

# Grit and Peers: An Experimental Study on Peer Effects in Perseverance

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## Abstract

Perseverance to accomplish long-term goals is a crucial determinant for success in life. Previous studies elicited self-reported perseverance, also known as grit, using the eponymous survey scale (Grit-S). In a novel lab experiment, we introduce a straight-forward behavioral measure of grit. Participants work on an anagram solving task where grit is quantified as the decision to continue working hard despite failure and challenges. We find that the survey measure of grit is significantly correlated with our behavioral measure. In a further treatment, we test whether individuals look at their peers' behavior to motivate themselves to endure in the anagram solving task. We find that the presence of peers increase their observers' perseverance, while being observed does not significantly alter behavior. In a third treatment, we investigate the motives to self-select into the role of an observing participant or that of a participant that is observed and which kind of peers individuals deliberately choose. Our findings provide novel insights into the workings of peer effects.

**Keywords:** Perseverance; Peers; Grit; Real effort task

## Introduction

Over the last decade, research has identified a number of non-cognitive skills, such as for instance the Big Five personality traits or the trait competitiveness, that shape individuals' academic or economic success, their health, and/or criminal activity [1-3]. In this paper, we focus on the non-cognitive skill grit, which is defined as "perseverance and passion to accomplish long-term goals in the face of challenges and setbacks" [4]. Previous studies have shown that grit significantly affects educational attainment, job stability, entrepreneurial success as well as performance in competitions [4-6].

At the same time, a large literature has studied the role of peer effects on productivity and behavior in the workplace [7-10]. However, the exact channels through which individuals influence each other are still largely unexplored.

In [11], we apply a novel experimental design to analyze if and how peers affect each other's perseverance/grittiness on a task. We base our research design on the following idea: While workers might not know their co-workers' initial abilities and cannot assess the quality of the output before the termination of a project, they often have a good estimate of how much effort their colleagues exert and how long they remain working on the task at hand. Consider for instance graduate students working in

the same office: They can observe on a daily basis when their peers come and go and whether they are working on their research projects or browsing the internet. But different fields of research and methods might make it difficult to compare the peers' progress and output to their own. Nevertheless, observing other students working more diligently likely affects a student's perseverance on his or her own project.

In the following, we focus on the general construct of grit in the sense of [4]. In the original paper [11], we split the Grit-S scale into its two facets "consistency of interests over time" and "perseverance of effort" to zoom into the different aspect of these factors and report a range of further results that we summarize only briefly here.

## Design

During the experiment, participants (mainly undergraduate students from a whole range of faculties at Aarhus University, Denmark) work on a tedious and strenuous computerized anagram solving task (coded in z-tree, [12]). They have to rearrange letters of English words to form new ones. We accept all possible anagrams that can be build from a word as correct solutions. As an example, consider the word "top" that can be rearranged to "pot" and "opt". Our main task involves solving relatively hard anagrams that comprise five to seven letters.

Alternatively, participants are free to work on an outside option with easy anagrams that comprise only three to four letters.

Each session starts with an unincentivized five minute practice round with easy anagrams. In the main part of the experiment, participants are paid based on their performance. It is divided into two parts consisting of ten rounds of three minutes each. Within each round, participants are given 90 seconds to work on an anagram, before the computer displays a new anagram free of cost. When working on hard anagrams, participants may also “skip” anagrams, so that a new anagram is displayed immediately.

For each correctly solved hard anagram participants earn DKK 5 (at the time of the experiment, the exchange rate of DKK 1 was US-\$ 0.18 or Euro 0.13). Skipping a hard anagram comes at a cost of DKK 3, just like switching to the outside option of easy anagrams. This, together with the relatively low incentives (DKK 0.50 per solved easy anagram) makes switching clearly monetarily unattractive.

The main aim of part 1 of the experiment is the incentivized elicitation of participants’ grit. In particular, we consider participants’ tendency to skip hard anagrams excessively as a manifestation of their non-gritiness in the sense of [4]. Instead of seriously trying to solve each single hard anagram, we expect that less gritty individuals skip hard anagrams more often.

In the Baseline Treatment (62 participants), the instructions presented in the beginning of part 2 simply ask participants to continue working on the anagram solving task, as they did in part 1.

Participants in the Peer Treatment are presented a new set of instructions on their computer screens. These inform them that in part 2, half of the participants in their session will be randomly assigned the role of an Observer and the other half will assume the role of a Peer (45 participants per role). Always one Observer and one Peer are randomly matched and stay together for the entire duration of part 2. Both are presented with the same anagrams in the same order. Observers learn their own and their Peer’s performance quintile from part 1. Moreover and more importantly, the instructions of both Observers and Peers make clear that Observers are constantly informed about their Peer’s skipping and switching behavior during part 2: When Observers work on hard anagrams their computer screens display the total number of hard anagrams the matched Peer has skipped since the beginning of that part and whether the Peer is working on hard or easy anagrams in the current round. This information is updated at the beginning of each round, that is, every three minutes.

In the Chosen Matching Treatment (involving further 90 participants), after being informed about their performance quintile in part 1, participants have to make two choices for part 2. First, we ask them to indicate whether they want to assume the role of an Observer or that of a Peer. We inform participants that the computer allocates the desired roles under the premise that within each performance quintile always one of the participants assumes either role. Subsequently, participants are asked to state

from which performance quintile they want to observe a Peer in case they are assigned the role of an Observer. Apart from that, the procedures and information presented are just the same as in the Peer Treatment. Lastly, to elicit participants’ self-reported grit level using the Grit-S scale [5] and to collect further control variables, we administer a short survey. For more details on the experimental design and the survey, please refer to [11].

