■ **Orijinal Makale / Original Article** ■

# Exploring the Dunning-Kruger Effect in First-Year Physical Education and Sports Students

## Beden Eğitimi ve Spor Birinci Sınıf Öğrencilerinde Dunning-Kruger Etkisinin Araştırılması

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## Abstract

In the present study, we aimed to explore whether the Dunning-Kruger effect occurs in college students across five different academic examinations regarding the Psychology of Education courses. The sample included 44 college students from a local university aged 19 to 23. Participants took five exams, each having ten questions immediately after a 1-hour Psychology of Education course. At the end of each exam, participants estimated their grade points and rated confidence in their grade point estimation. Participants also rated their perceived difficulty with the exams. Before conducting the statistical analysis, we categorized the participants into high-performing and low-performing students based on a median split of each exam. Further, we calculated how much the participants calibrated in their grade point prediction by subtracting the self-predicted grade point from the actual grade point. Then, we performed a series of paired sample t-tests to investigate whether self-estimate grade points, confidence in grade point estimation, and perceived exam difficulty differ between low and high-performing students. Results demonstrated no significant differences between high and low-performing students in four exams concerning grade point estimation, confidence in grade point estimation, and perceived difficulty. However, the differences between self-estimated and actual grade points were greater in low-performing than high-performing students. To put it simply, in four out of five exams, students who performed poorly tended to overestimate their scores more than those who performed well.

**Key words:** *Dunning-Kruger effect, academic success, self-estimation*

## Özet

Bu çalışmada, eğitim psikolojisi derslerine ilişkin beş farklı akademik sınavda Dunning-Kruger etkisinin üniversite öğrencileri arasında gözlemlenip gözlemlenmediğini incelemek amaçlanmıştır. Araştırmanın örneklemi, 19-23 yaşları arasında, yerel bir üniversitede öğrenim gören 44 üniversite öğrencisinden oluşmuştur. Katılımcılar, bir saatlik bir eğitim psikolojisi dersinin hemen ardından, her biri on sorudan oluşan beş sınavı tamamlamışlardır. Her sınavın sonunda, katılımcılar hem not tahminlerini hem de bu tahminlere olan güven düzeylerini bildirmiş, ayrıca sınav zorluk düzeylerini değerlendirmiştir. İstatistiksel analizden önce, her bir sınavın medyanı esas alınarak katılımcılar yüksek ve düşük performans gösteren öğrenciler olarak iki gruba ayrılmıştır. Katılımcıların not tahminlerinin doğruluğu, tahmin edilen not ile gerçek not arasındaki fark üzerinden hesaplanmıştır. Daha sonra, düşük ve yüksek performans gösteren öğrenciler arasında not tahminlerinin doğruluğu, tahmine olan güven düzeyi ve sınav zorluğu algısı açısından farklılıkların olup olmadığını belirlemek amacıyla bir dizi eşleştirilmiş örneklem t-testi gerçekleştirilmiştir. Analiz sonuçları, dört sınavda yüksek ve düşük performans gösteren gruplar arasında not tahminleri, tahminlere olan güven ve algılanan sınav zorluğu açısından anlamlı bir fark bulunmadığını ortaya konmuştur. Bununla birlikte, düşük performans gösteren öğrencilerin, tahmin ettikleri not ile gerçek notları arasındaki farkın daha büyük olduğu tespit edilmiştir. Diğer bir deyişle, beş sınavın dördünde, düşük performans gösteren öğrenciler, yüksek performans gösteren öğrencilere kıyasla notlarını daha fazla abartma eğilimi göstermiştir.

**Anahtar Kelimeler:** *Dunning-Kruger etkisi, akademik başarı, öz değerlendirme*

## 1. INTRODUCTION

It is common for certain individuals with a relatively lower level of ability and knowledge in a particular domain to assess their performance inaccurately. However, it is crucial to possess a realistic understanding of our abilities in order to make sound decisions, especially in achievement settings, such as school or business. Unrealistic self-assessments might give rise to negative repercussions in both personal and professional realms, leading to decreased productivity, communication issues, or safety concerns. Exploring the link between an individual's self-perceived and actual ability level is imperative to prevent issues stemming from inaccurate or unrealistic self-evaluation.

Research has indicated that individuals tend to hold a biased opinion of their knowledge, skills, and abilities in various areas. For example, Marottoli and Richardson's (1998) study found that people often have unrealistic optimism regarding their driving abilities, leading to safety concerns while driving. Similarly, Sullivan et al. (2019) discovered that volleyball coaches tend to overestimate their coaching skills. Tremayne et al. (2022) found that individuals generally believe they possess superior motor skills compared to others. Studies have also revealed that people tend to overestimate their academic abilities (Dal, 2019).

