Momentum in contests and its underlying behavioral mechanisms

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Motivation

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  - Success begets success: *positive momentum*, *snow-ball effect*, or *winner effect*
  - Lower performance after success: winners *rest on their laurels*, or losers fight harder because they have their *back to the wall*

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- Experimental evidence (Mago et al. 2013, Descamps et al. 2022) and field evidence (Gauriot and Page 2019) support the existence of positive momentum in contests.
  - Exact nature of the mechanisms underlying momentum in contests is however still an open question.

Motivation

- A key issue is whether momentum is strategic or behavioural (psychological)
  - Strategic differences in subsequent contest can arise from different outcomes in the first contest
  - E.g. round 2 of best of N contest is strategically different for winner and loser of round 1

Motivation

- A key issue is whether momentum is strategic or behavioural (psychological)
  - Strategic differences in subsequent contest can arise from different outcomes in the first contest
  - E.g. round 2 of best of N contest is strategically different for winner and loser of round 1
- Studies aiming to tease out strategic and behavioral mechanisms have mixed results (Malueg and Yates 2010, Mago et al. 2013, Cohen-zada et al. 2017, Gauriot and Page 2018, Descamps et al. 2022)

This Paper

Focus on potential behavioural sources of momentum

- Setting with no strategic momentum: Sequence of two contests with independent prizes and different (randomly chosen) opponents
- Model successive contests allowing for past success to affect
  - the utility of future prizes
  - productivity in later contests
  - the belief of self-efficacy
- Test theoretical predictions with a lab experiment
  - Use opponent's performance in first contest as a source of random variation
  - Differentiate between a winner effect and a loser effect

Overview of Results

- We find clear evidence of **positive momentum**
  - Winners of the first contest have higher performance and are more likely to win second contest relative to losers
- No evidence of momentum effect from **winning margin**
- Behavioral momentum: **Adaptive preferences** - participants lose relative interest in the round 2 contest's prize after losing in round 1

Model

- Two ex-ante symmetric players $i = 1, 2$ compete in the first of two independent contests
  - Contestant $i = 1$ then competes with third contestant, $i = 3$, in second contest
- Players simultaneously choose effort b_{it} with cost $c(b_{it})$, increasing, convex and satisfying Inada conditions
- Output: $y_{it} = f(b_{it}, a_i) + \varepsilon_{it}$
  - Increasing, concave down in effort
  - For positive effort, output increases in ability a_i
  - $\varepsilon_t \equiv \varepsilon_{-it} - \varepsilon_{it}$, distributed $G(\varepsilon_t)$ iid accross t, $g(\varepsilon_t)$ symmetric and unimodal at 0
- Payoffs: $\pi_{it} = u(v_t)p_{it}(y_{it}, y_{-it}) - c(b_{it})$
  - Deterministic outcome: $p_{it}(y_{it}, y_{-it}) = 1$ if $y_{it} > y_{-it}$, $= 0$ otherwise

First order conditions

Given uncertainty of noise term and relative ability of the contestants, expected payoffs:

$$\mathbb{E}_{a_i,a_{-i},b_{-it}}[\pi_{it}] = u_h(v_t)\mathbb{E}_{a_i,a_{-i},b_{-it}}[G(f_h(b_{it},a_i) - f_{h_{-i}}(b_{-it},a_{-i}))] - c(b_{it})$$

First order condition for effort provision in contest t:

$$u_h(v_t)\mathbb{E}_{a_i,a_{-i},b_{-it}}\left[g(f_h(b_{it},a_i) - f_{h_{-i}}(b_{-it},a_{-i}))\frac{\partial f_h(b_{it},a_i)}{\partial b_{it}}\right] = c'(b_{it})$$

We assume that first order conditions are sufficient for effort choice

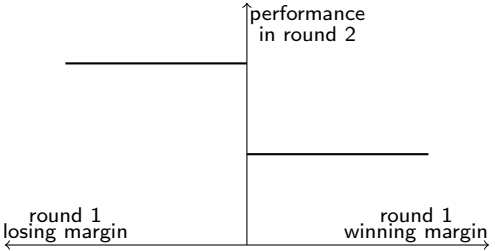
- Allow utility, impact function and beliefs to depend on history, h

