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The Dunning-Kruger Effect on Free Throw Shooting

Abigail Schescke, Nicolas Veldhorst, Makayla De Young

Dordt University

Abstract

This study examines the Dunning-Kruger effect in regards to physical activity. Seventy-four participants with various levels of basketball experience were recruited from an undergraduate university. Participants were assigned to make predictions regarding the number of free throw shots they would make out of ten before or after warming up. Out of factors which affected participant predictions (gender, previous experience, warm up group), gender was found to have a significant relationship with predictive error score. Additionally, underconfidence from top-performing participants and overconfidence from bottom-performing participants indicates the presence of the Dunning-Kruger effect in physical tasks.

Keywords: overconfidence, gender, prediction, physical task, self-evaluation

The Dunning-Kruger Effect on Free Throw Shooting

Humans are poor at accurate self-evaluation (Zell et al., 2020). Factors affecting accurate self-evaluation include consideration of past performance (Helzer & Dunning, 2012), metacognitive ability (Kruger & Dunning, 1999), self-efficacy (McPherson & McCormick, 2006), and gender (Lundeberg et al., 1994).

One aspect of inaccurate self-evaluation includes the better-than average effect (BTA), which occurs when people perceive their traits, abilities, and characteristics as superior to an average peer (Zell et al., 2020). The BTA effect is significantly larger when comparing traits than when comparing abilities, but the magnitude of the BTA effect is similar for women and men (Zell et al., 2020). Additionally, BTA effects are more likely to occur in situations involving easy (Moore & Small, 2007) and ambiguous (Dunning et al., 1989) tasks.

When predicting performance, one can err in gauging their performance compared to others (misplacement) and in predicting their performance in absolute, numeric, terms (misestimation) (Engeler & Häubl, 2021). Both those who incorrectly believe they are BTA and those who believe they are worse-than-average (WTA) have misplaced their performance relative to others. However, those who mistakenly believe that they are BTA tend to also misestimate their absolute performance, while those who are mistakenly WTA tend to be accurate about their absolute performance. Those who are mistakenly WTA seem to overestimate the ability of their peers, while those who are mistakenly BTA underestimate their peers (Engeler & Häubl, 2021).

One reason why people err in predicting their own performance is that they value their own aspirations more than their past behavior (Helzer & Dunning, 2012). In contrast, peer evaluation focuses primarily on past behavior rather than personal aspirations. Since past performance is statistically linked to future achievement, peer evaluation tends to be far more

accurate than personal evaluation. Unfortunately, people believe past behavior is more important when predicting the outcomes of others, but trust their own aspirations more when predicting personal outcomes (Helzer & Dunning, 2012). In the current study, past basketball performance should heavily impact participants' predictions of free-throw performance. However, past basketball experience may not affect participants' predictions of free-throw accuracy if the predictive error of overly valuing personal aspirations holds true.

Poor metacognitive skills also leave people less capable of recognizing competence in themselves and others, a phenomenon which has been termed the Dunning-Kruger effect (Kruger & Dunning, 1999). Metacognition critically impacts self-evaluation, with improvement of metacognitive skills leading to more accurate self-appraisals (Kruger & Dunning, 1999). Those competent in a domain are more accurate in their own self-appraisals than their estimates of others (Dunning, 2003), while those who are incompetent are mistaken about both their own performance and that of others (Kruger & Dunning, 1999).

A person's perception of their capability to perform a certain way in any given situation is known as self-efficacy (Allison et al., 1999; Bandura, 1997). The belief that a person holds concerning whether they can or cannot successfully complete a given task ultimately shapes the outcome of that situation. As such, an individual's level of self-efficacy more effectively and reasonably predicts the outcome of whatever situation they are in than other psychological, experiential, or ability-related measures. In academic situations, self-efficacy levels more significantly predict achievement as related to both exam scores and course completion than other variables related to prior learning experiences such as past experience in the same course or past work experience in the same area of knowledge (Beaston et al., 2020). The same truth applies to other performance-related areas, such as music. When musicians rated their

self-efficacy levels before performing, a substantial positive relationship between self-efficacy and final performance outcomes emerged (McPherson & McCormick, 2006). On the basis of these findings, one would expect that the self-efficacy levels of the current study participants will have an influence on their performance, or the number of free throws they are able to make.

