# Cognitive Interviewing: A Qualitative Tool for Improving Questionnaires in Sport Science

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# Cognitive Interviewing - a Qualitative Tool for Improving

## Questionnaires in Sport Science

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40 Cognitive Interviewing - a Qualitative Tool for Improving

41 Questionnaires in Sport Science

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43                                                    Abstract

44          Cognitive models postulate that respondents to a questionnaire follow a four-stage process

45     when answering a question: comprehension, memory retrieval, decision and response. Cognitive In-

46     terviewing is a qualitative tool to gain insight into this process by means of letting respondents think

47     aloud or asking them specific questions (Willis, 2005). It allows one to evaluate whether an individu-

48     al respondent understands and processes the instrument's items as was intended by the instrument's

49     developer. Flaws and errors in the item response stemming from any of the four stages can be de-

50     tected. However, Cognitive Interviewing has rarely been employed in the construction of question-

51     naires in sport science. In order to promote its use, a short introduction is given and an example

52     from sport psychology is provided. Potential applications for the enhancement of questionnaire

53     construction in sport science, for example in cross-cultural studies, are also discussed.

54

55     *Key words: questionnaire design, question answering process, cognitive interview, competitive anxiety*

56

57                                                     Introduction

58          In the construction of tests or questionnaires, and for the evaluation of their test criteria,

59    elaborate methods are employed, such as Structural Equation Modeling or latent trait/ latent class

60    analysis (cf. Marsh, 2007; Strauss, 1999). They rely on quantitative data and take a nomothetic ap-

61    proach, leaving the individual user of that instrument, the respondent, aside (Biemer, 2004). Thus,

62    these quantitative methods rest on the assumption that the meaning of the question, as intended by

63    the survey developer, is consistent with the respondent's interpretation of that question (Hughes,

64    2004). This assumption, however, is rarely tested.

65          One means of testing this crucial assumption and of identifying problems in the question an-

66    swering process of respondents (and the resulting flaws in a questionnaire) is Cognitive Interviewing.

67    It can provide us with information about the manner in which the respondents understand, mentally

68    process and respond to the material we present them, especially involving potential breakdowns dur-

69    ing this procedure (Willis, 2005). The comparison between the respondent's processing of each item

70    and that intended by the researcher can enhance wording and construction of any instrument in

71    which questions are used for data collection. This comparison, in turn, can increase the instrument's

72    reliability (e.g., refining ambiguously worded items) and validity (e.g., by providing information about

73    the relevance and clarity of items; see Knafl et al. 2007). Although understanding the respondent's

74    processing is generally valuable, it becomes a necessity when questioning a diverse sample (see, for

75    example, Ainsworth, 2000) or when performing cross-cultural studies (see, for example, Goerman,

76    2006).

77          Many public statistical agencies such as the U.S. Census Bureau (e.g., Goerman, 2006;

78    Hughes, 2004) or private research institutions, especially in the health sector (e.g., Mittag et al. 2003),

79    employ Cognitive Interviewing during questionnaire construction, however, it appears that Cogni-

80    tive Interviewing has rarely been used in general in sport science, and specifically in sport psycholo-

81    gy. A search in the PubMed database conducted with the terms "'cognitive interview' or 'cognitive

82    interviewing'" found 46 relevant references describing questionnaire construction; from these refer-

83    ences, 18 were concerned with health care, 15 with health behavior (such as nutrition or addiction,

84    but only 4 with physical activity) and only 6 had a psychological content (e.g., anxiety or depression).