Theoretical Predictions

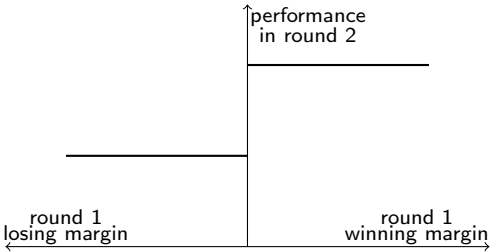
Consider one behavioural mechanism at a time, turning off all other impacts

1. Wealth Effects/Loss Aversion - loser of first round has higher marginal utility for prize in second round
2. Adaptive preferences - loser of first round has a lower marginal utility for prize in second round
3. Regret - Larger difference between realized payoffs and best possible payoff given noise realizations in first round lowers productivity in second round
4. Self-Efficacy - Larger winning margin in first round increases confidence and productivity in second round

Theoretical Predictions: Effect of winning on utility



Wealth Effects/Loss Aversion



Adaptive Preferences

With wealth effects or expectation-based loss aversion, $u_\ell(v_2) > u_w(v_2)$, so $b^*_{\ell 2} > b^*_{w2}$

With adaptive preferences, $u_\ell(v_2) < u_w(v_2)$, so $b^*_{\ell 2} < b^*_{w2}$

Theoretical Predictions: Regret

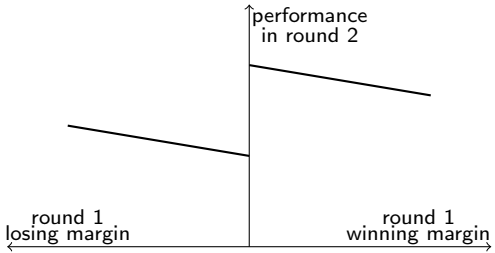
Contestant

i experiences the most regret after a close defeat;

ii experiences the least regret after a close success;

iii who has won the first contest experiences greater regret after success by a large margin;

iv who has lost the first contest experiences lower regret after failures by a large margin.

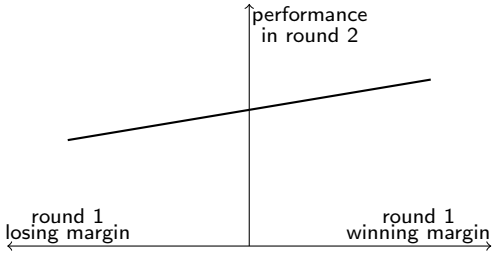


Theoretical Predictions: Self Efficacy

Contestant

i gains more confidence, and has a larger gain in performance, after a success by a large margin;

ii loses more confidence, and has a larger drop in performance, after a failure by a large margin.



Experimental Design: Task

- Real effort task: Participants asked to type strings of 8 characters backward in 7 minutes, and each time a string is correctly typed in reverse order, a new one appears.
  - Based off task in Descamps et al (2022)
- Subjective and objective opportunity cost of effort
  - Participant given initial endowment of \$2.1, and lose \$0.005 each second
- In each round, the player with the higher number of finished strings compared to their opponent wins that round's prize.

Experimental Design: Conditions

After a trial period, each participant completed three different conditions, one randomly drawn for payment

- **A** : both round one and round two have a prize of $15.
- **B** : round one has a prize of $25, and round two has a prize of $5.
- **C** : the prize structure is the same as *B*, but participants also receive full information on the performance of other participants in the session at the end of Game 2.

The order of Condition A and B were randomized, Condition C is always last

Experimental Design: Conditions

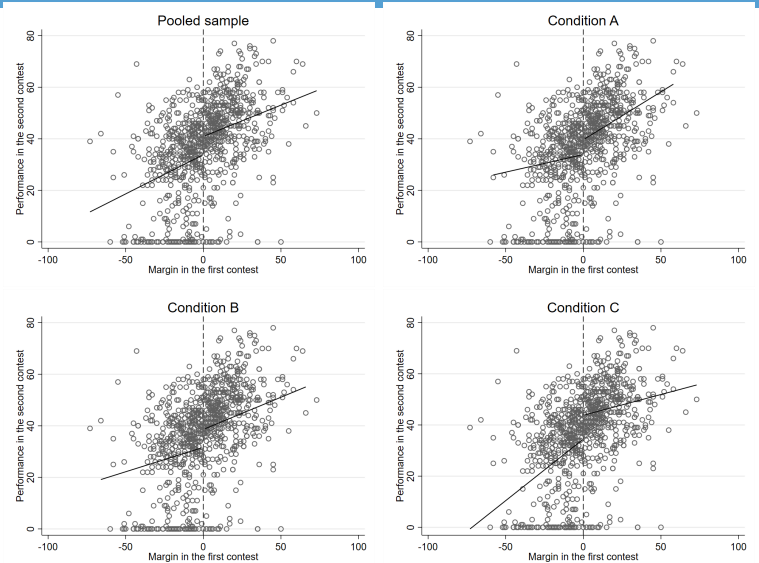
	Decreasing marginal utility	Adaptive preferences	Regret	Self-efficacy
Condition A	- -	++	+	++
Condition B	-	++	++	++
Condition C	-	++	++	++