However, issues with this relationship between self-efficacy and final outcomes arise when people have inaccurate perceptions of their own abilities, or when their internal gauge for measuring self-efficacy is skewed. To understand how the connection between self-efficacy and final outcomes operates, one must understand the building blocks of self-efficacy itself.

Three primary factors significantly affect self-efficacy in situations related to physical activity: mastery experience, self-persuasion, and affective states (Warner et al., 2014). Previous positive experiences in a similar situation, or mastery experiences, positively related to the development of self-efficacy. Another positive relationship exists between internal self-persuasion towards completing a task and increased self-efficacy. Finally, negative moods or affective states result in a decreased level of self-efficacy and hinder its development (Warner et al., 2014). This means that an individual's level of self-efficacy can easily become warped based on several factors, leading to a situation involving the Dunning-Kruger effect and inaccurate predictions concerning one's future performance.

Perceptions of self-efficacy can also be altered by implicit and explicit cognitive biases. Because affective states shape self-efficacy (Warner et al., 2014), implicit cognitive biases may also result in skewed perceptions of self-efficacy levels. Emotions are processed cognitively through implicit means, resulting in the development of biases towards certain behaviors over time. This means that an individual may hold an explicit prediction regarding a situation that

does not come to pass because of the implicit biases they have (Sun & Matthews, 2012). Thus, evaluation of self-efficacy is not objective.

The bottom-up explicitation model states that implicit knowledge is first learned through trial and error and is later applied explicitly to future situations (Sun & Matthews, 2012). Applying the bottom-up explicitation model to the current study regarding the Dunning-Kruger effect may have implications for participant performance as it relates to previous basketball experience as well as the manipulated variable of warming up before shooting free throws. These two factors may result in the development of implicit knowledge for current study participants, which can affect their explicit predictions regarding future performance.

Similarly, the top-down assimilation model states that explicit happenings can be implicitly assimilated into an individual's cognitive framework (Sun & Matthews, 2012), which also has implications for the current study, particularly the manipulated variable. If participants complete the warm up section of the current study and do not have a positive or successful experience, they may implicitly assimilate the belief that they are not successful at shooting free throws into their existing cognitive framework. Such assimilation will result in reduced self-efficacy, and a lower prediction of made free-throws than if participants had not had the warm up period.

It is crucial to take gender into consideration when testing the Dunning-Kruger effect as it can play a significant role when one is estimating their own abilities. Males and females have significantly different levels of overconfidence (Beyer, 1990). Males tend to overestimate their abilities at a higher rate than female participants, a difference known as the overconfidence gender gap (Amirkhanyan et al., 2021) .

Males and females are both overconfident in their incorrect exam answers (Lundeberg et al., 1994). However, males are more overconfident compared to females even when the accuracy between the two groups is ultimately the same (Lundeberg et al., 1994). The overconfidence gender gap is found in all content areas of the Scholastic Aptitude Test (SAT) when analyzing the number of questions students skipped from fear of penalty points. On average, female students skipped around two times the amount of the questions male students skipped, even though the ability of these students was consistent (Baldiga, 2014). The overconfidence gap does not solely apply to academic knowledge, but also financial, athletic, and "street smart" knowledge (Amirkhanyan et al., 2021; Barber & Odean, 2001; Johnson et al., 2006; Lirgg, 1991).

Predictive estimation is different from overconfidence as it inspects how humans estimate their future performance (Beyer, 1990). A significant difference in overestimation was found when students predicted their grade on a future exam. Male students overestimated their grade whereas female students actually underestimated their exam grade (Dahlbom et al., 2011). Researchers believe overconfidence and overestimation are related, but there is a lack of research in regards to each genders' estimation of future performance.

Gender stereotypes change the way individuals view themselves and their ability to perform (Bordalo et al., 2019). The gender overconfidence gap is demonstrated in domains in which males have a stereotypical advantage, such as contact sports or violent video games (Amirkhanyan et al., 2021; Bordalo et al., 2019). Interestingly, skills that are stereotypically female or neutral do not produce the same overconfidence gender gap as stereotypically male skills (Lirgg, 1991). Confidence levels affect the estimation of future performance (Beyer, 1990), so males are more likely to overestimate future performance in mascuine tasks. Since basketball

is categorized as masculine (Yi-Hsiu & Chen-Yueh, 2013), one would expect male overestimation in the current study about free-throw shooting and prediction.

