

1 **Title:** Exam Evaluation in Prosthodontics Across Preclinical and Clinical Years from Students'
2 Perspective: A Cross-sectional Study.

3

4 **Running Title:** Student exam evaluation in prosthodontics.

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32 **Keywords:** Prosthodontics, Exam evaluation, students' performance, exam time, exam
33 preparation.

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48 **Data Availability Statement**

49 The data that support the findings of this study are available from the corresponding author
50 upon reasonable request.

51

52

53 **Title:** Exam Evaluation in Prosthodontics Across Preclinical and Clinical Years from Students'
54 Perspective: A Cross-sectional Study.

55 **Abstract:**

56 **Introduction:** The purpose of this study was to explore the students' perceptions and
57 performance in prosthodontics theory exam.

58 **Methods:** A cross-sectional descriptive study was conducted on 560 (80.82%) students of
59 different levels (third, fourth and fifth years) to explore their opinions and performance with
60 regards to a number of issues on a prosthodontics theory exam (exam evaluation, exam
61 preparation, exam material, exam timing). Demographic data were also collected. Descriptive
62 statistics were generated and Chi-square test, independent sample t-test, ANOVA test, and
63 Pearson's correlation coefficient were used to examine the associations between different
64 variables. The significance level was set at $P < 0.05$.

65 **Results:** Students responses regarding exam evaluation was influenced by their gender, study
66 level, high-school Grade Point Average (GPA) and undergraduate cumulative GPA. Perceived
67 exam difficulty was significantly affected by gender ($P = 0.03$) and study level ($P < 0.001$), and
68 negatively correlated to both high-school GPA ($P < 0.001$) and university GPA ($P = 0.03$). The vast
69 majority (88.2%) depended on lecture hand-outs and lecture notes for study. Exam material
70 and preparation were not significantly affected by any of the demographic variables with
71 most respondents (76.8%) thinking that the lectures blended with prosthodontics
72 laboratories/clinics would improve their understanding of the exam material. The suggested
73 best time to conduct the exam was early afternoon (31.6%). Student performance was
74 significantly affected by the study level ($P < 0.001$) and cumulative GPA ($P < 0.001$) with
75 significant positive correlation between the high-school GPA and the mark in the exam
76 ($r = 0.29$, $P < 0.001$) and by the amount of time students spent for exam preparation ($P < 0.001$).
77 Those students who reported using textbooks to prepare for the exam got significantly higher
78 marks (66.1 ± 8.7) compared to the students who did not (62.8 ± 9.7) ($P = 0.03$).

79 **Conclusions:** Course level, GPA and gender were identified as the most influential factors in
80 different aspects of exam evaluation and students' performance. Regular study and use of
81 textbooks were demonstrated to improve academic performance. Additional orientation and
82 guidance relating to the exam (especially for third year students) would be welcomed, as
83 would alternate teaching methods such as small group discussions or study groups.

84 **Keywords:** Prosthodontics, Exam evaluation, students' performance, exam time, exam
85 preparation.

86

87 **1. Introduction**

88

89 Prosthodontics is a core course in the undergraduate dental curriculum and is defined as "*the*
90 *dental specialty pertaining to the diagnosis, treatment planning, rehabilitation and*
91 *maintenance of the oral function, comfort, appearance and health of patients with clinical*
92 *conditions associated with missing or deficient teeth or oral and maxillofacial tissues using*
93 *biocompatible substitutes*" [1, 2]. It is a major subject in the undergraduate dental curriculum
94 that includes treatment planning, designing and fabricating dental prostheses. However, it is
95 often considered challenging, which in part attributed to the need for a high skill level, the
96 conventional methods of teaching and lack of clinical exposure in the early learning period [3,
97 4].