85    An identical search in the PsycInfo database found only 2 references. Thus, despite a general ac-

86    knowledgment that the cognitive processes involved in the answering of items affect the reliability

87    and validity of data (Blair & Presser, 1993; Knafl et al. 2007), despite the use of Cognitive Interview-

88    ing in the health sector and despite an excellent overview by Durante and Ainsworth (1996) for in-

89    struments assessing physical activity, Cognitive Interviewing is not frequently used in the construc-

90    tion of questionnaires in sport science. It is the aim of this report to further promote the use of

91    Cognitive Interviewing in questionnaire and survey development in sport science. Rather than being

92    an assessment tool in and of itself, Cognitive Interviewing can help evaluate and optimize assess-

93    ment tools involving verbal materials, for example questionnaires on physical activity. We first pro-

94    vide a short introduction to Cognitive Interviewing and second, give an example of its application in

95    sport psychology.

*Question answering as a cognitive process*

97    Considering psychological aspects of language comprehension, memory and judgment, re-

98    searchers of cognitive psychology and survey methodology have developed models of the question-

99    answering process. The basic assumption is that answering a question involves a series of complex

100    and interrelated cognitive tasks. The four-stage cognitive model of the question answering process

101    states that each of the following stages must be completed successfully if the output is to be free of

102    bias (Jabine et al. 1984): First, the question needs to be comprehended, second, relevant information

103    needs to be retrieved from memory, third, a judgment or decision needs to be made and, fourth, a

104    response has to occur. This model holds true for all kinds of questions, regardless of the circum-

105    stances in which they are asked. Questionnaires, surveys, interviews, psychological instruments and

106    other question generating tests all require the respondent to go through the four stages. In this re-

107    port, we will use the term questionnaire, but the ideas presented are applicable to all methods involv-

108    ing questions for data collection.

109    Durante and Ainsworth (1996) have given some examples for each of the four stages in the

110    answering process to items of a physical activity questionnaire. The question: "How many city

111    blocks or their equivalent do you walk each day?" carries many possible sources of bias. For stage

112    one (comprehension), a possible source of bias might be the fact that even though the length of a

113    city block is defined as 12 blocks per mile, there is no adequate definition of a "city block". Another

114    bias might be that some respondents might interpret the term "walk" different from others, for in-

115    stance, including jogging or running. For stage two (retrieval of relevant information from memory),

116    a flaw of the question is the failure to state a clear reference period. Obviously, walking frequency

117    and distance varies with time and location, possibly leading to different reports of total distance

118    walked. As walking is a daily routine, it is rarely encoded and stored in our long-term memory. In

119    stage three (decision making), the lack of accurate information of walking activity might lead to an

120    incorrect estimation (usually underestimation; Johnson-Kozlow, 2004) of city blocks walked. In the

121    last stage (response generation), respondents may have to convert the decision derived in stage three

122    into a fitting format of the answer. Some might have calculated their walking distance in miles and

123    now have to convert into city blocks, a process demanding a certain proficiency in mathematical cal-

124    culations. Durante and Ainsworth's (1996) examples represent just a small scope of errors that can

125    occur during the question answering process of items. There are many other potential sources of

126    bias in most instruments.

127               *Implications of the four stage model on questionnaire design*

128               Since the *Advanced Research Seminar on Cognitive Aspects of Survey Methodology* (Jabine, Straf, Ta-

129      nur, Tourangeau, 1984) held in 1983, cognitive aspects of survey methodology (CASM) research has

130      become a broad, interdisciplinary area (Schwarz, 2007) that "has come to dominate the field of ques-

131      tionnaire design research, development and evaluation" (Willis, 2005, p. 34). This research has tar-

132      geted two key questions: First of all, what are the errors that occur during the four stages of the

133      question answering process and how can they be avoided? While Durante and Ainsworth focus

134      mainly on step two, memory retrieval, recent research (Schwarz, 2007) suggests that especially step

135      three and four are influenced by many external factors such as context of the interview, personal

136      conditions of the respondent or social desirability. Most of the studies of the interviewing process

137      have been respondent-focused, leaving the influence of the interviewer aside. As a study about fram-

138      ing effects by Galesic and Tourangeau (2007) shows, even the name or topic of the study and the

139      affiliation of the researcher/sponsor can influence the answers of respondents. Particularly in self-

140      administered surveys, where there is no source to ask for clarification, a reliance on contextual fac-

141      tors seems likely. Understanding the pragmatic meaning of a question, that is the research-

142      er's/interviewer's intention, is also important to produce unbiased and useful responses to survey

143      questions (Schwarz, 2007). For example, if a person is asked what he/she did yesterday, he/she will

144      certainly understand the words, but may not know what information to provide. Should he/she state

145      what he/she had for breakfast or is the researcher interested in other behaviors of the respondent?