While research about the Dunning-Kruger effect exists in knowledge-based tasks, there is a considerable lack of research regarding its application to specific and measurable physically active tasks. Researchers hypothesize that the Dunning-Kruger effect is less prominent when evaluating physical skill rather than knowledge-based skill (Kruger & Dunning, 1999). The current study will test this hypothesis by examining how past experience, warmup participation, and gender will affect predictions of free-throw performance.

Methods

Participants

Seventy-four participants between the ages of 18 and 22 were recruited from a private, Christian, liberal-arts university. Forty were males and 34 were females. Participants were recruited from lower-level psychology courses as well as the cross country, track, and basketball teams. Participants enrolled in lower-level psychology courses may have been compensated for their involvement in this study with extra credit points which could be applied to one course at the discretion of their professors. Recruitment for this study took place in the form of several brief presentations to target students in each group mentioned above.

Measures

Participants were consented (see Appendix A). Participants recorded pertinent demographic information such as gender and year in college (see Appendix B). This included questions related to previous basketball experience, indicating years of competitive and/or recreational basketball experience since sixth grade. Seventeen participants had zero to three years of previous basketball experience. Twenty-eight participants had four to seven years of

previous basketball experience; and 29 participants had eight to 11 years of basketball experience.

We reserved the gymnasium of the same university. The gymnasium seats 2,500 spectators and could be divided into three separate courts. Two hoops on opposite sides of the gymnasium were used to minimize distractions. All male participants used basketballs with a 29.5-inch circumference, while all female participants used basketballs with a 28.5-inch circumference, consistent with standard-sized basketballs typically used competitively for each gender.

Procedure

Participants signed up for 10-minute time blocks. A random digit table (see Appendices C and D) was used to assign participants within each gender to one of two groups, predicting their free throw performance before warm-up or after warm-up.

Participants arrived at the gym lobby at their assigned time and were consented. Next, they completed the demographics information and were sent to their assigned hoop. When they arrived at their assigned hoop, they handed the completed survey to the researcher.

Participants in group one were given instructions to shoot 5 warmup free-throws and then predict how many free-throws they would make out of 10. Participants in group two were instructed to make their prediction then shoot 10 free throws. Instructions included the assertion that any faults such as jumping or stepping over the free throw line would count as a miss. These instructions were standardized. We recorded participant predictions and shooting scores on the bottom of the survey sheet. After completing their free throw shots, participants were allowed to leave the gym. Upon completion of the study a debrief email (see Appendix E) was sent to all participants to clarify the purpose of the study and the confidentiality of their personal data.

Data Analysis

We analyzed collected data by comparing participants' predictive error score to three independent variables: past basketball experience, warm-up group, and gender. Participants' predictive error score was determined by subtracting the number of free throws made from the number of free throws predicted. A negative score indicated underconfidence in free throw ability; a positive score indicated overconfidence in free throw ability; and a score of zero indicated no under- or over-confidence in free throw ability. Participants' predictive accuracy was determined by finding the absolute value of their predictive error score.

Independent sample t-tests compared warm-up groups on accuracy, as well as the gender on their predictive error. An ANOVA test assessed the relationships between years of experience for accuracy.

Results

Pre-warmup and post-warmup predictions did not significantly affect participant predictive accuracy. Participants who made predictions prior to warming up had similar accuracy (n = 36, $M = 1.67$, $SD = 1.24$) to participants who made predictions after warming up (n = 38, $M = 2.08$, $SD = 1.53$), $t(72) = -1.28$, $p > .05$.

Free throw predictive accuracy did not significantly differ among groups with 0-3 years of total basketball experience (n = 17, $M = 2.17$, $SD = 1.55$), 4-7 years of total basketball experience (n = 28, $M = 2.03$, $SD = 1.50$), and 8-11 years of total basketball experience (n = 29, $M = 1.55$, $SD = 1.28$), $F(2, 72) = 2.48$, $p > .05$.