98

99 In the University of Jordan, prosthodontics theory and laboratory courses start at the third
100 year of a 5-year undergraduate dentistry bachelor's degree programme followed by clinical
101 and theoretical courses in fourth and fifth years. The main objective of the third-year
102 curriculum is to introduce the students to removable prosthodontics including basic
103 information on the fabrication of complete and partial dentures along with laboratory
104 sessions (delivered in English language). Clinically relevant information is covered in the
105 fourth and fifth years along with clinical sessions [5]. Preclinical education is essential in order
106 to obtain the required level of knowledge and competency in the clinical years [3, 6, 7].

107

108 The optimal goal of the undergraduate curriculum is to provide students with the essential
109 theoretical and practical knowledge [8]. In order to ensure good learning outcomes, the
110 "*assessment processes should be rigorous, appropriate and reliable as a gateway for dental*
111 *graduates to become qualified to practise independently*" [9]. Learner feedback is also
112 important and assessments should thus also be considered from a student perspective [9].
113 Such learner feedback in relation to performance/achievement of the students (from
114 preclinical to final clinical years) plays an important role in the continuing development and
115 improvement of the course [10, 11] to enhance their engagement, learning experience, skills

116 development and performance in prosthodontics. Exam preparation, exam questions and
117 exam time are all factors influencing perceptions of the exam and subsequent performance
118 [12, 13], and GPA has also been suggested to be a valid tool to predict academic performance
119 [13, 14].

120

121 It has been brought to the attention of the academics of University of Jordan that the dental
122 students are struggling to do well in prosthodontics theory exam. Therefore there was an
123 urgent need to understand the underlying factors involved from the students' perspective.
124 This is the first study conducted in the University of Jordan to evaluate prosthodontics theory
125 exam as a core part of the dental curriculum and to identify and manage key challenges faced
126 by preclinical and clinical level students. The aim of this study was to explore the University
127 of Jordan dental student perceptions of a prosthodontics theory exam in terms of exam
128 evaluation, exam preparation, exam material, exam timing, as well as student performance,
129 and to explore any correlation with the demographic factors.

130

131 **2. Methods:**

132

133 **2.1. Ethical approval**

134 The research protocol was approved by the Ethical Committee of the Faculty of Dentistry at
135 the University of Jordan (Reference: 97-2022) and in full accordance with the world medical
136 declaration of Helsinki. All the participant students were informed regarding the aim and
137 objectives of the survey and agreed to fill the form.

138 **2.2. Study group and survey design**

139 This was a cross-sectional study conducted in the academic year 2021/2022. The study group
140 included all third-, fourth- and fifth- year students who completed an online survey after
141 completing a prosthodontics course and examination and but did not receive their results.
142 Participation in the survey was voluntary. Data were collected using a self-administered
143 online questionnaire (Google forms) of 20 questions (Table-2) in total constructed of different
144 aspects, including:

145 1- Sociodemographic data of students including five variables: gender, study level, high
146 school GPA and cumulative university GPA.

147 2- Opinions of students regarding a prosthodontics theory exam via multiple choice
148 questions with multiple responses (exam evaluation, exam preparation, exam material,
149 exam timing) and their performance.

150

151 **2.3. Statistical Analysis**

152 The G*Power software (version 3.1.9.7; Heinrich-Heine University, Germany) was used to
153 conduct a priori power analysis for calculating the sample size. The analysis considered the
154 variation in students' performance between 3 groups (3rd, 4th, and 5th year students) as the
155 main outcome, and was based on F-tests utilizing an ANOVA test with confidence intervals
156 of 95%, two tailed α probability error of 0.05, effect size of 0.25, and the number of groups
157 is 3. The calculated sample size was 252 participants (84 per group). 693 participants were
158 invited and recruited to ensure the ability to recruit the required number of participants. 560
159 responded (80.8% response rate). Therefore, the responses from the participants considered
160 in this study more than double of the calculated sample size.

161 Statistical analysis was performed using SPSS for Windows release 16.0 (SPSS Inc., Chicago,
162 IL, USA). Descriptive statistics were generated and Chi-square test, independent sample t-
163 test, ANOVA test, and Pearson's correlation coefficient were used to examine associations
164 between different variables. The significance level was set at $P=0.05$.

