not related to self-reported fear or respiratory reactivity during the imagined exposure.

The present studies aimed to (a) develop a validated Dutch version of the CLQ and (b) further explore the predictive validity of the CLQ. In particular, we aimed to address the question to what extent the restriction and the suffocation scales of the Dutch CLQ allow for prediction of actual fear and respiratory reactivity in claustrophobic situations with or without restriction and/or risk of suffocation.

1. Study 1: Validation of the Dutch CLQ

The first study aimed to develop a Dutch version of Radomskey et al.’s (2001) Claustrophobia Questionnaire.

1.1. Method

1.1.1. Participants
Participants were 371 undergraduate, Dutch-speaking students (282 women) aged 18–23 years old. They all received course credit in return for their participation. All participants provided an informed consent. The study was approved by the Ethics Committee of the Department of Psychology (University of Leuven, Belgium).

1.1.2. Procedure
The English CLQ was translated and back-translated several times until agreement was reached among three Dutch-speaking persons with a profound knowledge of English. Next, during two 1-h group sessions one week apart, participants completed the Dutch translation of the CLQ once, as well as a series of other questionnaires (see below).

1.1.3. Measures
1.1.3.1. The Claustrophobia Questionnaire (CLQ; Radomskey et al., 2001). Participants had to rate the 26 claustrophobic items on a five-point scale ranging from 0 (not at all anxious) to 4 (extremely anxious).

1.1.3.2. The Beck Depression Inventory-II-NL (BDI-II-NL; van der Droes, 2002). The BDI-II (Beck, Steer, & Brown, 1996) is a frequently used questionnaire to measure self-experienced cognitive and somatic symptoms of depression. The Dutch translation of the BDI-II, the BDI-II-NL has good psychometric qualities. The internal consistency is high with Cronbach α of .92 and .88 for a patient population and a control population, respectively. Also the test-retest reliability (r = .82) and the convergent validity are good (van der Droes, 2002). Cronbach α in our sample of students was .88.

1.1.3.3. The Dutch NEO Five-Factor Inventory (NEO-FFI-NL; Hoekstra, Ormel, & De Fruyt, 1996). The Dutch version of the NEO-FFI (NEO-FFI-NL) contains 60 questions assessing the big five personality traits, Neuroticism (NEO-FFI-NL-N), Extraversion, Openness to experience, Altruism and Conscientiousness. For the present study, only scores on Neuroticism were investigated. This subscale obtained a Cronbach α of .86 in our sample.

1.1.3.4. Spielberger’s State-Trait Anxiety Inventory (STAI; Spielberger, 1983). Barennes, Harp, and Jung (2002) reviewed 816 papers in which the STAI was used to measure trait and state anxiety. They report a mean internal consistency of .91 and .89 for the state and trait subscales, respectively. The mean of the test-retest reliability was .70 for the state and .88 for the trait subscale. van der Ploeg (2000) translated the STAI into Dutch. He reported Cronbach αs of .92 (state) and .90 (trait). Cronbach α in our student sample was .82.

1.1.3.5. Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI-3 is a multidimensional measurement of anxiety sensitivity. It encompasses three factors: Physical Concerns, Cognitive Concerns, and Social Concerns. The validation study of the Dutch version demonstrated a good validity of the factor structure, as well as a good internal consistency for each of the three scales (Cronbach αs were .80 for Physical Concerns, .81 for Cognitive Concerns, and .76 for Social Concerns; Taylor et al., 2007). Cronbach α for the total scale in our student sample was .83.

1.1.3.6. Fear of Pain Questionnaire-III (FPQ-III; McNiel & Rainwater, 1998). The FPQ-III consists of 30 items related to the fear of severe pain, minor pain, and medical pain. These factors accounted for 51% of total variance. The scales of the questionnaire are internally consistent with Cronbach αs of .88, .87, .87, and .92 for the three subscales and the total scale, respectively. The test-retest reliability is also good with correlations of .69, .73, .76, and .74 for the three subscales and the total scale, respectively (McNeil & Rainwater, 1998). Roelofs, Peters, Deutz, Spijker, and Vlaeyen (2005) translated this questionnaire into Dutch. They also found evidence for the three subscales, severe pain, minor pain, and medical pain. For a sample of first-year college students, they found Cronbach αs .93, .88, .86, and .88 for the total FPQ-III and the subscales, respectively. For a sample of first-year and higher-year college students they found Cronbach αs .91, .89, .82, and .85 for the total FPQ-III and the subscales, respectively. They reported a moderate to good test-retest stability and a good convergent and predictive validity. Cronbach α in our sample of students was .92 for the total FPQ-III.