The gender of participants significantly influenced their predictive error scores. A negative predictive error value indicated underconfidence; a positive predictive error value indicated overconfidence. A predictive error score of zero indicated no error in prediction. Males

were more overconfident in their predictions of free-throw performance (n = 40, *M* = 0.38, *SD* = 2.53) than females (n = 34, *M* = -0.76, *SD* = 1.99). Males were significantly more overconfident than females, t (72) = 2.17 , $p < .05$.

Participants were divided into quartiles based on free-throws made in order to compare confidence differences between the top and bottom quartiles. The top-performing quartile tended to be underconfident in their free-throw predictions (n = 17, *M* = -1.59, *SD* = 0.87), while the bottom-performing quartile was overconfident (n = 19, *M* = 1.79, *SD* = 2.32). The difference between the two groups was significant, t (34) = 5.89, $p < .001$.

Discussion

Existing literature in the field has not found the Dunning-Kruger effect's presence in physical tasks (Kruger & Dunning, 1999). This study utilized the physical task of free-throw shooting to investigate the influence of gender, past basketball experience, and warm up order on the magnitude of the Dunning-Kruger effect. Men were overconfident in their predictions and women were underconfident. Participants' past basketball experience did not affect their predictive error scores. Pre-warm up and post-warm up prediction groups demonstrated no significant difference in predictive accuracy. The top and bottom quartiles of performance were compared to test the Dunning Kruger effect. It was supported as the bottom quartile was overconfident and the top quartile was under confident in their predictions.

The relationship between gender and predictive error was consistent with the literature regarding gender, confidence, and self-evaluation of abilities. Males tend to exhibit more overconfidence than females (Barber & Odeon, 2001; Johnson et al., 2006; Lirgg, 1991; Lundeberg et al., 1994), and females tend to underestimate their performance (Dahlbom et al., 2011). Overconfidence by males increases in stereotypically masculine skills (Amirkhanyan et

al., 2021; Bordalo et al., 2019) such as basketball (Yi-Hsiu & Chen-Yueh, 2013). In our study males were overconfident in their free-throw predictions, while females were under confident. This difference between genders in confidence compared to performance (predictive error) was significant.

Besides gender, another explanation for inaccurate prediction of performance is that people tend to value their own aspirations rather than their past behavior (Helzer & Dunning, 2012). Even though past performance is statistically linked to future achievement, people trust their aspirations in predicting personal outcomes (Helzer & Dunning, 2012). In our study, we tested whether recent past performance (the warm-up free throws before the actual ones) and long-term past experience (years of basketball playing experience) affected accuracy of free-throw predictions.

While the group in our study that warmed up prior to making their free-throw predictions had the benefit of recent past performance in the task they were about to perform, they did not demonstrate significantly greater predictive accuracy than the post-warm up prediction group. Similar predictive accuracy between the post-warm up and pre-warm up prediction groups affirms previous findings that past performance is not properly considered in evaluating one's future performance. Additionally, the amount of previous basketball experience did not significantly improve predictive accuracy. Those with 0-3 years of total basketball experience did not significantly differ in predictive accuracy from those with 4-7 or 8-11 years of total basketball experience.

The Dunning-Kruger effect presents a strange paradox: the most competent in a domain tend to underestimate their performance while the incompetent overestimate their performance (Kruger & Dunning, 1999). In our study this effect was supported, with the top-performing

quartile, based on free-throws made, being under confident in predictions and the bottom-performing quartile being overconfident. Previous researchers hypothesized that the Dunning-Kruger effect would be less prominent in physical tasks than knowledge-based tasks (Kruger & Dunning, 1999), making the significance of our findings surprising and important for future studies.

Limitations arose in our study based on the low power and weak manipulation. When the participants' years of basketball experience was divided into three groups, the participants were not equally distributed. In future research studies, this limitation can be addressed by recruiting a larger sample size, as an increase in participants should lead to a better distribution of experience.

Another limitation was the weak manipulation of the post-warm up group. We expected a significant difference in predictive accuracy between the pre- and post-warm up groups because the warm up would allow the participant to gauge their ability. Since the two groups showed no significant difference, it is possible that the warm up of five shots was not an accurate predictor of the participants' performance. To address this limitation, the warm up could be extended to 10 shots in order to reflect the actual task.