165

166 **3. Results**

167

168 The questionnaire was disseminated to 693 students. 560 participants (168 males, 392
169 females) responded to the questionnaire, yielding a response rate of 80.8%. The
170 sociodemographic characteristics of the respondents are shown in Table 2.

171

172 **3.1. Exam evaluation**

173 2.9% of students reported that the exam was easy, 45.2% reported moderate difficulty, 36.8%
174 reported difficult, and 15.2% reported very difficult. Exam difficulty response was significantly
175 different between the male and female students with 60.8% of male students considering the
176 exam difficult/very difficult compared to 48.2% of female students ($P= 0.03$). Significantly
177 more males (18.5%) than females (12%) ($P=0.043$) reported the language being a barrier.

178 The perceived exam difficulty was negatively correlated to both high-school GPA ($P < 0.001$)
179 and undergraduate cumulative GPA ($P = 0.03$); the higher the students' high school GPA the
180 higher the degree of difficulty they felt about the exam. Additionally, those students reported
181 insufficient time during exam ($P < 0.001$) affected their performance or grades. The lower the
182 year of study, the higher the percentage of students who considered the exam difficult/very
183 difficult accounting to 82.5% third year, 29.2% fourth year, and 23.8% fifth year students ($P <$
184 0.001).

185 Reported problems with the exam included the questions were unclear (50%), the questions
186 were challenging (48.2%), there was not enough time (41.6%), the questions were not set
187 from the lecture materials presented (36.1%), or the language of the exam was a barrier
188 (13.9%).

189 The most difficult types of questions according to the respondents (in decreasing frequency)
190 were multiple choice questions (MCQs) with combinations of answers (45.9%), with
191 correct/incorrect statements (40.5%), with long statements (10.7%), true/false questions
192 (2.1%), and questions associated with given figures (0.5%). Questions with long statements
193 being difficult was reported mostly by the fifth (17%) and fourth (14.2%) year students
194 compared to the third (4.7%) year students ($P < 0.001$), and by those with lower mean high-
195 school GPA (93.8%) compared to other students (95.3%) ($P = 0.001$). The type of questions
196 reported as best for evaluation in prosthodontics was: MCQs (90.4%), true/false questions
197 (33.8%), short essays (24.5%), questions with combination of answers (6.8%), and long essays
198 (3.8%). Short essays were preferred more by fifth (33.5%) compared to the fourth (22.8%)
199 and third (19.1%) year students ($P = 0.002$).

200

201 **3.2. Exam preparation**

202 The resources reported to be used by the students to prepare for the exams in prosthodontics
203 are shown in Figure 1. The vast majority (88.2%) depended on lecture hand-outs and lecture
204 notes, 26.2% searched on-line sources for additional information while only 7.9% reviewed
205 the recommended textbooks for the course. The use of only lecture hand-outs was more
206 prevalent among the fourth (27.6%) and fifth (25%) year students compared to the third
207 (17.1%) year students ($P = 0.03$). In contrast, the hand-outs with lecture notes were used more
208 frequently by the third (92.2%) than the fourth (85%) or fifth (84.7%) year students ($P = 0.026$).

209 On-line sources were used more frequently by the third (31.5%) than the fourth (23.6%) or
210 fifth (20.5%) year students ($P=0.027$).

211

212 When asked about the time spent in exam preparation, the majority (70.7%) of the students
213 reported that they studied regularly and just revised before the exam while a minority just
214 studied the day before the exam (8.4%) or relied on questions from previous years (0.40%) as
215 shown in Figure 2. Time management was significantly affected by the year level ($P<0.001$)
216 and cumulative undergraduate GPA ($P=0.014$). Studying regularly and revising ahead of exam
217 was practiced more frequently for exam preparation by the third (84.8%) compared to the
218 fifth (64.8%) and fourth (50.4%) year students. The percentage who just studied the day
219 before the exam was 2.7% for the third, 11% for the fourth, and 17% for the fifth year
220 students. Not managing to finish the material before the exam was reported by 35.4% fourth,
221 17% fifth, and 11.7% third year students. Studying regularly was also more common by those
222 with high (3.0 to 4.0) cumulative undergraduate GPA compared to the other groups with GPA
223 ranging between 2.00 to 2.99.