One of the most critical issues demonstrated by the previous studies is that inaccurate self-evaluation regarding performance is more prevalent among individuals with relatively lower ability and knowledge levels. The Dunning-Kruger effect, which refers to low-performing individuals' tendency to overestimate their capabilities, is one of the most influential theoretical perspectives that can explain the gap between perceived and actual ability, knowledge, and performance. Accordingly, Kruger and Dunning (1999) emphasized that people with significant and measurable deficiencies in their knowledge or expertise cannot recognize these deficiencies.

Studies have revealed that individuals with limited abilities and knowledge tend to exhibit a greater tendency towards inaccurate self-assessment of their performance. This is what we refer to as the Dunning-Kruger effect, which describes the propensity of low-performing individuals to overestimate their skills. In their seminal research, Kruger and Dunning (1999) underscored how those lacking expertise or knowledge remain oblivious to their shortcomings. This theory can help elucidate the discrepancy between perceived and actual aptitude, knowledge, and performance.

The Dunning-Kruger effect can manifest in various domains, such as social, intellectual, academic, and motor domains. In a study conducted by Sheldon et al. (2014), it was found that participants who were emotionally unqualified, unaware, and uninterested in learning more tended to have almost as high self-evaluations as those who performed emotionally best. Tremayne et al. (2022) showed that individuals who performed poorly in a motor task, such as hand-grip strength, significantly overestimated their performance. In two studies, Miller and Geraci (2011) also discovered that college students with low academic skills overestimated their grade points more than high-ability college students.

Kruger and Dunning's 1999 study suggested that individuals who perform poorly in a particular domain face a dual burden of being unskilled and having less ability to recognize their incompetence. These researchers argued that the same skills required to be competent in a domain are necessary to evaluate one's own or others' performances in that domain. Therefore, low-performing individuals suffer from a metacognitive deficit that leads to inaccurate self-evaluation.

However, Miller and Geraci's 2011 study contradicts Kruger and Dunning's findings. They found that low performers in academic settings are aware of their poor performance. Hence, it is important to investigate whether low-performing students are also unable to recognize their actual performance, in addition to their poor performance.

The Dunning-Kruger effect is a fascinating phenomenon that often manifests itself among students across a range of academic disciplines. This effect describes the tendency of some individuals to overestimate their proficiency in a given area, even when they lack the requisite skills or knowledge to excel.

Numerous studies have demonstrated the existence of the Dunning-Kruger effect among students. For example, Pavel et al. (2012) discovered that aviation students who scored lower on grammar and pilot knowledge tests tended to significantly overestimate their abilities compared to those who scored higher.

Similarly, Plohl & Musil (2018) showed that undergraduate students in psychology and sociology were prone to overestimating their competence in grammar, literature, and nanotechnology.

Gao et al. (2020) also conducted a study that revealed that students who performed poorly in principles of economics courses tended to overestimate their performance. Furthermore, Dogan et al. (2023) concluded that low-achieving students were just as confident as high-performing students when estimating their grades, based on a study that measured academic success.

In summary, the Dunning-Kruger effect is a common occurrence among students in various academic fields, and it is crucial to be mindful of it to avoid overestimating one's abilities. Our study seeks to explore whether college students exhibit the Dunning-Kruger effect in Psychology of Education exams. Through analyzing their performance in five one-hour courses, we aim to investigate their expectations of grade points based on actual earned points. Building on prior research and theoretical frameworks, we have developed two hypotheses.

Hypothesis 1: suggests that students who perform below the class median will likely overestimate their grade points.

Hypothesis 2: posits that there will be no significant difference in the confidence levels of low-performing and high-performing students in predicting their grade points. In simpler terms, students who perform poorly will exhibit the same level of confidence in their predictions as those who perform well.

## 2. METHODS

This study adopted a quantitative research model with a cross-sectional design, which is widely used for examining relationships among variables at a single point in time. A cross-sectional design involves collecting data from participants simultaneously across different conditions or measures, enabling the comparison of self-assessment behaviors and performance levels within a specific timeframe.

### Participants

The study sample comprised 44 undergraduate students (26 males, 19 females) enrolled in the Psychology of Education course. Participants were first-year teacher candidates at Manisa Celal Bayar University's Faculty of Sport Sciences, Department of Physical Education and Sports. Their ages ranged from 19 to 23 years (mean age = 19.9, SD = 1.1). All participants provided informed consent. Participation in the online exams varied, with attendance ranging from 29 to 36 students, as some individuals opted to take only selected exams.