Based on this research study, we conclude that confidence levels are affected when performing a non-exertive physical task. Gender also had the most significant effect on confidence levels, while past experience and post warm up prediction were not found to significantly alter participant confidence levels. Previous studies found the Dunning-Kruger effect exists in a variety of situations (Kruger & Dunning, 1999). Given the significant relationship of gender and predictive error score, and the significant difference in predictive error

of the quartiles, the Dunning-Kruger effect is also present in situations involving non-exertive physical activity.

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Appendix A

Informed Consent

Informed Consent Form

We are asking you to participate in a research study titled Practice Effects and Non-Exertive Physical Activity. We will describe this study to you and answer any of your questions. This study is being led by Makayla De Young, Nicolas Veldhorst, and Abigail Schescke. The Faculty Advisor for this study is Dr. Luralyn Helming, Department of Psychology at Dordt University.

The purpose of this research study is to examine the accuracy of predicting a physical task.

We will ask you to predict and shoot ten to fifteen free throws.The total time commitment should take you ten minutes or less.

We do not anticipate any risks beyond the normal level of risk incurred during daily non-exertive physical activities.

We do not anticipate any direct benefits from participating in this research.

You may receive compensation in the form of extra credit points at the discretion of your course instructor(s).

We will protect your privacy and confidentiality by assigning an identification number to each set of data provided by each participant. Signed consent forms will always be kept separate from survey data. Data will be tracked via this assigned number.

Please note that email communication is neither private nor secure. Though we are taking precautions to protect your privacy, you should be aware that information sent through email could be read by a third party.

De-identified data from this study may be shared with the research community at large to advance science and health. We will remove or code any personal information that could identify you before files are shared with other researchers to ensure that, by current scientific standards and known methods, no one will be able to identify you from the information we share. Despite these measures, we cannot guarantee anonymity of your personal data.

Your information will not be used or distributed for future research studies.

Taking part is voluntary; you may refuse to participate before the study begins, discontinue at any time, or skip any questions/procedures that may make you feel uncomfortable, with no penalty and no effect on the compensation earned before withdrawing.

If you have any questions, please contact us, Makayla De Young at mkyldyng@dordt.edu, Nicolas Veldhorst at nclsvldh@dordt.edu, and Abigail Schescke at bschsck19@dordt.edu. If you have additional questions about this study, feel free to contact our faculty sponsor and Chair of the Institutional Review Board, Prof. Luralyn Helming, at Luralyn.Helming@dordt.edu or (712)722-6038. If you have any questions in general about your participation as a research participant in studies at Dordt University please contact the Acting Chair of the Institutional Review Board and Director of Kielstra Center for Research and Grants, Angela Kroeze Visser, at Angela.KroezeVisser@dordt.edu or (712)722-6339.

I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature Date:

Your Name (printed)

Signature of person obtaining consent Date:

Printed name of person obtaining consent

This consent form will be kept by Dr. Helming for five years beyond the end of the study. It will be securely stored in her private office.

Appendix B

Demographic Survey

Gender: Male or Female

Year in college: 1st year 2nd year 3rd year 4th year 5th year +

Mark all the years you have played *organized* basketball (including the current year):
("Organized basketball" refers to school team, AAU, club, NOT intramurals)

Middle School	High School	College
___ 6th grade	___ 9th grade	___ 1st year
___ 7th grade	___ 10th grade	___ 2nd year
___ 8th grade	___ 11th grade	___ 3rd year
	___ 12th grade	___ 4th year

Mark all the years you have played *recreational* basketball (including current year):
("Recreational basketball" refers to a community rec league and intramurals)

Middle School	High School	College
___ 6th grade	___ 9th grade	___ 1st year
___ 7th grade	___ 10th grade	___ 2nd year
___ 8th grade	___ 11th grade	___ 3rd year
	___ 12th grade	___ 4th year