146               The second key question of CASM is: how can the errors in the question answering process

147      be detected to aid in and improve questionnaire development? Consequently, research on CASM has

148      developed a variety of methods to address the problems of question answering, e.g., *Respondent De-*

149      *briefing, Behavior Coding* (Hughes, 2004) and *Confidence Ratings*. The methods are widely used in survey

150    centers and statistical agencies when doing qualitative research on questionnaire design. The most

151    common, however, is Cognitive Interviewing.

152    *Aims and Purpose of Cognitive Interviewing*

153        Cognitive Interviewing is used as a pre-testing method in order to detect potential sources of

154    errors in the question-answering process (see the four-stage model mentioned above) associated

155    with specific items (Willis, 2004). The main aim is to improve the given instrument by rewording,

156    deleting, replacing or simply changing the order of some items. Which of the above-mentioned

157    measures are to be taken is often determined during the process. Even though hypotheses or ideas

158    often exist about potential "problematic items", the cognitive interview takes a clear respondent-

159    centered approach and is – at least initially – inductive.

160    *The main techniques of Cognitive Interviewing: Think-aloud and verbal probing*

161        There are basically two main techniques of Cognitive Interviewing, both having their ad-

162    vantages and disadvantages. The two techniques are not mutually exclusive, and are often used sim-

163    ultaneously during an interview (Willis, 2004).

164        *Think aloud.* Using the Think-aloud technique, the respondent is simply asked to think out

165    loud as he/she is answering the questionnaire. The interviewer reads each question to the subject

166    and then writes down or otherwise records (audio or video tape) the processes the respondent uses

167    to answer the question. It is the interviewer's main task to make the respondent think aloud and to

168    keep him/her doing so during the process of the interview. Thinking aloud can be carried out con-

169    currently, while answering the questionnaire, or retrospectively, after having answered all the ques-

170    tions (Mittag et al. 2003).

171        This technique imposes minimal bias by the interviewer on the subject. It requires little, if

172    any, interviewer training, as the interviewer plays a rather passive role after having given the instruc-

173    tions at the beginning of the interview. The interview is open-ended, and can produce valuable, even

174   unanticipated data about the questionnaire or a specific question, especially by extraverted respond-

175   ents conversant with the subject covered in the questionnaire (Willis, 2005). Less extraverted re-

176   spondents, however, may be uncomfortable with, or even reluctant to, think aloud. For example,

177   some might tend to simply answer the question they are asked (without explaining their internal

178   considerations when doing so) in order to "get through" with the interview as quickly as possible.

179   The other extreme is the possibility of respondents straying from the task, meaning they provide a

180   lot of irrelevant information not related to the question. Thinking aloud might even impose a bias to

181   the respondent's information processing and answering behavior. Thinking aloud and spending a

182   larger amount of time on one item might alter the respondent's answer compared to the spontane-

183   ous answer he or she would have given when filling out the questionnaire in silence and by

184   him/herself (Beatty & Willis, 2007). Hence, in many questionnaires, especially in self-administered

185   paper and pencil questionnaires, respondents are asked to answer the questions spontaneously,

186   without thinking about it too much.