1.1.3.7. The Claustrophobia Scale (CS; Öst, 2007). The claustrophobia scale consists of two scales: one scale measuring anxiety (CSA) and one scale assessing avoidance behavior (CSB). We translated both scales ourselves, because no Dutch validated version is available. The English SC has a high reliability with Cronbach αs .97 and .81 for the anxiety and avoidance subscales, respectively. In our translated Dutch version, the anxiety subscale had a Cronbach α .89; Cronbach α for the avoidance subscale was .80.

1.1.3.8. Fear Survey Schedule-III (FSS-III; Wolpe & Lang, 1964). This questionnaire assesses specific fears. Psychometric properties for a Dutch version of the FSS-III have been described by Arinell (1980) and are good, with a Cronbach α of .95. Cronbach α for the total scale in our sample was .97. Three items of the FSS-III involve claustrophobic fear (FSS-III-CL), such as fear of ‘crowds,’ ‘being in an elevator,’ and ‘enclosed spaces.’ The other 73 items are classified...
in six categories all measuring another specific fear: ‘animal’ (FSS-III-A), ‘social or interpersonal’ (FSS-III-S), ‘tissue damage, illness and death, and their associations’ (FSS-III-T), ‘noises’ (FSS-III-N), ‘other classical phobias’ (FSS-III-O), and ‘miscellaneous’ (FSS-III-M).

1.1.4. Data analyses

As we have a clear hypothesis about the factorial structure of the CLQ (i.e., two-factorial), confirmatory factor analyses (CFAs) were performed with LISREL 8.71 (Jöreskog & Sörbom, 2004). To test whether the power of the two-factor model of Radomsky et al. (2001) was large enough to reject a more parsimonious one-factor alternative, we fitted an additional one-factor model (Bentler, 2007), assuming one general underlying claustrophobia factor. For the two-factor model, each item loaded on its corresponding factor: restriction or suffocation, as specified in Radomsky et al. (2001). Both latent factors were allowed to correlate.

Because our indicators are categorical variables, CFA models were estimated using a Robust Weighted Least Square estimation method, on the polychoric correlations, weighted by the asymptotic variances (Flora & Curran, 2004). Fit was assessed by multiple criteria: Satorra-Bentler scales Chi-square values for absolute fit, comparative fit index (CFI) for fit relative to a null model and, additionally, the root mean squared error of approximation (RMSEA). Criteria for fit were defined according to Hu and Bentler (1999) as CFI > .97 and RMSEA < .06. Fit of nested models is compared with Chi-square difference test.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>Satorra-Bentler Chi²</th>
<th>AIC</th>
<th>CFI</th>
<th>RMSEA</th>
<th>NNFI</th>
<th>NFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-factor model</td>
<td>299</td>
<td>1184.35</td>
<td>1288.35</td>
<td>.94</td>
<td>.09</td>
<td>.93</td>
<td>.91</td>
</tr>
<tr>
<td>Two-factor model</td>
<td>298</td>
<td>697.34</td>
<td>803.34</td>
<td>.97</td>
<td>.06</td>
<td>.97</td>
<td>.95</td>
</tr>
</tbody>
</table>

Note: AIC, Akaike’s Information Criterion; CFI, Comparative Fit Index; RMSEA, Root Mean Squared Error of approximation; NNFI, Non-Normed Fit Index; NFI, Normed Fit Index.

To investigate internal consistency, Cronbach αs were calculated for the Dutch CLQ, the restriction scale, and the suffocation scale.

In order to study the convergent validity, correlations were calculated between CLQ scores and scores on (sub)scales of other questionnaires tapping claustrophobic fears (SC and FSS-III-CL).