## Results

**Table 1** presents the main effects of self-reported grit on perseverance on the task. In all regressions, the dependent variable is the number of skipped anagrams in those sub-periods in which participants work on hard anagrams. In specifications (1) and (2) we focus on part 1 of the experiment and pool the data from all our three treatments. The instructions to these treatments do not differ up to this point in the experiment.

Specification (1) confirms that participants’ propensity to skip hard anagrams is significantly negatively correlated with their self-reported level of grit, as measured using the Grit-S scale. Additional control variables, such as gender, age, a dummy capturing whether the survey measure of grit was elicited in the beginning or end of the experimental session, and an independent ability measure of self-reported experience in wordplay games leave the coefficient of self-reported grit largely unaffected, see specification (2).

Specification (3) examines peer effects in perseverance. Here we only consider data from part 2 of the Baseline and Peer Treatment. Essentially, we regress participants’ number of skipped anagrams in rounds in which they actually work on hard anagrams on their self-reported grit levels, role dummies and interactions thereof. The role dummies take value 1 for participants in the Observer and Peer role, respectively. We hence treat participants from the Baseline Treatment as our reference group. Considering the role coefficients, we find that for average gritty individuals, being able to observe another participant significantly increases Observers’ perseverance when working on hard anagrams, while knowing to be observed does not significantly affect Peers’ perseverance. Moreover, the grit effect is significant for participants from the Baseline Treatment (see the highly significant Grit-S coefficient), the total effects of grit for Observers and Peers are both far from significant and do not differ significantly from each other ( $p > 0.801$ , not reported in **Table 1**). We conclude that participants’ inherent levels of grit are decisive when working in isolation – like in the Baseline Treatment. However, if participants can observe someone else’s perseverance or know that they are observed, their genuine level of grit has less of an effect on their task perseverance.

When we turn to the analysis of the Chosen Matching Treatment, we find that slightly less than a third of the participants indicated a desire to assume the Observer role. Moreover, participants who actually assume that role choose on average a Peer who proved to be at least as able as they were themselves in part 1. In all five performance quintiles, at least half of the participants prefer to be informed about the (non-)perseverance of a Peer from

Hard anagrams skipped in	Part 1 (all treatments)		Part 2 (Peer treatment only)
	1	2	3
Grit-S (centered)	-0.125*	-0.132*	-0.540***
	(0.043)	(0.041)	(0.001)
Observer			-0.998*
			(0.049)
Peer			-0.705
			(0.185)
Observer × Grit-S (ctr.)			0.553**
			(0.007)
Peer × Grit-S (ctr.)			0.571**
			(0.004)
Constant	0.749*	0.589	1.080*
	(0.011)	(0.220)	(0.017)
Controls	No	Yes	Yes
Adjusted R <sup>2</sup>	0.069	0.075	0.264
Number of clusters	242	242	151
Observations	1848	1848	1230

Pooled OLS Regressions, Dep. variable in (1) and (2): Number of skipped hard anagrams per round in part 1 (if actually working on hard anagrams), observations from all treatments used. Dep. variable in (3): Number of skipped hard anagrams per round in part 2 (if actually working on hard anagrams), restricted to observations from Peer Treatments. Control variables in (2) include self-reported experience in wordplay games such as Scrabble and crosswords (answer options: “never”, “once a year”, “once a month”, “once a week” and “every day”), a gender dummy and age in years. Control variables in (3) comprise ‘Tactics’ (defined as participants’ mean earnings from rounds in which they work on hard anagrams in part 1) and Cumulated # switches in part 2. All regressions include dummy variables for rounds and sessions and a dummy for whether the survey measure of grit was elicited in the beginning or end of the experimental session. Grit measures are mean-centered. P-values for two tailed tests calculated from cluster-robust standard errors in parentheses: \*p<0.05 \*\* p<0.01 \*\*\* p<0.001.

their own or a better performance quintile, in line with [13,14]. However, a further, non-negligible fraction of Observers prefers to observe a (slightly) less able Peer, potentially to motivate them to persevere, in line with [15]. For further results, we refer the reader to [11].

## Conclusion

By means of a controlled experiment, we investigate how the presence of a peer affects individuals’ performance in a qualitative dimension, i.e. their perseverance. The fact that Observers increase their perseverance in the presence of a Peer has policy implications for diverse situations in which peer effects can be expected, including, but not limited to sport, social, work, and educational contexts. In the organizational context, superiors are well advised to arrange working conditions that permit workers to observe each other regardless of their individual tasks, in order to profit from perseverance-increasing peer effects. In a similar vein, our findings suggest that students would benefit from studying in the library or study rooms instead of working individually at home. In the domain of sports, athletes might

benefit from training with other athletes - even if they compete in different sports.

Although our findings from the Peer Treatment indicate that the presence of peers increase their co-workers’ perseverance, the results from our Chosen Matching Treatment, suggest that a significant part of the workforce prefers to avoid the peer situation. When given the choice between the Observer and Peer role, the majority of participants prefers the Peer role. Participants’ survey responses suggest that they chose this role as a means to avoid being distracted by information about another participant’s actions. This finding warrants further study. Individuals might prefer and even deliberately choose to work alongside a peer in a tedious task. However, if they are confronted with a cognitively more challenging task, the present study indicates that they might prefer to work in isolation in order to not get distracted by peer information. It seems worthwhile to gain further understanding of how the work environment and specificities of the work task influence peer effects.

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