187      *Verbal probing.* In contrast to the minimally invasive think-aloud technique, verbal probing

188   requires the interviewer to play a more proactive role during the interviewing process. This tech-

189   nique has received increased attention over the last years, with many cognitive researchers tending to

190   favor it over thinking aloud (Willis, 1999). A study by Blair and Presser (1993) conducted with 63

191   academic organizations dealing with questionnaire development showed that out of 21 organizations

192   using cognitive interview techniques, only 5 reported using thinking aloud, while 16 reported using

193   some sort of probing. The interviewer reads the question to the respondent or asks him to read it

194   out loud. The respondent answers the question and the interviewer then follows up by asking specif-

195   ic questions - probes - to obtain additional information. Again, this can be performed concurrently

196   (e.g., after each question) or retrospectively (after completion of the questionnaire). The probes can

197   be standardized (constructed prior to the interview) or non-standardized (constructed during the

198  interview) and administered proactively (initiated by the interviewer) or reactively (triggered by the

199  respondent's behavior). Readers interested in a more detailed discussion of the advantages and dis-

200  advantages of the specific types of probes are referred to Willis (2005).

201      Verbal probing has the benefit of placing the control of the interview in the interviewer's

202  hand. The respondent can be "guided" through the interview and irrelevant discussion can be avoid-

203  ed. The interviewer can focus on specific areas or items of the questionnaire that are potential

204  sources of flaws. In contrast to the thinking-aloud technique, there is no need for explaining to re-

205  spondents what they have to do, since answering questions is what respondents expect in an inter-

206  view. Because probing can be a highly complex task, it may require a considerable amount of profi-

207  ciency and experience on the part of the interviewer, depending on the topic and specificity of the

208  questionnaire. The misuse of probes, and especially the use of suggestive probes, can lead to the re-

209  spondent answering in a certain way. Furthermore, verbal probing might create some artificiality

210  compared to the respondent answering the questionnaire by him/herself. However, potential prob-

211  lems can be minimized, if not eliminated, by careful preparation and training of the interviewer (Wil-

212  lis, 1999, 2005).

213      As mentioned above, thinking aloud and verbal probing can be used simultaneously and, in

214  fact, they "fit together very naturally" (Willis, 2005, p. 57). The decision concerning which technique

215  or which combination is most adequate should be based on the research subject or intention, the

216  instrument's length and content to be investigated, the population sample at hand and the interview-

217  ers available. It has not been investigated satisfactorily under which circumstances each technique is

218  most useful (Willis, 2004). At least considering the instrument's length, it seems logical that retro-

219  spective probing or thinking aloud is of little use if we are dealing with a 150 item questionnaire. It is

220  hard to recall what one was thinking while answering a question more than half an hour ago.

221    *How to do Cognitive Interviewing - a short guide*

222    Once a rough draft of the survey is available for testing, the instrument is reviewed by ex-

223    perts on the subject of the survey, and suggestions regarding modifications of items have to be con-

224    sidered. Parallel to this process, recruitment issues such as subjects to be interviewed, modes of re-

225    cruitment (advertisements, flyers, etc.) and an eventual compensation have to be decided upon.

226    Organizational aspects, such as premises, technical equipment (tape recorder, etc), staff and

227    time schedules, need to be taken care of. Researchers have to decide which of the two, above-

228    mentioned interviewing techniques to use, or if they want to use a combination of both. Based on

229    that decision, a standardized  instruction and, if applicable, basic probes have to be developed, both

230    general ones (e.g., "I noticed you were hesitating with the answer. What were you thinking about?")

231    and item-specific ones (e.g., "When answering the question, did you rather focus on the first or the

232    second part of the question?"). There are different categories of probes besides general and specific

233    ones as well. Willis (1999) mentions the following categories: comprehension/interpretation probes

234    (e.g., "What does the term pressure mean to you?"), paraphrasing ("Can you re-formulate this ques-

235    tion in your own words?"), confidence judgments (e.g., "How sure are you that your last visit to the

236    dentist was within the past 12 months?") and recall probes (e.g., "How do you remember that you

237    went to the doctor five times in the last 12 months?").