The divergent validity of the Dutch CLQ was investigated using t-tests, comparing the correlations of the Dutch CLQ with other measures of claustrophobia (SC, FSS-III-CL) with those of the Dutch CLQ with questionnaires assessing other fears (FSS-III-A, the FSS-III-S, the FSS-III-T, the FSS-III-N, the FSS-III-O, the FSS-III-M FPQ-III, ASI-3), depression (BDI-II-NL), trait anxiety (STAI), and Neuroticism (NEO-II-NL).

1.2. Results

1.2.1. Factor structure

The two-factor model obtained a better fit than the one factor model (Chi-Square difference = 487.01; df = 1; p < .001). Moreover, the two-factor model obtained a reasonable fit to the data (see Table 1). Both factors correlated .68. Factor loadings of the two-factor model are presented in Table 2.

1.2.2. Normative data

Means and standard deviations of the Dutch CLQ items can be found in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
<th>M (R)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing in the trunk of a car with air flowing through freely for 15 min</td>
<td>.77</td>
<td>1.77</td>
<td>1.28</td>
</tr>
<tr>
<td>Lying in a tight sleeping bag enclosing legs and arms, tied at the neck, unable to get out for 15 min</td>
<td>.70</td>
<td>1.44</td>
<td>1.12</td>
</tr>
<tr>
<td>Caught in tight clothing and unable to remove it</td>
<td>.57</td>
<td>.95</td>
<td>.96</td>
</tr>
<tr>
<td>Head First into a zipped up sleeping bag, able to leave whenever you wish</td>
<td>.56</td>
<td>.88</td>
<td>1.06</td>
</tr>
<tr>
<td>Swimming while wearing a nose plug</td>
<td>.44</td>
<td>.29</td>
<td>.63</td>
</tr>
<tr>
<td>Working under a sink for 15 min</td>
<td>.70</td>
<td>.24</td>
<td>.59</td>
</tr>
<tr>
<td>Working under a sink for 15 min</td>
<td>.70</td>
<td>.40</td>
<td>.79</td>
</tr>
<tr>
<td>Trying to catch your breath during vigorous exercise</td>
<td>.55</td>
<td>.31</td>
<td>.59</td>
</tr>
<tr>
<td>Having a bad cold and finding it difficult to breath through your nose</td>
<td>.58</td>
<td>.31</td>
<td>.61</td>
</tr>
<tr>
<td>Snorkelling in a safe practice tank for 15 min</td>
<td>.51</td>
<td>.43</td>
<td>.77</td>
</tr>
<tr>
<td>Using an oxygen mask</td>
<td>.60</td>
<td>.58</td>
<td>.72</td>
</tr>
<tr>
<td>Lying under a sink for 15 min</td>
<td>.59</td>
<td>.14</td>
<td>.45</td>
</tr>
<tr>
<td>Standing in the middle of the third row at a packed concert realizing that you will be unable to leave until the end</td>
<td>.55</td>
<td>.49</td>
<td>.83</td>
</tr>
<tr>
<td>In the centre of a full row at a cinema</td>
<td>.47</td>
<td>.10</td>
<td>.36</td>
</tr>
<tr>
<td>At the furthest point from an exit on a tour of an underground mine shaft</td>
<td>.64</td>
<td>1.02</td>
<td>1.04</td>
</tr>
<tr>
<td>Lying in a sauna for 15 min</td>
<td>.53</td>
<td>.30</td>
<td>.68</td>
</tr>
<tr>
<td>Working under a sink for 15 min</td>
<td>.58</td>
<td>.28</td>
<td>.67</td>
</tr>
</tbody>
</table>

Note: S, suffocation scale of the Dutch CLQ; R, restriction scale of the Dutch CLQ.

Standing in the middle of the third row at a packed concert realizing that you will be unable to leave until the end
2. Study 2: Predictive validity of the Dutch CLQ

The aim of the second study was to investigate to what extent the Dutch CLQ and its subscales predict self-reported fear and respiratory reactivity during actual exposure to different claustrophobic situations. To this end, participants were exposed to nine claustrophobic situations that varied with respect to the presence or absence of elements of restriction and risk of suffocation. We hypothesized that (a) the restriction scale would be the better predictor for reactivity to restriction situations without elements referring to risk of suffocation, (b) the suffocation scale would be the better predictor for reactivity to situations referring to risk of suffocation but without restriction, and (c) the total score on the Dutch CLQ would predict fearful responding to all types of claustrophobic situations.