### Study Design and Procedures

The Psychology of Education course, a required component for all teacher candidates without prerequisite requirements, was conducted during the spring semester of the 2021-2022 academic year. Students attended synchronous online lectures, followed by five examinations, each administered immediately after a one-hour class session. Each exam included ten multiple-choice questions, and students could earn scores between 0 and 100. The time allocated for completing each exam was precisely 10 minutes, a duration determined based on prior experience and the course content's structure. This constraint required participants to engage actively with the course material to achieve high accuracy.

Following each examination, participants were asked to estimate their performance in terms of grade points (ranging from 0 to 100). Additionally, they rated their confidence in their performance predictions and perceived difficulty of the exams. Confidence was rated on a scale from 1 (lowest) to 10 (highest), while exam difficulty was similarly assessed. The exams focused on topics such as the principles of learning, factors influencing learning, classical conditioning, the theory of contiguity, and operant conditioning.

All procedures performed in this study involving human participants were in accordance with the latest version of the Helsinki Declaration. An informed consent form was obtained from all participants in the study.

### Analysis

To assess participants' calibration in predicting their exam performance, the actual grade points were subtracted from the predicted grade points. This calculation provided a measure of the deviation between participants' estimated and actual grades. Based on the median exam score, participants were categorized into higher-performing and lower-performing groups. A series of paired samples t-tests were conducted to determine whether the two performance groups differed in terms of their grade point deviations, predicted grade points, confidence in their predictions, and perceived exam difficulty.

### 3. RESULTS

Tables 1 to 5 provide a comparison of the perceived difficulty, grade point estimation, confidence in grade point estimation, and deviation of self-estimated grade points from actual grade points between low- and high-performing students in Exams 1 to 5, respectively.

**Table 1.** Results of the Exam 1

| Exam 1 | Groups | Mean | SD | t | p |
|---|---|---|---|---|---|
| GP | Less Successful | 66 | 6.81 | -8.28 | **.01*** |
| | Successful | 85.63 | 7.27 | | |
| Perceived Difficulty | Less Successful | 4.60 | 1.79 | 1.16 | .26 |
| | Successful | 3.88 | 1.96 | | |
| GP Estimation | Less Successful | 72.50 | 11.64 | -1.92 | .06 |
| | Successful | 79.38 | 9.29 | | |
| Confidence in GP Estimation | Less Successful | 7.65 | 1.14 | -1.09 | .28 |
| | Successful | 8.06 | 1.12 | | |
| Difference between GP and GP Estimation | Less Successful | 6.50 | 11.37 | 3.33 | **.01*** |
| | Successful | -6.25 | 11.48 | | |

Results demonstrated that in Exam 1, perceived difficulty, grade point estimation, and confidence in grade point estimation did not differ significantly between high and low-performer students. However, the difference between the self-estimated grade points and the actual grade points was much larger in low-performing students compared to high-performing ones. Examination of descriptive statistics suggested that while low-performing students overestimated their exam scores by 6.5%, high-performing students underestimated their exam scores by -6.25%.

**Table 2.** Results of the Exam 2

| Exam 2 | Groups | Mean | SD | t | p |
|---|---|---|---|---|---|
| GP | Less Successful | 49.50 | 11.46 | -7.97 | **.01*** |
| | Successful | 76.67 | 7.79 | | |
| Perceived Difficulty | Less Successful | 5.70 | 1.53 | .37 | .72 |
| | Successful | 5.50 | 1.45 | | |
| GP Estimation | Less Successful | 68.50 | 7.45 | .91 | .37 |
| | Successful | 65.83 | 9,01 | | |
| Confidence to GP Estimation | Less Successful | 7.20 | 1,54 | .55 | .59 |
| | Successful | 6.92 | 1.17 | | |
| Difference between GP and GP Estimation | Less Successful | 19.00 | 13.34 | 6.19 | **.01*** |
| | Successful | -10.83 | 13.11 | | |

The paired-sample t-test results showed no significant differences between high and low-performing students' perceived difficulty, grade point estimation, and confidence in grade point estimation. On the contrary, the deviation of the self-estimated grade point from the actual grade point was greater in low-performing students than in high-performing students. Descriptive statistics indicated that in Exam 2, low-performing students overestimated their grade points by 19%, while high-performing students underestimated their grade points by 10.83%.