238    If necessary, interviewers need to be trained in introduction, probing and with regard to

239    clues to focus on. Even with small sample sizes of nine subjects or less, several interviewers rather

240    than only one should conduct the interviews, in order to obtain a variety of opinions (Willis, 1999).

241    Once these preparations are completed, the first interviewing round can commence. Willis (1999,

242    2005) suggests a number of five to ten subjects for each interviewing round, focusing rather on gen-

243    eral concepts of the survey. In the following rounds, emphasis should be placed on more specific

244    problems, for example question wording or format. After completing the first round of interviews,

245    the data produced is analyzed by the researchers and/or experts on the specific subject, and sugges-

246    tions are made regarding probes and interviewing technique in general. If a specific problem of the

247    instrument is evident after the first round, the pertained item of the instrument can be modified or

248    probes can be added/modified towards a deeper understanding of that problem. Feedback is given

249    to the interviewers on how to improve interviewing behavior.

250        For the second interviewing round, another five to ten subjects are interviewed with the re-

251    vised probes, although the procedure employed is the same as during the first round. Again, after

252    completion of the second round, the data is analyzed by experts and further steps are discussed. If

253    all experts agree that considerable improvement of the questionnaire can result from the data ob-

254    tained so far, no more interviews need to be conducted. Otherwise, a third interviewing round can

255    be performed, but usually a total number of 15-25 interviews is considered sufficient (Willis, 2005).

256    The numbers provided here concerning interviewing rounds, total number of interviews to be con-

257    ducted and interviews per round, are only recommendations and depend highly on the ability of the

258    interviewer(s) to elicit viable data from the participants and, as mentioned above, on the willingness

259    and ability of the respondent to provide that data.

260        The length of one single interview depends on the survey and can vary individually. Howev-

261    er, a length of more than one hour poses excessive demands on the subject (and on the interviewer)

262    and should be avoided (Willis, 2005). Comments should be written up after each interview. A tran-

263    scription of the audio taped interview can be very helpful for analyzing the data, but is time consum-

264    ing as well. Together with the preparation time, post interview tasks make the interviewing process a

265    lot longer than the actual interview itself.

266        Cognitive Interviewing in sport science – an example from sport psychology

267        The Competitive State Anxiety Inventory (CSAI-2; Martens, Burton, Vealey, Bump, &

268    Smith, 1990) is among the most widely used instruments in sport psychology (Burton, 1998). During

269  the development of a German short version (Ehrlenspiel, Brand, & Graf, 2009), the uni-

270  dimensionality of the items measuring the three components of somatic anxiety, cognitive anxiety

271  and self-confidence was tested applying probabilistic test theory. Analysis of the self-confidence sub-

272  scale consisting of four items indicated a non-satisfactory fit to the ordinal Rasch model. It appeared

273  that respondents could be split into two separate classes with distinctive answering tendencies (cf.

274  Strauss, 1999). It was assumed that the two classes differed with regard to the manner in which they

275  understood the items. To test for this hypothesis, Cognitive Interviewing was applied.

276  *Methods*

277  Fifteen athletes (*n*=4 female, age *M*= 24.31, *Range*: 19- 30 yrs) were recruited for the inter-

278  views, all of them being or having been athletes with at least two training sessions per week and reg-

279  ular participation in competitions. They were given 5 euros as compensation for the interview. In-

280  terviews were conducted by either of two interviewers (interviewer A: 11 interviews).