224

225 When asked about the thoughts regarding how to be better prepared for future exams and
226 behaviors to avoid, the answers in decreasing frequency were: not asking about the topics
227 that were unclear (49.3%), not giving enough time to prepare for exam (45%), ignoring any
228 extra papers or hand-outs provided (30.9%), and not attending lectures (7.7%). Not attending
229 lectures was reported more frequently by the fourth (12.6%) than the fifth (9.7%) or third
230 (3.9%) year students ($P=0.005$). Not giving enough time to prepare for the exam was reported
231 mostly by those with acceptable (57.1%) and good (56.9%) cumulative GPA compared to
232 those with very good (42.9%) or excellent GPA (30.3%) ($P<0.001$). Not asking about the topics
233 that were unclear was reported by those with acceptable (64.3%) and excellent (60.6%)
234 university GPA compared to 49.1% of those with very good and 41.2% of those with good GPA
235 ($P=0.015$).

236

237 **3.3. Exam material evaluation**

238 76.8% of the respondents thought that having lectures blended with prosthodontics
239 laboratories/clinics would improve their understanding of the exam material. The majority of

240 the students (70%) reported understanding lectures well when they reviewed and studied
241 hand-outs, whereas only 12.3% reported understanding at the time of the lectures delivered
242 (Figure 3). This finding was not associated with any of the sociodemographic variables.
243 Regarding content, 16.2% reported that uncovered material was not encountered at all;
244 however, 72% reported uncovered information in a few questions, 5% in too many questions,
245 and 6.8% in more than 50% of the questions. Those with higher GPAs at school ($P=0.016$) and
246 at university ($P=0.024$) reported significantly higher degree of uncovered information in the
247 exam compared with those with lower GPAs.

248
249 In relation to the suggestions to increase subject level understanding, the students suggested
250 arranging study groups for specific topics (52.9%), giving the lecture hand-outs and/or any
251 extra material in advance (45.9%), or having an online discussion for each lecture (39.6%).
252 Giving the lecture hand-outs and/or any extra material in advance was reported by
253 significantly lower percentage of the fifth (36.4%), compared to the third (48.2%), or fourth
254 (54.3%) year students ($P=0.005$).

255
256 Around half of the students (49.5%) thought that the prosthodontics exam was challenging
257 though this was reported less significantly by the third (31.9%), compared to the fourth
258 (65.4%), or fifth (67.0%) year students ($P<0.001$). For the students who thought the exam
259 material was challenging, Figure 4 shows the reasons for this. Too much new information
260 given was the most common reason and was reported by 68.6% of the third compared to
261 34.1% of the fourth and only 13.8% of fifth year students ($P<0.001$). That the material was
262 not explained well in lectures was also reported more significantly by the third (45.7%)
263 compared to the fourth (34.1%) and fifth (24.1%) year students ($P=0.01$). Not enough time
264 and attention given by the students to the material was reported more significantly by the
265 fourth (45.5%) compared to the third (37.1%) and fifth (15.5%) year students ($P=0.002$).

266

267 **3.4. Exam timing**

268 The best time suggested to conduct the prosthodontics exam was early afternoon (31.6%),
269 late afternoon (30.4%), and in the morning (21.6%). 16.4% of the students had no preference
270 for timing. The best timing for male students was late afternoon (39.3%) while for females it

271 was early afternoon (35.5%) (P=0.006). The best timing suggested by the third-year students
272 was early afternoon (36.2%) while for the fourth (39.4%) and fifth (37.5%) years, it was late
273 afternoon (P<0.001).