**Table 3.** Results of the Exam 3

| Exam 3 | Groups | Mean | SD | t | p |
|---|---|---|---|---|---|
| GP | Less Successful | 45.26 | 14.67 | -8.85 | .01* |
| | Successful | 79.00 | 5.68 | | |
| Perceived Difficulty | Less Successful | 6.63 | 1.98 | 1.13 | .27 |
| | Successful | 5.60 | 2.95 | | |
| GP Estimation | Less Successful | 45.79 | 14.27 | -4.59 | .01* |
| | Successful | 73.00 | 15.67 | | |
| Confidence to GP Estimation | Less Successful | 5.37 | 1.83 | -3.69 | .02* |
| | Successful | 7.70 | 1.49 | | |
| Difference between GP and GP Estimation | Less Successful | .53 | 21.21 | .85 | .41 |
| | Successful | -6.00 | 16.47 | | |

The results indicated that low-performing students' estimation of grade points was significantly lower than that of high-performing students. Also, low-performing students reported significantly lower confidence in their grade point estimation than high-performing students. In other words, low-performing students were relatively aware of their actual performance and uncertain in their prediction about their exam grades in Exam 3. Contrary to Exam 1 and 2, in Exam 3 deviation of the self-estimated exam grade from the actual exam grade did not differ significantly, which means that low-performer students were more calibrated in their exam grade prediction.

**Table 4.** Results of the Exam 4

| Exam 4 | Groups | Mean | SD | t | p |
|---|---|---|---|---|---|
| GP | Less Successful | 62.94 | 15.72 | -7.24 | .01* |
| | Successful | 91.54 | 3.76 | | |
| Perceived Difficulty | Less Successful | 5.53 | 1,91 | 1.32 | .20 |
| | Successful | 4.62 | 1.85 | | |
| GP Estimation | Less Successful | 68.82 | 9.93 | -1.49 | .15 |
| | Successful | 74.62 | 11.27 | | |
| Confidence to GP Estimation | Less Successful | 6.88 | 1,54 | -1.14 | .26 |
| | Successful | 7.46 | 1.13 | | |
| Difference between GP and GP Estimation | Less Successful | 5.88 | 20.33 | 3.72 | .02* |
| | Successful | -16.92 | 13.16 | | |

We found no significant difference in perceived difficulty, grade point estimation, and confidence in grade point estimation between low and high-performing students. However, the deviation of self-estimated grade points from actual grade points was significantly greater in low-performing students than in high-performing students in Exam 4. Accordingly, descriptive statistics suggested that low-performing students overestimated their grade points by 5.88%. On the contrary, high-performing students underestimated their grade points by 16.9%.

**Table 5.** Results of the Exam 5

| Exam 5 | Groups | Mean | SD | t | p |
|---|---|---|---|---|---|
| GP | Less Successful | 51.00 | 16.83 | -8.16 | .01* |
| | Successful | 87.27 | 7.86 | | |
| Perceived Difficulty | Less Successful | 6.10 | 1.99 | 1.98 | .06 |
| | Successful | 4.64 | 1.91 | | |
| GP Estimation | Less Successful | 60.50 | 12.34 | -2.94 | .01* |
| | Successful | 74.55 | 12.93 | | |
| Confidence to GP Estimation | Less Successful | 6.25 | 1.45 | -2.95 | .01* |
| | Successful | 7.82 | 1.40 | | |
| Difference between GP and GP Estimation | Less Successful | 9.50 | 16.38 | 4.33 | .01* |
| | Successful | -12.73 | 11.91 | | |

The results of paired sample t-tests showed that perceived difficulty did not differ significantly between low and high-performing students. However, high-performing students' estimation of grade points in Exam 5 was significantly higher than low-performing students' grade point estimation. High-performing students had significantly greater confidence in their ability to estimate their grade point average compared to low-performing students. Lastly, the deviation of grade point estimation from the actual grade point differed significantly between high and low-performing students. In this respect, an examination of descriptive statistics revealed that low-performing students overestimated their grade points by 9.5% in Exam 5. On the other hand, high-performing students underestimated their grade points by 12.7% in the same exam.

## 4. DISCUSSION

This study aimed to investigate the presence of the Dunning-Kruger effect among college students taking five different Psychology of Education exams. The results revealed that low-performing students overestimated their grades by 8.3%, while high-performing students underestimated their grades by an average of 10.5%. This indicates that lower-performing students were more inaccurate in predicting their exam grades compared to higher-performing students. Interestingly, both groups of students exhibited similar levels of confidence in their grade predictions, despite the difference in accuracy. he findings of this research are consistent with previous studies on the topic (Pavel et al., 2012; Gude et al., 2017; Plohl & Musil, 2018; Coutinho et al., 2020; Dogan et al., 2023).