281  After giving their informed consent, participants were asked to mentally put themselves into

282  a condition reflecting the situation shortly before an important competition and to answer the ques-

283  tionnaire as if they were actually in that situation. To facilitate this mental task, some questions were

284  asked about the setting of the competition (e.g., "How many spectators were present?", "How was

285  the weather that day?", "What kind of competition was it?", "Who else was present?"). Standardized

286  instructions were given to participants to think aloud while filling out the questionnaire. They were

287  asked (and if necessary repeatedly reminded during the interview), to speak out loud everything that

288  was going on in their head while filling out the questionnaire. In addition, both standardized (e.g.,

289  "Please explain what 'confidence' means to you!") and non-standardized verbal probes were given

290  by the interviewer on certain items. After finishing the questionnaire, some retrospective, summariz-

291  ing probes were given, asking the respondent to compare certain terms with each other (e.g., "feel-

292  ing confident" vs. "feeling secure"). Probes were mainly directed towards question comprehension

293  (stage 1) and judgment/decision (stage 3) within the question answering process. Every interview was

294  tape recorded and later transcribed. The interviews lasted between 12 and 24 minutes.

295       The interviews were conducted in three rounds, each round consisting of five interviews. Af-

296  ter each interviewing round, the interviews of that round were analyzed by the interviewers and a

297  third expert in sport anxiety. Following round one and round two, feedback was given to the inter-

298  viewers and steps were discussed in order to improve both the interviewing skills of the interviewer

299  and the quality of data to be obtained from further interviewing rounds. Probes were added or mod-

300  ified based on the information given by respondents. After the first round, for example,  we added

301  the following probe for the item "I feel confident, because I mentally picture myself reaching my

302  goal." asking precisely, "When thinking about your answer, did you rather focus on the first or the

303  second part of the question?" From the first few interviews, it also became apparent that respond-

304  ents reacted differently to items worded "I feel confident *about* …  " vs. " I feel confident *because* …

305  ". Consequently, a further probe presented the alternatives and asked the respondents to compare

306  them and explain the difference.

307       After the completion of all three rounds of interviewing, the transcriptions of the interviews

308  were fragmented by items, making it easier to compare the answers given to each item. Fragmenta-

309  tions were again analyzed by the two interviewers and the expert. The notes taken by the interview-

310  ers during the interviews, as well as the information provided from the retrospective/summarizing

311  probes were also considered in the analysis process.

312

313       *** insert Table 1 about here ***

314

315 *Results and Conclusions*

316        Although the athletes put "feeling secure" and "feeling confident" on a single dimension,

317 they also identified "feeling secure" as expressing a stronger conviction. More importantly, some

318 athletes noted a differential temporal perspective: "Feeling secure" is based on the past (for example

319 preparation) and is thus retrospective, whereas "feeling confident" is prospective: the chances of

320 succeeding in the (near) future are evaluated. The interviews also clearly showed that respondents

321 used the two parts of the "self-confidence" items differently. Whereas some answered the items

322 based on the general part ("I feel confident…"), others responded to the specific part (i.e., "…I can

323 meet the challenge"). This distinction, in turn, lead to some conflicts with respect to the conjunc-

324 tions "because" vs. "about". As one respondent commented on the item "I feel confident, because I

325 can mentally picture myself reaching my goal", one can feel confident, *despite* being unable to picture

326 oneself reaching one's goal.

327        As a consequence, the items for the self-confidence subscale were re-phrased completely so

328 that they consist of only one part (e.g., "Right now …  I can mentally picture myself reaching my

329 goal"). This way, the items are also more similar to the items of the other subscales. The revised ver-

330 sion is currently administered to a large sample of athletes for quantitative scrutiny.

331

332                                   Discussion

333        Cognitive Interviewing is a qualitative means to evaluate and improve questionnaires. Our

334 practical example showed that this approach can detect and consequently eliminate potential flaws in

335 a sport psychology questionnaire. Flaws often stem from the (un-challenged) assumption of congru-

336 ence between the researcher's and a respondent's processing of an item. Gaining insight into the

337 question answering process of respondents while answering a questionnaire can thus be an ad-

338 vantage if we want to prove this congruency and, hence, make the instrument more valid and relia-

339   ble. Cognitive Interviewing must be seen as an integrative part in the development of a question-

340   naire. It does not obviate the quantitative analysis of a questionnaire, but instead complements the

341   quantitative methods. Cognitive Interviewing may be employed in the initial phase of item construc-

342   tion and phrasing. In our case, we employed Cognitive Interviewing in a later phase to test a hypoth-

343   esis derived from quantitative analyses. In a next step, it has to be tested whether the resulting modi-

344   fications have the desired effect of making the self-confidence subscale uni-dimensional.