Researcher Use Only

Prediction:
___ out of 10

Warm-Up:
___ 1
___ 2
___ 3
___ 4
___ 5

Actual:
___ 1
___ 2
___ 3
___ 4
___ 5
___ 6
___ 7
___ 8
___ 9
___ 10

Appendix C

Random Digit Table (Males)

TABLE 1 - RANDOM DIGITS

11164	36318	75061	37674	26320	75100	10431	20418	19228	91792
21215	91791	76831	58678	87054	31687	93205	43685	19732	08468
10438	44482	66558	37649	08882	90870	12462	41810	01806	02977
36782	28236	33266	66583	60881	97395	20461	36742	02852	50564
73944	04773	12032	51414	82384	38370	00249	80709	72605	67497
49563	12872	14063	93104	78483	72717	68714	18048	29005	04151
64208	48237	41701	73117	33242	42314	83049	21933	92813	04763
51486	72875	38605	29341	80749	80151	33835	52602	79147	08868
99756	26360	64516	17971	48478	09610	04638	17141	09227	10606
71325	55217	13015	72907	00431	45117	33827	92873	02953	85474
65285	97198	12138	53010	94601	15838	16805	61004	43516	17020
17264	57327	38224	29301	31381	38109	34976	65692	98566	28550
95639	99754	31199	92558	68368	04885	51092	37780	40261	14479
61555	76404	86210	11808	12841	45147	97438	60022	12645	62000
78137	98768	04689	87130	79225	08153	84967	64539	79483	74917
62490	99215	84987	28759	19177	14733	24550	28067	68894	38490
24216	63444	21283	07044	92729	37284	13211	37485	10415	36457
16975	95428	33226	55903	31605	43817	22250	03918	46999	98501
59138	38542	71168	57609	91510	77904	74244	50940	31553	62562
29478	59652	50414	31966	87912	87154	12944	49862	96566	48825
96155	95009	27429	72918	08457	78134	48407	26061	58754	05326
29621	66583	62966	12468	20245	14015	04014	35713	03980	03024
12639	75291	71020	17265	41598	64074	64629	63293	53307	48766
14544	37134	54714	02401	63228	26831	19386	15457	17999	18306
83403	88827	09834	11333	68431	31706	26652	04711	34593	22561
67642	05204	30697	44806	96989	68403	85621	45556	35434	09532
64041	99011	14610	40273	09482	62864	01573	82274	81446	32477
17048	94523	97444	59904	16936	39384	97551	09620	63932	03091
93039	89416	52795	10631	09728	68202	20963	02477	55494	39563
82244	34392	96607	17220	51984	10753	76272	50985	97593	34320
96990	55244	70693	25255	40029	23289	48819	07159	60172	81697
09119	74803	97303	88701	51380	73143	98251	78635	27556	20712
57666	41204	47589	78364	38266	94393	70713	53388	79865	92069
46492	61594	26729	58272	81754	14648	77210	12923	53712	87771
08433	19172	08320	20839	13715	10597	17234	39355	74816	03363
10011	75004	86054	41190	10061	19660	03500	68412	57812	57929
92420	65431	16530	05547	10683	88102	30176	84750	10115	69220
35542	55865	07304	47010	43233	57022	52161	82976	47981	46588
86595	26247	18552	29401	33712	32285	64844	69395	41387	87195
72115	34985	58036	99137	47482	06204	24138	24272	16196	04393
07428	58863	96023	88936	51343	70958	96768	74317	27176	29600
35379	27922	28906	55013	26937	48174	04197	36074	65315	12537
10982	22807	10920	26299	23593	64629	57801	10437	43965	15344
90127	33341	77806	12446	15444	48244	47277	11346	15884	28131
63002	12990	23510	68774	48983	20481	59815	67248	17076	78910
40779	86382	48454	65269	91239	45989	45389	54847	77919	41105
43216	12608	18167	84631	94058	82458	15139	76856	86019	47928
96167	64375	74108	93643	09204	98855	59051	56492	11933	64858
70975	62693	35684	72607	23026	37004	32989	24843	01128	74658
85812	61875	23570	75754	29090	40264	80399	47254	40135	69916

Appendix D

Random Digit Table (Females)