Several factors could explain the psychological phenomenon of low-performing individuals' tendency to overestimate their abilities. One potential factor is the need for insight into one's performance, which may lead to overestimating academic success (Raat et al., 2013). The same knowledge and skills are typically needed to succeed in a specific domain and accurately evaluate success. Individuals with a low level of expertise in a particular domain may be more likely to assess their performance in that domain (Kruger and Dunning, 1999) inaccurately.

Another crucial factor to consider is how students perceive intelligence. Some individuals may view intelligence as a fixed trait that remains unchanged over time, while others hold the belief that intelligence is malleable and can be developed (Costa & Faria, 2018; Dweck, 2013). According to Shih (2011), students' implicit theories of intelligence can influence how they respond to achievement situations. This idea is supported by a study conducted by Ehrlinger et al. (2016), which revealed that individuals who perceive intelligence as a fixed trait are more likely to overestimate their performance compared to those who believe it can be developed. The authors also illustrated that those with a fixed mindset might demonstrate an attentional bias towards complex problems, potentially resulting in overestimating their performance.

A recent study by Muller et al. (2021) discovered that differing cognitive processes are employed when assessing the performance of individuals who overestimate and those who underestimate. According to Muller et al. (2021), individuals who underestimate their performance rely on memory recall, while those who overestimate rely on excessive familiarity. Hence, it appears that episodic memory plays a significant role in metacognitive judgments of illusory superiority.

Students' initial proficiency level or students' initial predisposition to the course content might be a factor with the potential to explain low-performing students' tendency to overestimate their performance. In this regard, Saito et al., (2020) students who initially underestimated their performance in a second language speech-learning course could make more calibrated estimations as the course progressed. Contrary, low-performing students who overestimate their performance showed only limited progress in making more calibrated predictions. The downward social comparison might play a role in low-performing students' inflated and miscalibrated performance estimation. Accordingly, when individuals engage in social comparison, they may compare themselves to others who are less knowledgeable or skilled in a particular domain. This comparison can lead them to overestimate their own abilities and knowledge, as they perceive themselves as more competent than their peers. In a recent study by Rubin and Froustis (2023), it has been stated that social comparison with individuals having lower levels of ability might lead to unrealistic performance and skill perception.

The absence of performance feedback, or the presence of subjective and flawed performance feedback, may lead to unrealistically optimistic performance estimations in low-performing students. This assertion is substantiated by a study conducted by Vílchez (2020). According to the study, accurate performance feedback in an academic context has been shown to reduce self-assessment bias in low-performing students. Additionally, Vílchez (2020) suggested that systematic feedback from teachers on individual

errors can eliminate cognitive biases in self-evaluation between low-performing and high-performing students.

The present results that show low-performing students' tendency to overestimate their expertise and performance in a specific course carry specific implications for educational practices, psychological interventions, and future research. First, education administrators should design programs that incorporate more frequent formative assessments and feedback mechanisms to assist students in enhancing their self-evaluation skills. As the parents' attitudes toward students' academic performance might play an important role in erroneous self-evaluation, parental involvement might be another point that education administrators should consider. Also, parents should be aware of their children's academic capabilities and limitations. It is important for parents to help their children develop improved study habits and effectively track their academic advancement while establishing attainable academic targets.

## 5. LIMITATIONS AND RECOMMENDATIONS

The current study has some limitations that suggest several potential avenues for future research. Our focus was solely on investigating whether the Dunning-Kruger effect could manifest in specific course material. However, addressing the tendency of underperforming students to overestimate their abilities necessitates a comprehensive approach. Therefore, it is important to consider individual differences, such as academic self-efficacy and students' cognitive capabilities, to gain a deeper understanding of the factors contributing to the Dunning-Kruger effect studies. Personality, and parental support should be incorporated into future research for a deeper understanding of the factors than can lead to Dunning-Kruger effect in school.

## 6. CONFLICT OF INTEREST AND ETHICS COMMITTEE APPROVAL

**Conflict of interest:** *There isn't conflict of interest among the authors.*

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**Ethics Approval:** *The authors declare that the article complies with national and international research and publication ethics. In case of a contrary situation, the **Journal of Sport and Recreation Research** has no responsibility, and all responsibility belongs to the authors of the article.*

**Ethics Committee Approval:** *This study was prepared with the approval of Recep Tayyip Erdoğan University Non-Interventional Clinical Research Ethics Committee (Decision number: 2021/35, E-40465587-050.01.04-47).*

All procedures performed in this study involving human participants were in accordance with the latest version of the Helsinki Declaration.

**Informed Consent:** *An informed consent form was obtained from all participants in the study.*

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