2.1. Method

2.1.1. Participants

Based on the factor scores on fear of suffocation and fear of restriction, which were calculated for each of the 362 participants from study 1, 41 students scoring high for restriction or suffocation (not both) were invited for the experiment in a first wave. Because only 8 participants could be recruited this way, all 362 participants from study 1 were invited in a second wave. A total 23 students volunteered to participate in return for course credit or a fee of 7 Euro. Three of them were men. The study was approved by the ethical commission of Psychology Department of the University of Leuven.

2.1.2. Measures

2.1.2.1. Subjective measures. Before entering each claustrophobic situation, participants rated how fearful they expected to be in that particular situation (PRE). After exposure, participants rated their average fear level during the exposure (POST) and during the most fearful moment (PEAK). Each of these questions was rated on an 11-point Likert scale ranging from 0 (not at all fearful) to 10 (extremely fearful).

2.1.2.2. Physiological measures. Cardio-respiratory activity was measured continuously with the LifeShirt System (VivoMetrics, Inc., Ventura, CA), an ambulatory system using inductive plethysmography and ECG. End-tidal CO2 was monitored using a nasal Capnograph, with a sampling flow rate of 50 ml/min. The monitor uses Microstream non-dispersive infrared (NDIR) spectroscopy to continuously measure the percentage of CO2 at the end of an expiration (PetCO2). PetCO2 is a good estimate of the level of CO2 in the blood (Gardner, 1996). The CO2-signal was recorded using the VivoLogic software. End-tidal values for each breath were extracted off-line with PSychoPhysiological Analysis (PSPHA – De Clerck, Verschuere, Crombez, & De Vlieger, 2006), a modular script-based program which we further developed to perform such parameter extraction. All waveforms were visually inspected off-line and technical abnormalities and artifacts were eliminated using the PSPHA software.

The present paper will only report findings on PetCO2, because of two reasons. First, in contrast to parameters of heart rate and
timing and volume components of the respiratory cycle, FetCO₂
varies not as a function of muscle activity and body position,
for which the nine claustrophobic situations were not equalized.
Because blood gases of healthy humans are kept rather constant,
even under changing metabolic conditions, the end-tidal CO₂ level
is not expected to differ between situations where participants
have to stand, to sit down or to walk from one room to another.
In addition, FetCO₂ is the most relevant indicator of hyperventila-
tion, a situational respiratory stress response in which more CO₂ is
breathed out than is actually being produced by the body, leading
to a decreased pressure of CO₂ in the blood and in the exhaled air
(Van Diest et al., 2001).

2.1.3. Procedure

After providing their informed consent, participants put on the
lifeshirt and the nasal cannula. Following this, a 10 min baseline
registration of resting heart rate, respiration and FetCO₂ was per-
formed. Next, the experimenter explained to the participants that
they would be asked to enter several particular situations and that
they would be asked to rate on a scale from 0 to 10 (1) how fearful
they expected themselves to be in that situation (PRE), (2) the
maximum fear level they had experienced during actual exposure
to the situation (PEAK), and (3) their average level of fear during
the actual exposure (POST).

The nine claustrophobic situations were composed by crossing
two independent variables with three levels each. The first vari-
able (‘Situation’) referred to whether the claustrophobic exposure
involved (a) standing in a large room (‘standing large’), (b) sit-
ting on a chair in the large room (‘sitting large’), or (c) standing
in a small room (‘standing small’). The second independent vari-
able referred to the claustrophobic fear that the situation intended
to evoke: (a) only restriction (‘R’), (b) only suffocation (‘S’), or (c)
both restriction and suffocation (‘RS’). Both variables were fully
crossed, yielding nine situations. Nine presentation orders for these
nine situations were created in such a way that the same situation
(standing large/sitting large/standing small) and the same claustro-
phobic component (RS/R/S) were never presented twice in a row.
Participants were counterbalanced across these nine presentation
orders. Each situation lasted for 2 min, but participants were not
informed on this.

In situation ‘standing large-S’ participants had to stand in a large
room (5.10 × 6.85 m, 3 m high) while wearing a face mask covering
their nose and mouth and wearing a shawl around their neck.