274 **3.5. Performance**

275 The average mark for the students in the exam was 63.0% (SD 9.7) out of 100. It was
276 significantly different between the study levels: third year 63.0 ± 10.1, fourth year 57.2 ± 9.1,
277 fifth year 67.2 ± 6.8 (P<0.001). The performance in the exam was, as expected, significantly
278 associated with cumulative GPA (P<0.001); it was 56.4 (SD 7.9) for those with acceptable GPA,
279 57.7 (SD 9.0) for those with good GPA, 63.1 (SD 8.6) for those with very good GPA, and 72.1
280 (SD 6.5) for those with excellent GPA. A significant positive correlation was also found
281 between the high-school GPA and the mark in the exam (r=0.29, P<0.001). Those students
282 who reported using textbooks to prepare for exam achieved significantly higher marks (66.1
283 SD 8.7) compared to the students who did not (62.8 SD 9.7) (P=0.03).

284
285 The performance was affected significantly (P<0.001) by the study patterns followed by
286 students for exam preparation. The average mark was 50.2 (SD 12.5) for those who rely on
287 the questions from previous years, 59.5 (SD 10.7) for those who did not manage to finish the
288 whole study material before the exam, 62.5 (SD 11.7) for those who skim read before exam,
289 and 63.7 (SD 9.2) for those who studied the day before exam, while the highest marks were
290 obtained by those who studied regularly and just revised before the exam (63.9 SD 9.2).

291 292 **4. Discussion**

293
294 Continuous assessment of teaching process and the achieved learning outcomes are essential
295 in order evaluate and improve the educational system [15, 16]. One way of doing this is to
296 gather and evaluate the student opinions about the teaching and examination processes,
297 which has been shown to be reliable technique [17, 18]. This study aimed to explore student
298 perceptions on a prosthodontics theory exam in terms of exam evaluation, exam preparation,
299 exam material, exam timing and their performance and to find out any correlation between
300 sociodemographic factors and the aforementioned aspects.

301
302

303

304

305

306 **4.1. Exam evaluation**

307 Male students in this study had significantly higher difficulty in the exam and considered exam
308 language as a barrier more compared to the females, in line with a previous study that
309 showed a higher percentage (69.2%) of male students lack English language proficiency (skills)
310 in their prosthetic exam compared to 64.6% of the female students [12]. Further, more male
311 students, reported being distracted from their studies by their use of electronic devices [12].
312 Although many studies showed that the female students show higher level of exam anxiety
313 [12, 19], and they perform better than their male counterparts [20-23].

314

315 Interestingly, the reported exam difficulty was negatively correlated to both high-school GPA
316 and cumulative GPA. Additionally, those students reported lack of time during exam. This
317 might be related to the fact that students with higher GPA experienced more exam anxiety
318 to perform well that affected their response [13, 24]. In contrast, other studies have reported
319 more anxiety related to low GPA [25-28]. Stress poses a significant barrier for medical and
320 dental students, and can lead to a lack of a learning plan, lack of sleep before the exam, and
321 the consumption of unhealthy foods while taking exams [29].

322

323 Factors such as exam patterns and exam time can influence student perceptions of an exam
324 and their performance [12, 13]. Questions were mostly reported to be challenging with lack
325 of time by the third-year students compared to the fourth and fifth year students, most likely
326 due to limited exposure to prosthodontics at this stage [3, 5, 30].

327

328 The prosthodontics exams conducted were all of MCQs type. The most difficult type of
329 questions reported were those with a combination of answers and the least difficult those
330 associated with figures and MCQs without combinations. Although it has been reported that
331 multiple choice testing (MCQs) is one of the most preferable assessment method [31], the
332 degree of MCQ question difficulty can clearly impact this [32]; MCQ questions with multiple

333 combinations need more conceptual and creative skills compared to simple MCQ questions,
334 which would explain the responses.