TABLE 2 – RANDOM DIGITS

40603	16152	83235	37361	98783	24838	39793	80954	76865	32713
40941	53585	69958	60916	71018	90561	84505	53980	64735	85140
73505	83472	55953	17857	11446	22618	34771	25777	27064	13526
39412	16013	11442	89320	11307	49396	39805	12249	57856	88686
57994	76748	54627	48511	78646	33287	35524	54522	08795	56273
61834	59199	15469	82285	84164	91333	90954	87186	31598	25942
91402	77227	79516	21007	58602	81418	87838	18443	76162	51146
58299	83880	20125	10784	37780	61705	18276	99041	78135	98661
40684	99948	33880	76413	63839	71371	32392	51812	48248	98419
75978	64298	08074	62055	73864	01928	78374	15741	74452	49854
34556	39861	88267	76068	62445	64361	78685	24246	27027	48239
65990	57048	25067	77571	77974	37634	81564	98608	37224	40848
16381	15869	25416	87875	90374	86203	29677	82543	37554	89179
52458	88880	78352	67913	09245	47773	51272	06976	99571	33365
33007	85607	92008	44887	24864	50559	79549	85658	96865	24186
38782	31512	08588	61490	72294	42862	87334	05866	66269	43158
58722	03678	19186	69602	34625	75958	56869	17907	81867	11535
26188	69497	51351	47799	20477	71786	52560	66827	79419	70886
12893	54048	07255	86149	99090	70958	50775	31768	52903	27845
33186	81346	85095	37282	85536	72661	32180	40229	19209	74939
79893	29448	88392	54211	61708	83452	61227	81690	42265	20310
48449	15102	44126	19438	23382	14985	37538	30120	82443	11152
94205	04259	68983	50561	06902	10269	22216	70210	60736	58772
38648	09278	81313	77400	41126	52614	93613	27263	99381	49500
04282	46028	75666	26954	34979	68381	45154	09314	81009	05114
17026	48737	85875	12139	59391	81830	30185	83095	78752	40899
48070	76848	02531	97737	10151	18169	31709	74842	85522	74092
30159	95450	83778	46115	99178	97718	98440	15076	21199	20492
12148	92231	31361	60850	54695	30035	22765	91386	70399	79270
73838	77087	24863	97576	01139	54219	02959	45696	98103	78867
73547	43759	95632	39555	74391	07579	69491	02647	17050	40869
07277	93217	79421	21769	83572	48019	17327	99638	87035	89300
65128	48334	07493	28098	52087	55519	83718	60904	48721	17522
38716	61380	60212	05099	21210	22052	01760	36813	19528	07727
31921	76458	73720	08857	74922	61335	41690	41967	50691	30508
57238	27464	61487	52329	26150	79991	64398	91273	26824	94827
24219	41090	08531	61578	08236	41140	76335	91189	66312	44000
31309	49387	02330	02476	96074	33256	48554	95401	02642	29119
20750	97024	72619	66628	66509	31206	55293	24249	02266	39010
28537	84395	26654	37851	80590	53446	34385	86893	87713	26842
97929	41220	86431	94485	28778	44997	38802	56594	61363	04206
40568	33222	40486	91122	43294	94541	40988	02929	83190	74247
41483	92935	17061	78252	40498	43164	68646	33023	64333	64083
93040	66476	24990	41099	65135	37641	97613	87282	63693	55299
76869	39300	84978	07504	36835	72748	47644	48542	25076	68626
02982	57991	50765	91930	21375	35604	29963	13738	03155	59914
94479	76500	39170	06829	10031	48724	49822	44021	44335	26474
52291	75822	95966	90947	65031	75913	52654	63377	70664	60082
03684	03600	52831	55381	97013	19993	41295	29118	18710	64851
58939	28366	86765	67465	45421	74228	01095	50987	83833	37216

Appendix E

Debriefing Statement

In this study we were testing the Dunning-Kruger effect, which measures overconfidence in relation to abilities. We wanted to see how accurate free-throw predictions were for people with varying levels of basketball experience. Additionally, we wanted to see if warming up before making free-throw predictions would influence the accuracy of the predictions. We kept the purpose of the study vague so as to not influence your predictions.

Your predictions and free-throw data will be kept confidential, and your personal information will not be linked to your performance data (you will be represented by a number, not your name).