In situation ‘standing large-R’ participants had to stand up in a
locked dark closet that was placed in the large room. The closet had
a surface of 1 × 4 m, was 1.85 m high and had 30 visible holes in the
back of the closet with a diameter of .5 cm. These holes aimed to
suggest a supply of ‘fresh air’ while the participant remained in the
closet.

In situation ‘standing large-RS’ participants had to stay in a sim-
ilar, locked dark closet without such holes, suggesting that no fresh
air was available.

In situation ‘sitting large-R’ participants were sitting in the large
room with their hands handcuffed behind their back and with their
feet tied to the chair with a rope. In situation ‘sitting large-S’ partic-
IPs were wearing a mask covering their nose and mouth while
sitting on a chair in the large room.

In situation ‘sitting large-RS’ participants were sitting down in a
large room while tied up to the chair in a similar ways as in situation
‘sitting large-R’. In addition, they were wearing a face mask covering
their nose and mouth.

In situation ‘standing small-R’ participants were locked up in a
dark, small room. A fan provided fresh air in the room. The room’s
surface was 220 × 90 cm and had a small kitchenette in the back;
the height of the room was 270 cm.

In situation ‘standing small-S’ participants were standing in the
same small room, but now the room was unlocked, the fan was
removed and they were wearing a neck supportive bandage.

In situation ‘standing small-RS’ participants were wearing a
neck bracket and were locked up in the small room, without the
fan.

Before entering each of the nine situations, participants received
both oral and written information about the specificities of situa-
tion. For example, in situation ‘standing-RS’ participants were told
“In a moment, you will enter this closet and we will lock you in with
this key. Next, we will leave the room. After a while, we will re-enter
the room to unlock the closet, so you can come out.” The same infor-
mation was written down on a sheet, which they were asked to read
after the explanation by the experimenter. Then, participants were
asked to rate how much fear they expected to experience during
the situation (PRE question). Following this, participants entered
the situation for two minutes without knowing the duration of the
exposure. After the exposure, participants completed the other fear
ratings (PEAK and POST). This procedure was repeated for each of
the other eight situations. After the experiment the LifeShirt was
disconnected and participants changed back into their own clothes.
They received their course credit or money, were debriefed and
thanked for their participation.

2.1.4. Analyses

2.1.4.1. Subjective measurements. In order to reduce the amount
of dependent variables, a sum of the three fear scores (PRE, PEAK,
and POST) was calculated for each situation and each participant.
In a next step, these scores were averaged across the RS, R, and
S situations for each participant, yielding three fear indexes per
participant: fear in situations characterized by both claustrophobic
components (fear RS), fear in situations with only risk of suffoc-
ation (fear S), and fear in situations with only the restriction component
(fear R). These fear indexes were correlated with each individual’s
scores on the Dutch CLQ and its subscales (fear of restriction and
fear of suffocation), as well as with the(sub)scores on all other
questionnaires (FSS-III-CL, SCA, SCB, BDI-III-NL, NEO-II-NL-N, STAI,
ASI-3, FPQ-III, FSS-III-A, FSS-III-S, FSS-III-T, FSS-III-N, FSS-III-O, and
FSS-III-M).

2.1.4.2. Fractional end-tidal CO₂ (FetCO₂). FetCO₂s of each breath
were averaged across each 2 min exposure for each participant. The
mean FetCO₂ during the 10 min baseline was subtracted from these
mean FetCO₂s during each of the nine exposures, yielding an index
of reactivity in FetCO₂ for each situation. These reactivity scores in
FetCO₂ were averaged across the three RS situations, the three R
situations and the three S situations per participant. In a final step,
these reactivity scores in FetCO₂ were correlated with each individu-
al’s scores on the Dutch CLQ and its subscales (fear of restriction and
fear of suffocation), as well as with the(sub)scores of all other
questionnaires (FSS-III-CL, SCA, SCB, BDI-II-NL, NEO-II-NL-N, STAI,
ASI-3, FPQ-III, FSS-III-A, FSS-III-S, FSS-III-T, FSS-III-N, FSS-III-O, and
FSS-III-M).