335

336 Summative assessment methods can test skills, knowledge, and competency of students.
337 Multiple-choice questions (MCQs) are widely used due to ability of standardization, efficient
338 testing for large student numbers, ability to cover a wide area of knowledge, the answers are
339 simple to score accurately and objectively and they offer quick feedback at reasonable costs
340 and intervals [33-38]. However, poorly written MCQs test the students memorisations of
341 random facts rather than comprehensive understanding [37]. This might be attributed to the
342 lack of academic staff training to produce a proper MCQs that are able to test the students'
343 understanding and application of knowledge [37, 39]. Instructors may tend to favour essay
344 questions since they are simple to write. However, the students with strong intellectual and
345 conceptual abilities but weak writing skills would prefer MCQs as misunderstanding one MCQ
346 only costs the student a small percentage of the grade; unlike misreading an essay question,
347 which costs a significant grade loss [31]. Further, multiple-choice compared to the essay type
348 exams are considered less stressful, less difficult, and less complex, while being high in
349 achievement, expectation, and emotions of ease [31, 40]. However, MCQ testing method
350 does not measure the creativity and the deep knowledge of students [32].

351

352 **4.2. Exam preparation**

353 The "strategic" or "achieving approach" to learning, as described by Struyven et al. (2002)[31],
354 is one in which students aim to gain the best marks possible by adhering to organized, diligent
355 study techniques and time-management strategies [41-43].

356 Most students depend on the hand-outs and lecture notes to prepare for the exam, while
357 only 7.9% review the recommended textbooks for the course. Hand-outs with lecture notes
358 and extra sources from webpages, YouTube etc. were used more by the third-year students
359 than the other students. The basic purpose of the instructional materials and learning
360 resources is to facilitate teaching and learning in a variety of contexts. The main goal of
361 educational materials is to offer a source of instruction potent enough to encourage an
362 interaction between the students and teachers during the learning or teaching process [44,
363 45]. An effective learning resource has the capacity to support students in their academic

364 endeavours, increase their scope of knowledge, and attend to their specific learning
365 requirements. Learning and teaching resources are available in several different forms like
366 reference books, workbooks, worksheets, web-based learning materials, computer-based
367 learning, structured coursework and audio-visual teaching aids. Libraries and learning
368 communities also serve as effective tools in the natural environment of learning [46, 47]. In a
369 recent study, using interactive E-books improves students' academic achievement [48].
370 Students' academic success has been impacted by their reading habits. Additionally, it has
371 been discovered that a reading habit has boosted brain capacity, improved reading skills, and
372 acted as a channel for learning about the real world. As a result, these studies suggest that
373 university libraries should subscribe to more books, journals, and related materials for more
374 research [49-51].

375

376 Students reported good time management, the majority reported that they studied regularly
377 and just revised before the exam while a minority just studied the day before the exam or
378 rely on questions from previous year. Studying regularly and revising ahead of exam was
379 practiced more frequently by the third compared to the fourth- and fifth-year students and
380 by those with excellent cumulative GPA compared to the other groups. It has been shown
381 previously that daily study hours significantly contribute the academic performance of the
382 graduate students [49, 52]. Procrastination and evading study are some of the worst habits
383 that affect academic achievement [49]. Time management has been reported as very
384 important factor in coping strategies and reducing exam anxiety.

385

386 Among the mistakes that the students reported to avoid in future exams in decreasing
387 frequency were not asking about the topics that were unclear, not giving enough time to
388 prepare for exam, ignoring any extra papers or handouts provided, and not attending
389 lectures. Not giving enough time to prepare for exam was reported mostly by those with
390 acceptable and good university GPA and this finding supports the previous finding about time
391 management and strategic studying [12, 19]. All these aforementioned practices had been
392 approved to have a negative impact on the academic progress [49].

