



CREDITS

- **MENTOR:** João Antunes
- **SCIENTIST:** Ewa Miendlarzewska
- **CREATIVE CODER & VISUAL ARTIST:** Rodrigo Carvalho
- **STORYTELLER & DESIGNER:** Ryan Wallace
- **BLACKBOX:** Teresa Mendes

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SUMMARY

SEX VERSUS GENDER

Studying sex differences in humans is made more complex by the concept of gender. Where biological sex is genetically determined, gender is a concept that encompasses both biological sex and social constructs ultimately referring to which sex the individual identifies. In biological sciences and in this document, we refer to the biological sex.

Reference: Riley, A. L., Hempel, B. J. & Clasen, M. M. Sex as a biological variable: Drug use and abuse. *Physiol. Behav.* 187, 79–96 (2018).

With this game, we'd like to introduce you to a few paradoxes in men and women's behaviors that are most likely biologically determined and that may underlie global outcomes that disadvantage women versus men. For instance, you have surely heard about **the gender pay gap** but did you know that women invest less in high-risk/high-growth assets which may later contribute to **the gender pension gap**?

THE GENDER PENSION GAP

- The gender pension gap is the percentage by which women's average pension is lower than men's; it measures by how much women are lagging behind men
- The estimated gender pension gap is 85.1% for the EU-28

Source: Eurostat report, 2017

OUR MESSAGE

Clearly, our biology is not the only reason why women are on average financially disadvantaged but our aim here is to bring these important issues to your attention: we need to recognize and cherish the scientifically confirmed biological differences between men and women and adapt the man-made social systems so that they serve both sexes equally well.

Thank you for your interest and kind attention!

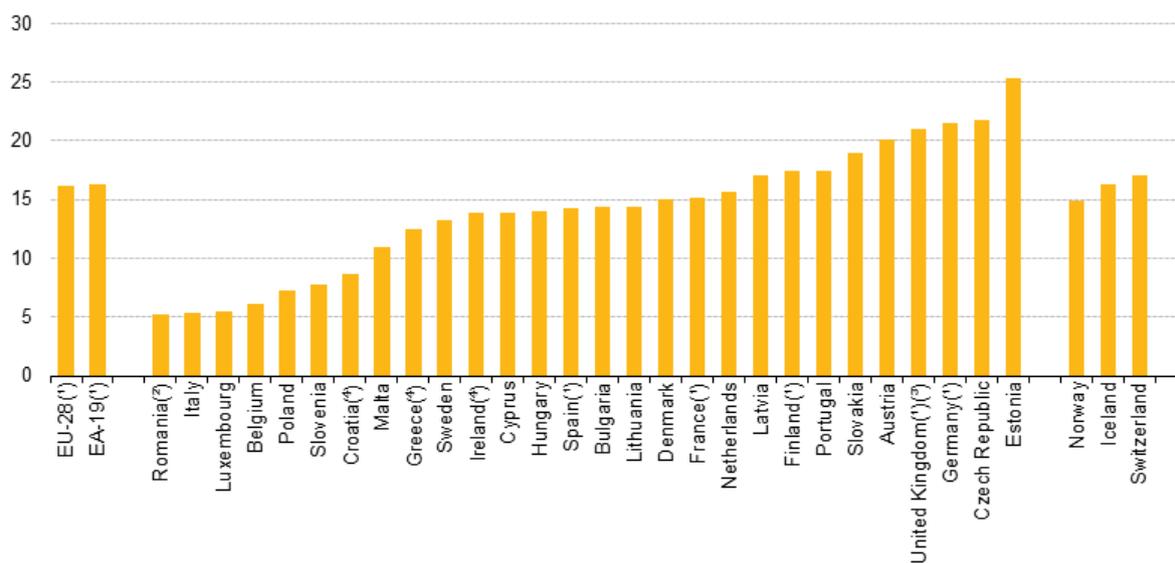
WHO DONATES MORE MONEY: MEN OR WOMEN?

The paradox: Even though women earn less, they donate more money to charities than men.

THE GENDER PAY GAP

The unadjusted **gender pay gap** is defined as the difference between the average gross hourly earnings of men and women expressed as a percentage of the average gross hourly earnings of men. It is calculated for enterprises with 10 or more employees.

- In 2016, women's gross hourly earnings were on average 16.2 % below those of men in the EU.
- In 2016, the highest gender pay gap in the EU was recorded in Estonia (25.3 %) and the lowest in Romania (5.2 %). **Portugal was at 17.5%.**
- In all EU countries, except for Spain, **the highest gender pay gap was recorded for financial and insurance industries**. In 2016, it varied from 18.1 % in Italy to 39.8 % in the Czech Republic (35.9% in the UK and 23.7% in Portugal).



Note: For all countries except the Czech Republic: data for enterprises employing 10 or more employees, NACE Rev. 2 B to S (-); Czech Republic: data for enterprises employing 1 or more employees, NACE Rev. B to S

(*) Provisional data

(*) Estimated

(*) Estimated by Eurostat

(*) 2014 data

Source: Eurostat

THE SCIENCE OF WHY WOMEN GIVE MORE MONEY

The neural reward system is more sensitive to prosocial than selfish rewards in women.

- Research indicates that women prefer shared (prosocial) outcomes because women's dopaminergic signal to shared rewards is stronger than to non-shared (selfish) rewards.
- Dopamine in the ventral striatum reliably correlates with subjective value and reward and reducing dopaminergic activity using a dopamine-suppressing drug biased women to make more selfish decisions.