2.2. Results

2.2.1. Self-reported fear

Mean scores of the participants on the Dutch CLQ and its
subscales as assessed in study 1 were: M = 23.24 (SD = 11.83)
for the total score, M = 15.15 (SD = 8.83) for the restriction scale
and M = 7.55 (SD = 6.16) for the suffocation scale. The correlation
between both scales was not significant in this sample (r = .23,
N = 21, see Fig. 1 for a scatter plot showing how participants were
distributed across both subscales).

Table 4 displays the mean self-reported fear scores and standard
deviations for the nine claustrophobic situations.
Table 5 shows the correlations between self-reported fear to actual exposure and the questionnaire data. Fear RS, Fear R and fear S did not correlate with any of the questionnaires not assessing claustrophobic fear. In contrast with this, several significant correlations were observed between the Dutch CLQ or its subscales on the one hand, and self-reported fear during actual claustrophobic exposure on the other hand. More specifically, the total score on the Dutch CLQ showed significant, moderate, positive correlations with Fear RS, Fear R and Fear S. The restriction subscale of the Dutch CLQ was moderately correlated with Fear S and Fear R, but not with Fear RS. The correlations of the suffocation subscale of the Dutch CLQ with Fear RS, Fear R and Fear S did not reach significance. Also the other measures of self-reported claustrophobic fear (FSS-III-CL, CSA, CSB) showed significant, moderately strong correlations with Fear RS, Fear R and Fear S. An exception to this was the non-significant correlations between FSS-III-CL and Fear RS.

2.2.2. FetCO2

Mean changes in FetCO2 in response to the three types of claustrophobic situations were: M = −.10 (SD = .14) for RS situations, M = −.08 (SD = .15) for R situations and M = .01 (SD = .17) for suffocation situations.

Table 6 displays correlations between changes in FetCO2 during exposure to claustrophobic situations of each type and the questionnaire data. Higher scores on the Dutch CLQ were significantly associated with a stronger decrease in FetCO2 during actual exposure to situations with both elements of suffocation and restriction (RS). The correlations between the subscales on the one hand, and

Table 4

<table>
<thead>
<tr>
<th>Situations</th>
<th>Fear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Standing large-RS</td>
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<td>Standing large-R</td>
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<td>Sitting large-S</td>
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<tr>
<td>Standing small-RS</td>
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<tr>
<td>Standing small-R</td>
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<tr>
<td>Standing small-S</td>
<td>10.22</td>
</tr>
</tbody>
</table>

Note: RS, situations with restriction and risk of suffocation; R, situations with restriction and without risk of suffocation; S, situations with risk of suffocation and without restriction.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>Fear RS</th>
<th>Fear S</th>
<th>Fear R</th>
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<tbody>
<tr>
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<td>.53*</td>
<td>.55*</td>
</tr>
<tr>
<td>S</td>
<td>.26</td>
<td>.31</td>
<td>.28</td>
</tr>
<tr>
<td>R</td>
<td>.42</td>
<td>.45*</td>
<td>.52*</td>
</tr>
<tr>
<td>FSS-III-CL</td>
<td>.39</td>
<td>.51*</td>
<td>.55*</td>
</tr>
<tr>
<td>CSA</td>
<td>.55*</td>
<td>.50*</td>
<td>.60*</td>
</tr>
<tr>
<td>CSB</td>
<td>.48*</td>
<td>.48*</td>
<td>.49*</td>
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<tr>
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<td>.23</td>
<td>.23</td>
</tr>
<tr>
<td>NEO-FFI-NL-N</td>
<td>.08</td>
<td>.21</td>
<td>.26</td>
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<tr>
<td>STAI</td>
<td>−.01</td>
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<td>.16</td>
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<tr>
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<td>.03</td>
<td>.03</td>
<td>.03</td>
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<tr>
<td>FPQ-III</td>
<td>.05</td>
<td>.15</td>
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<td>.23</td>
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<td>FSS-III-S</td>
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<td>.10</td>
<td>.16</td>
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<tr>
<td>FSS-III-T</td>
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<td>FSS-III-O</td>
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<tr>
<td>FSS-III-M</td>
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<td>−.02</td>
<td>.02</td>
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</tbody>
</table>