393

394

395

396 **4.3. Exam material evaluation**

397 The academic community today recognizes the significance of various learning preferences
398 and their role in achieving academic performance [53, 54]. Students also gain from knowing
399 their learning styles because it will aid in creating effective and balanced learning techniques
400 that will improve their academic performance [55]. In a previous study on medical students,
401 bimodal learning style was the most preferred, which indicated that they preferred multiple
402 modes of information presentation (learning style). This suggests that the majority learns
403 efficiently as long as the teaching strategies incorporate a variety of tasks that engage the
404 visual, auditory, read-write, and kinesthetic sensory modalities [55]. In agreement with the
405 previous studies, most students in this study thought that having lectures blended with
406 prosthodontics lab/clinics with same topic will improve their understanding of the exam
407 material. The majority of the students understands the lectures well when they review it and
408 study the hand-outs. According to research, revision is a critical, students who tend to revise
409 and take notes and revisers achieved higher scores than those who don't revise lectures [56].

410

411 Student learning may be negatively impacted by teaching-learning methodologies that are
412 not matched to their learning styles [57, 58], hence it is recommended that instruction be
413 adapted to the learning preferences of the students [58]. In this study, the students suggested
414 different learning styles such as arranging study groups for specific topics, giving the lecture
415 hand-outs and/or any extra material in advance or having an online discussion for each
416 lecture. All suggested styles by students were used to impart and acquire knowledge of the
417 basic sciences in the medical curriculum [55], however, no matter how effective a method
418 may be, it cannot be the optimum teaching-learning strategy for every student. According to
419 some earlier studies, some teaching-learning strategies, such as problem-based learning, are
420 preferred above the conventional strategies, like lectures [59].

421

422 Students reported the exam material provided to prepare for the exam being challenging due
423 to too much new information. Excessive course load might negatively influence learning and
424 examination experiences and thus it should be avoided when planning the course curriculum
425 [60]. It is well-known that the amount of material that medical students must acquire and
426 study is massive, necessitating the knowledge and use of study techniques [61, 62]. A lack of

427 knowledge about study techniques may prevent students from learning effectively and
428 steadily, which could lead to an inappropriate level of academic accomplishment [63].
429 Additionally, independent study methods (self-study) is an important learning method
430 especially in medical field where the information cannot be obtained totally and solely from
431 lectures [55]. Another challenge that has been reported in this study was lack of time, and
432 again this problem can be overcome by applying proper learning habits and applying different
433 learning styles including regular study, and study with a partner [56].

434

435 **4.4. Exam timing**

436 Circadian rhythms are one of several factors that could affect how well pupils perform on
437 standardized tests [64, 65]. Studies have shown that cognitive abilities, such as memory and
438 attention, are at their highest during an individual's 'ideal' hours of the day and significantly
439 decline during their inefficient ones [65, 66]. In a prior study, the impact of test timing and
440 break times on student performance was investigated. They discovered that test scores drop
441 by 0.9% for each hour later in the day, as morning is the best time. A 20-to-30-minute break
442 also raises standard test performance. Therefore, test results would actually increase
443 throughout the day if there was a break after every hour [65]. Not surprising that there was
444 no agreement between the surveyed students regarding the best time to conduct the
445 prosthodontics exam in this study, which could be attributed to the personal variations
446 considering having morning and evening types of students [66]. For example, the best timing
447 for the males and fourth- and fifth-year students was late afternoon, however, early
448 afternoon was the preferred time for the females and third year students.

449

450 **4.5. Performance**

451 The academic performance was higher for the third- and fifth-year students, the students
452 with higher high school GPA and cumulative GPA, those students who reported using
453 textbooks to prepare for the exam and those who studied regularly and just revised before
454 the exam. It is widely believed that students who performed better in their early academic
455 levels of study would likewise perform better in upcoming degree-level academic years (daily
456 study). Additionally, the most significant predictor of academic achievement is the study
457 habits, and studies conducted around the world have shown that study habits have an impact

458 on academic performance [67]. Previous studies have shown that effective study habits
459 include working in a quiet environment every day, avoiding distractions like TV and cell
460 phones, taking notes on important material, taking regular breaks, listening to soothing
461 music, prioritizing the difficult material, and studying according to one's own learning
462 preferences [49, 68].