Table: How experimental conditions are expected to modulate the different possible behavioural effects. Two symbols is a larger effect than one symbol. We expect no strategic learning effect in *Condition C*.

Descriptive statistics

	Pooled sample	*Condition A*	*Condition B*	*Condition C*
First contest				
Mean performance, $\overline{y}_1$	38.15	34.67	37.52	42.27
Standard deviation	16.46	16.53	16.46	15.53
N participants	891	297	297	297
Second contest				
Mean performance, $\overline{y}_2$	36.90	38.59	35.62	36.49
Standard deviation	17.86	15.92	17.60	19.78
N participants	891	297	297	297

Descriptive statistics



Effect of Winning

Endogeneity of past performance as an explanatory variable

- Past performance can be linked to later performance due to unobservable external factors and the personal characteristics of the players.

Model performance y_{it} of each player i in round t as generated by:

$$\begin{cases} y_{i2} = \alpha + \tau win_{i1} + \delta + u_i + \varepsilon_{i2} \\ y_{i1} = \alpha + u_i + \varepsilon_{i1} \end{cases} \tag{1}$$

- win_{i1} is a dummy taking the value 1 if player i won in round 1, and 0 otherwise.
- δ round effect (learning or exhaustion)
- u_i is an individual effect

Identification of Effect of Winning

Conditional on the player's performance in round 1, variations in winning vs. losing (and in margin of victory) entirely driven by performance of opponent

- Since opponents are randomly matched in each contest, a player's opponent's score is the source of a random variation
- Similar to IV method a la Gill and Prowse (2014), but allows for dealing with endogenity of both win and margin

Include fixed effects of each level of performance, $\mathbb{1}_{y_{i1}=k}$ to Model (1)

$$y_{i2} = \beta_{2,0} + \beta_{2,1} win_{i1} + \sum_{k} \gamma_k \mathbb{1}_{y_{i1}=k} + \eta_{i2} \quad (2)$$

Effect of Winning

	Model (2): Effect of winning			
	Pooled sample	*Condition A*	*Condition B*	*Condition C*
Performance after:				
Won	40.14	40.94	38.31	39.65
Lost	34.64	36.22	32.92	33.32
Difference	6.50^{***}	4.72^{**}	5.39^{*}	6.32^{*}
p-value	(<0.001)	(0.004)	(0.020)	(0.026)
N	891	297	297	297

Table: Effect of the first round outcome on the player's second round performance. p-values in brackets. Significant at * 5%, ** 1%, *** 0.1%.

Effect of Winning and of the Margin

Add margin to Model (2) to estimate the effect of winning and the margin of the outcome in the first contest:

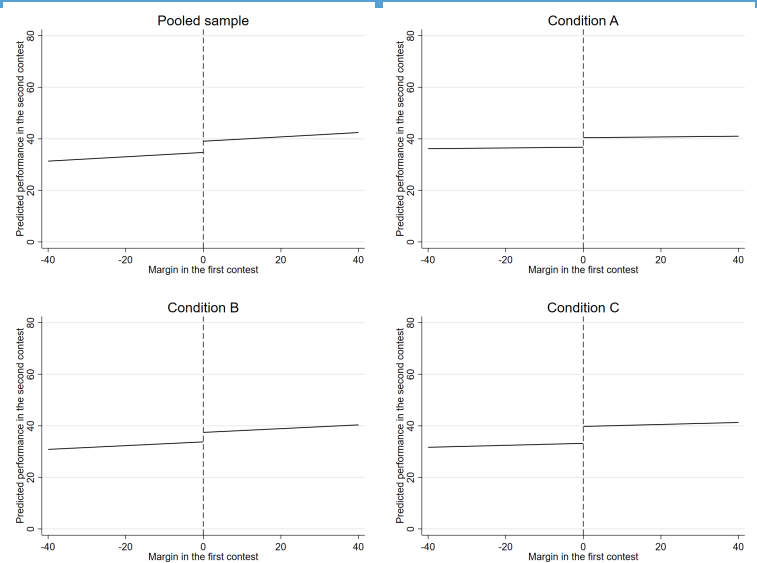
$$y_{i2} = \beta_{2,0} + \beta_{2,1} win_{i1} + \beta_{2,2} margin_{i1} + \sum_k \gamma_k \mathbb{1}_{y_{i1}=k} + \eta_{i2} \quad (3)$$