Note: RS, situations with restriction and risk of suffocation; S, situations with risk of suffocation only; R, situations with restriction only; FSS-III-CL, claustrophobia subscale of the Fear Survey Schedule-III; CSA, anxiety subscale of the Claustrophobia Questionnaire; CSB, avoidance behavior subscale of the Claustrophobia Questionnaire; BDI-II-NL, Dutch version of the Beck Depression Inventory-II; NEO-FFI-NL-N, Neuroticism subscale of the Dutch NEO Five-Factor Inventory; STAI, Spielberger’s State-Trait Anxiety Inventory; ASI-3, Anxiety Sensitivity Index-3; FPQ-III, Fear of Pain Questionnaire-III; FSS-III-A, animal subscale of the Fear Survey Schedule-III; FSS-III-S, social or interpersonal subscale of the Fear Survey Schedule-III; FSS-III-T, tissue damage. FSS-III-N, noises subscale of the Fear Survey Schedule-III; FSS-III-O, other classical phobias subscales of the Fear Survey Schedule-III; FSS-III-M, miscellaneous subscale of the Fear Survey Schedule-III.

Table 6

<table>
<thead>
<tr>
<th></th>
<th>dFetCO2 RS</th>
<th>dFetCO2 S</th>
<th>dFetCO2 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLQ</td>
<td>−.47*</td>
<td>−.32</td>
<td>−.37</td>
</tr>
<tr>
<td>S</td>
<td>−.27</td>
<td>−.24</td>
<td>−.28</td>
</tr>
<tr>
<td>R</td>
<td>−.42</td>
<td>−.36</td>
<td>−.21</td>
</tr>
<tr>
<td>FSS-III-CL</td>
<td>−.31</td>
<td>−.31</td>
<td>−.41</td>
</tr>
<tr>
<td>CSA</td>
<td>−.27</td>
<td>−.24</td>
<td>−.38</td>
</tr>
<tr>
<td>CSB</td>
<td>−.25</td>
<td>−.27</td>
<td>−.15</td>
</tr>
<tr>
<td>BDI-II-NL</td>
<td>.13</td>
<td>.01</td>
<td>.05</td>
</tr>
<tr>
<td>NEO-FFI-NL-N</td>
<td>−.21</td>
<td>−.02</td>
<td>.10</td>
</tr>
<tr>
<td>STAI</td>
<td>−.01</td>
<td>−.07</td>
<td>−.02</td>
</tr>
<tr>
<td>ASI-3</td>
<td>.04</td>
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<tr>
<td>FPQ-III</td>
<td>−.11</td>
<td>−.18</td>
<td>−.05</td>
</tr>
<tr>
<td>FSS-III-A</td>
<td>−.30</td>
<td>−.39</td>
<td>−.38</td>
</tr>
<tr>
<td>FSS-III-S</td>
<td>.01</td>
<td>.01</td>
<td>.07</td>
</tr>
<tr>
<td>FSS-III-T</td>
<td>−.26</td>
<td>−.26</td>
<td>−.21</td>
</tr>
<tr>
<td>FSS-III-N</td>
<td>−.18</td>
<td>−.20</td>
<td>−.22</td>
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<tr>
<td>FSS-III-O</td>
<td>−.20</td>
<td>−.33</td>
<td>−.27</td>
</tr>
<tr>
<td>FSS-III-M</td>
<td>.07</td>
<td>−.06</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note: dFetCO2, reactivity in Fractional End-tidal CO2; RS, situations with restriction and risk of suffocation; S, situations with risk of suffocation only; R, situations with restriction only; FSS-III-CL, claustrophobia subscale of the Fear Survey Schedule-III; CSA, anxiety subscale of the Claustrophobia Questionnaire; CSB, avoidance behavior subscale of the Claustrophobia Questionnaire; BDI-II-NL, Dutch version of the Beck Depression Inventory-II; NEO-FFI-NL-N, Neuroticism subscale of the Dutch NEO Five-Factor Inventory; STAI, Spielberger’s State-Trait Anxiety Inventory; ASI-3, Anxiety Sensitivity Index-3; FPQ-III, Fear of Pain Questionnaire-III; FSS-III-A, animal subscale of the Fear Survey Schedule-III; FSS-III-S, social or interpersonal subscale of the Fear Survey Schedule-III; FSS-III-T, tissue damage. FSS-III-N, noises subscale of the Fear Survey Schedule-III; FSS-III-O, other classical phobias subscales of the Fear Survey Schedule-III; FSS-III-M, miscellaneous subscale of the Fear Survey Schedule-III.

p < .05.
reactivity in FetCO\textsubscript{2} during actual exposure on the other hand, were not significant. A similar pattern of results was present for the correlations between other questionnaires measuring claustrophobia (CSA, CSB, FSS-III-CL) and reactivity in FetCO\textsubscript{2} during actual exposure. Reactivity in FetCO\textsubscript{2} during actual claustrophobic exposure did not correlate with scores on any of the questionnaires not assessing claustrophobic fear.