345         Any of the four relevant stages in the question answering process (see above, Jabine et al.

346   1984) can be targeted by Cognitive Interviewing, revealing possible pitfalls. In our example, Cogni-

347   tive Interviewing primarily targeted the comprehension of the question (stage 1) and the judgment

348   or decision process (stage 3). For stage one, it was found that the words *secure* and *confident* are com-

349   prehended differently, which means that a bias can occur even in this very early stage of the question

350   answering process. With respect to the third stage, where respondents have to form a judgment, it

351   became clear, for example, that respondents based their judgments on different parts of the items.

352   This makes a comparison of interindividual (quantitative) responses impossible and results in a loss

353   of validity for that item. Although less prominent in our example, also stage 2, memory retrieval, is a

354   complex task that can heavily influence answering behavior. Durante and Ainsworth (1996) provid-

355   ed excellent examples on how biases deriving from memory retrieval can be detected and subse-

356   quently minimized through Cognitive Interviewing. Much less is known about how answer catego-

357   ries affect stage 4, the response itself.

358         A significant limitation to the method can be the considerable amount of experience needed

359   by the interviewer, especially in the case of verbal probing. If the interviewer serves merely as a data

360   collector, this experience is not needed, as probes should be developed by the researchers prior to

361   the interview. If, in contrast, the interviewer himself serves as an investigator, he/she needs to be

362   firm in the subject being covered and trained in giving spontaneous and emergent probes (Beatty &

363 Willis, 2007). Still, it is advised that interviewers practice interviewing and probing prior to actual

364 interviews. There is also still no generally accepted standard for Cognitive Interviewing (Willis,

365 2004). Different researchers conduct cognitive interviews differently (Conrad & Blair, 2004). Beatty

366 (2004), for example, states that, "there is considerable room for interpretation regarding how to do

367 these interviews, when and how to probe, what to say, what not to say, and how often to say it" (p.

368 46; see also Presser et al. 2004). It remains a challenge for CASM researchers to develop a best prac-

369 tice for Cognitive Interviewing. Such best practices are especially necessary if Cognitive Interviewing

370 is to be used for cross-cultural investigations. The International Physical Activity Questionnaire, for

371 example, has been shown to be a reliable and valid tool in different cultures (Craig et al. 2003).

372 However, caution has been advised and further research advocated for the use in rural and low liter-

373 acy samples, primarily in developing countries. Also, today's classrooms and school gyms are home

374 to students from diverse social, cultural and ethnic backgrounds. Cognitive Interviewing can serve as

375 an invaluable tool for accounting for this diversity in respondents when constructing or translating a

376 questionnaire, survey or diagnostic instrument employing verbal material.

377   Cognitive Interviewing offers clear benefits in the process of questionnaire construction be-

378 cause it takes a respondent-centered approach. Information provided by Cognitive Interviewing

379 should help to further improve questionnaire design, not only in sport psychology, but in exercise

380 and sport science in general.

381

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473

474                                         Tables

475    Table 1.

476    *Sample probes used in the study*

| stage | proactive probe | retrospective probe |
| --- | --- | --- |
| question comprehension | How could one rephrase that question? | Is "feeling secure" and "feeling confident" the same to you? |
| retrieval from memory | I notice you are hesitating – what are you thinking about? | When you answered this question, did you actually mentally picture yourself performing? |
| judgment/ decision | What is a 'poor performance' to you? | … did you focus on the first part ("I feel confident…") or rather the second part (… because I mentally picture…")? |
| response | Please don't forget to actually give an answer | Why did you chose "very much" when you just said you felt more or less confident? |

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