Effect of Winning and of the Margin

	Model (3): Effect of winning and of the margin			
	Pooled sample	*Condition A*	*Condition B*	*Condition C*
Performance after:				
Just won (Margin=0)	39.13	41.19	37.66	39.33
Just lost (Margin=0)	34.64	35.97	33.55	33.63
Difference	4.48**	5.22*	4.11	5.70
p-value	(0.006)	(0.047)	(0.204)	(0.110)
Effect of margin:				
Margin	0.07	-0.02	0.05	0.02
p-value	(0.103)	(0.818)	(0.515)	(0.786)
N	891	297	297	297

Table: Effect of the first round outcome on the player's second round performance. p-values in brackets. Significant at * 5%, ** 1%, *** 0.1%.

Effect of Winning and of the Margin



Decomposition of Winner and Loser Effects

Modify Model (1):

$$\begin{cases} y_{i2} = \alpha + \tau_w win_{i1} + \tau_l(1 - win_{i1}) + \delta + u_i + \varepsilon_{i2} \\ y_{i1} = \alpha + u_i + \varepsilon_{i1} \end{cases} \tag{4}$$

Rewriting the first equation taking the first difference between the player's performance in rounds 2 and 1 in a given game we have:

$$\Delta y_{i2} = (\tau_\ell + \delta) + (\tau_w - \tau_\ell) win_{i1} + \eta_{i2} \tag{5}$$

Can identify both τ_ℓ and τ_w when $\delta = 0$ using IV of opponent's performance on win_{i1}

- All learning occurs between first and second round of the first set of contests (Game 1)

Decomposition of Winner and Loser Effects

		Condition A	*Condition B*	*Condition A & B*	*Condition C*
Game 1	Winner effect	13.40***	6.71†	10.90***	
		(0.001)	(0.087)	(0.001)	
	Loser effect	-0.45	-2.77	-1.71	
		(0.877)	(0.468)	(0.475)	
Game 2	Winner effect	4.52	1.49	2.65	
		(0.129)	(0.018)	(0.180)	
	Loser effect	-3.91	-10.93***	-7.88*	
		(0.113)	(0.001)	(0.018)	
Game 3	Winner effect				-1.80
					(0.336)
	Loser effect				-9.76***
					(0.001)

Table: P-values in brackets. Significant at * 5%, ** 1%, *** 0.1%.

Conclusion

Evidence supports the behavioral explanation of positive momentum that arises from **Adaptive Preferences**

- Find a positive momentum from winning round 1 on round 2.
- Did not find positive momentum from the margin of winning/losing
- Momentum appears to stem from a loser effect - less effort is put in the second round by the loser of the first round

Identification of Effect of Winning

Since opponents are randomly matched in each contest, a player's opponent's score is the source of a random variation in the player's winning in that round.

- Use the score of the player's opponent in round 1 as an instrumental variable for the player's success in round 1

The 2SLS system of equation is:

$$\begin{cases} y_{i2} = \beta_{2,0} + \beta_{2,1} win_{i1} + \eta_{2,i} \\ win_{i1} = \beta_{1,0} + \beta_{1,1} y_{j1} + \eta_{1,i} \end{cases} \tag{6}$$

Effect of Winning

	Model (6)**: Effect of winning**			
	Pooled sample	*Condition A*	*Condition B*	*Condition C*
Performance after:				
Won	39.04	35.81	37.79	42.27
Lost	34.74	41.38	33.43	30.67
Difference	4.30†	-5.56	4.36	11.60***
p-value	(0.060)	(0.175)	(0.264)	(0.001)

Table: P-values in brackets. Significant at * 5%, ** 1%, *** 0.1%.