3. Discussion

A first study aimed to validate the Dutch version of the CLQ. In accordance with the original English version of the CLQ (Rachman & Taylor, 1993; Radomsky et al., 2001), the Dutch CLQ consists of two factors, fear of restriction and fear of suffocation. The internal consistency of the Dutch CLQ is acceptable and comparable to those found for the English CLQ (Radomsky et al., 2001), confirming that it is a reliable instrument.

Furthermore, our results also showed that the Dutch CLQ has a good divergent and convergent validity. Whereas it correlates strongly with other self-report measures of claustrophobia, the correlations with questionnaires measuring specific fears other than claustrophobia, depression, and dispositional anxiety or neuroticism were substantially lower. Therefore, our findings also provide preliminary evidence for the validity of the Dutch CLQ as a measure of claustrophobia.

The predictive validity of the Dutch CLQ was examined in a second, experimental study. To this end, associations between scores of the Dutch CLQ and fear experienced in actual claustrophobic situations were explored. The pattern of results indicates that self-reported fear and respiratory reactivity (as reflected in decreases in end-tidal Fractional CO\textsubscript{2}) during claustrophobic exposure are related to individuals’ scores on the Dutch CLQ. There were positive associations between the total CLQ score and self-reported fear during situations in which both restriction and fear of suffocation were prominent, and between the restriction scale and subjective fear during situations with restriction only. The latter finding contrasts somewhat with findings from McGlynn et al. (2007) who reported that fear of restriction did not significantly contribute in path models of subjective fear during exposure to a mock scanner environment. Interestingly, scores on the restriction, but not those on the suffocation scale correlated significantly with self-reported fear during exposure to situations with risk of suffocation only. The origin of this finding is unclear, but it may relate to the specifics of the employed operationalizations. For example, an implicit social demand of the experimenter expecting somehow the participant to complete the entire experiment may have constituted an element of ‘restriction’, even in the suffocation-only situations. Therefore, we recommend future studies to include a manipulation check to see whether the exposure situations actually trigger the claustrophobic fear component(s) they intended to trigger.

Whereas several studies found that the CLQ did not predict cardiac responses during actual claustrophobic exposure (e.g., McGlynn et al., 2003; McGlynn, Smitherman, & Mulfinger, 2006), the present study found that scores on the Dutch CLQ were associated with a stronger decrease in FetCO\textsubscript{2} during exposure to claustrophobic situations. This is a rather surprising finding, given that no to very low associations between self-reports of fear and physiological reactivity are very common (Rachman & Hodgson, 1974). A speculative explanation for the presently observed concordance between self-reports and reactivity in FetCO\textsubscript{2} may be that a tendency towards hyperventilation may be an evolutionary ‘prepared’ response to claustrophobic situations (Van Diest et al., 2005).

A limitation of the present work is the small number of participants in study 2. Particularly the findings on reactivity in FetCO\textsubscript{2} may be underpowered, so that potentially low to moderate correlations between reactivity in FetCO\textsubscript{2} with each of the CLQ subscales may have remained undetected. Other limitations include the relative lack of men in our sample and the absence of test-retest reliability evidence.

In summary, the Dutch CLQ seems a reliable and valid instrument to measure self-reported claustrophobic fear. Similar to the English and French versions of the CLQ (Radomsky et al., 2001, 2006), it consists of two subscales, referring to restriction fear and fear of suffocation. Whereas the predictive validity of the total score of the Dutch CLQ is good both for self-reported fear and respiratory reactivity, the predictive validity of the restriction and suffocation subscales seems much weaker. More research is needed to further investigate the predictive, convergent, and discriminant validity of both subscales.

References