463 Surveys are a type of research method that collect data on respondents' beliefs, attitudes,
464 and behaviours [69]. However, it is well recognized that such a research instrument should
465 also optimize response rates in addition to a thoroughly thought out and prepared collection
466 of questions and a representative sample size. For dentistry surveys, it was stated that a
467 response rate of (80%) or above is preferable and (70-79%) is acceptable [70]. For the third-
468 year students in this study, an overall response rate of (88.6%) was attained. As a result, it
469 can be said that the study's findings are typical among Jordanian dentistry students.

470

471 One limitation of this study can be generalizability of the results due to the fact that the study
472 was conducted in one educational institution that represents its own students' responses
473 with their demographic variables. Further, under- and over reporting might exist due to data
474 collection method (self-administered questionnaire). Future studies should be widely carried
475 out in many institutions nationally and internationally to be able to draw general
476 recommendations.

477

478 Based on the findings, this study could act as a guidance to improve prosthodontics course
479 and examination set-up for providing the best possible learning experience to the students.
480 Furthermore, it can be recommended that prosthodontics exams or dental exams in general
481 should undergo an evaluation process by the academic members prior to exams considering
482 the students' best interest of relevant prosthodontics knowledge and skills development in
483 mind. The students should be advised and guided clearly on how they should prepare for
484 exams. In addition, the resources and textbooks should be clearly defined and made available
485 to the students. The suggested methods to improve the teaching process of prosthodontics
486 course should be followed up and executed if feasible.

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492 **5. Conclusions:**

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494 Within the limitations of this study, the following can be concluded:

495 Course level, GPA and gender were identified as the most influential factors in different

496 aspects of exam evaluation and students' performance. Regular study and use of textbooks

497 were demonstrated to improve academic performance. Additional orientation and guidance

498 relating to the exam (especially for third year students) would be welcomed, as would

499 alternate teaching methods such as small group discussions or study groups.

500

501 **References**

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682 **Tables**683 **Table 1:** The questions used in this study.

Category	Questions
Identification	1. University ID
Sociodemographic characteristics	2. Gender 3. Year of study 4. What was your cumulative GPA? 5. What was your GPA in high school certificate?
Exam evaluation	6. How do you evaluate the exam? 7. What was the main problem with the exam? 8. What type of questions did you find the most difficult? 9. What type of questions do you think is the best for evaluation?
Exam preparation	10. How did you study for the exam? 11. How much time did you spend in exam preparation? 12. What are the mistakes that you have made preparing for the exam you will avoid in the future? 13. Do you think having lectures blended with prosthodontics lab/clinics (with same topic) will improve your understanding of the subject area?
Exam material evaluation	14. Do you understand the lectures thoroughly? 15. Was/were there any information/terms in the exam that was/were not covered/mentioned in the lectures? 16. What suggestions do you have that can help you understand prosthodontics? 17. Do you think the exam material was challenging? 18. If yes in the previous question, Why? (more than one option)
Exam timing	19. What time do you think is better to conduct the exams?
Students' Performance	20. The student course mark was collected blindly according to the provided university ID.

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695 **Table-2:** Sociodemographic characteristics of the study sample, frequency (n) and percentage
 696 (%).

Variable		Frequency (n)	Percentage (%)
Gender	Male	168	30
	Female	392	70
Year of study	Third	257	45.9
	Fourth	127	22.7
	Fifth	176	31.4
Cumulative GPA	Acceptable(2-2.49)	14	2.5
	Good(2.5-2.99)	160	28.6
	Very good(3-3.64)	287	51.2
	Excellent (3.65-4)	99	17.7
GPA high school	Mean \pm SD	95.2 \pm 3.3	-

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700 **Figure captions**

701 **Figure 1:** The resources used by the students to prepare for the exams in prosthodontics.

702 **Figure 2:** The study pattern followed by the students during exam preparation.

703 **Figure 3:** Understanding of the lectures by students.

704 **Figure 4:** Reasons for students thinking that the exam material was challenging.