In a money-sharing experimental task, women chose the prosocial reward option more often than men (51% vs. 40%). During that choice, activation of the striatum (reward value-coding structure in the brain) for prosocial versus selfish decisions were stronger in female participants. However, when brain dopamine transmission was pharmacologically suppressed, women chose to share their money significantly less often (45%), around as often as men (44%).

- This research demonstrates that gender differences in the brain are functional rather than morphological.

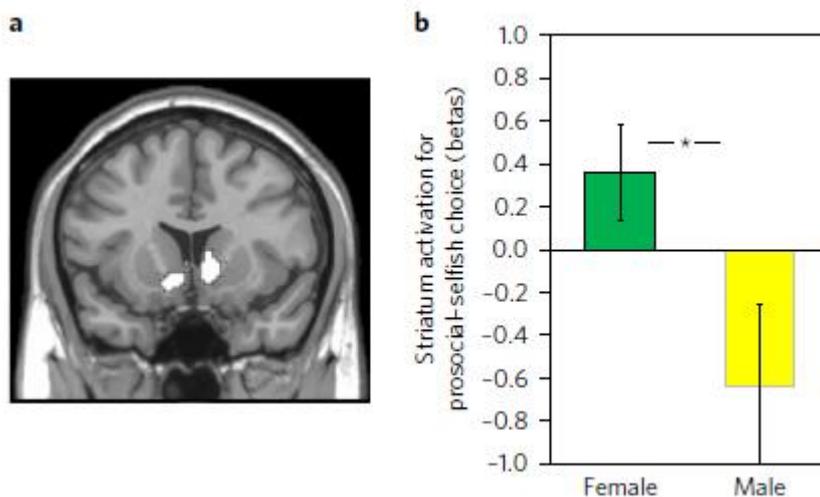


FIGURE 1 RESULTS OF THE NEUROIMAGING STUDY OF MONEY-SHARING TASK.

Reference: [Soutschek, A. et al. The dopaminergic reward system underpins gender differences in social preferences. Nat. Hum. Behav. 1, \(2017\).](#)

WHO TAKES MORE FINANCIAL RISK?

The paradox: although women save more, they invest less.

In a report by a private US bank, women have been found to save on average 8.3% of their income, while men only save 7.9%. Other reports from 2017 show that paradoxically, although men and women save around the same proportion of it (roughly a third), men invest twice as much of it compared to women.

Specifically, **women** are particularly less willing to invest their money in **risky financial products** compared to men. In the UK, women are more likely than men to hold their own savings account (62 percent compared to 55 percent), but **half as likely to hold stocks and shares (23 percent versus 11 percent)**, which have historically – although not always – provided better returns.

Sources: RateSetter, Earnest, Fidelity, Financial Times

THE SCIENCE BEHIND MEN'S FINANCIAL RISK APPETITE

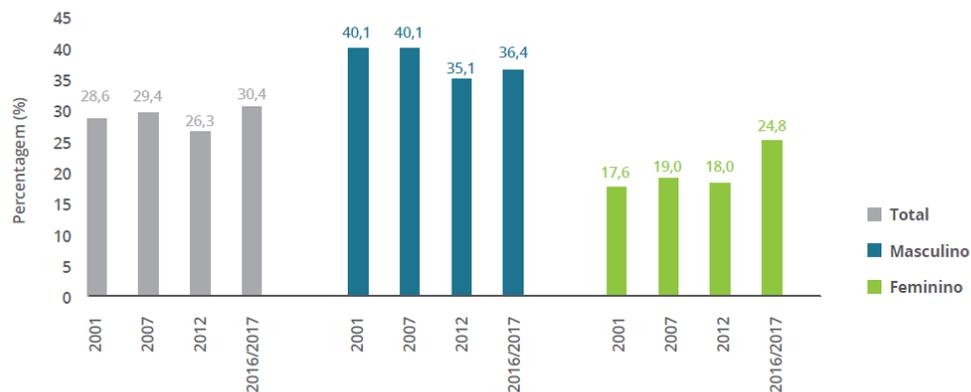
- Differences in risk taking between men and women depend on the type of risk. Men have greater appetite for financial risks (e.g., gambling), possibly due to the testosterone modulation of the willingness to invest in high-volatility assets.
- In men, but not in women, testosterone production increases in preparation for a challenge, increases further if the challenge is won and drops if lost—just like stock prices. This is called the “winner effect” of testosterone. Therefore, traders/investors winning in bull markets likely experience increases in endogenous production of testosterone.
- Experimental research shows that giving testosterone to traders playing an economic game resulted in increased price offers and over-optimism about future changes in asset values ([Nadler et al., 2017](#)). In one study, testosterone administration to non-professionals (healthy young male volunteers) caused a 46% increase in purchasing of high-volatility assets and no change in low-risk assets ([Cueva et al., 2015](#)).
- Thus, testosterone appears to increase individual willingness to take financial risks because it biases estimates of future outcome. As a result, women are relatively more pessimistic about a positive future outcome of a stock gamble and enjoy taking financial risk less ([Harris and Jenkins, 2006](#)).

For a review see: [Herbert, J. Testosterone, Cortisol and Financial Risk-Taking. Front. Behav. Neurosci. 12, 1–17 \(2018\).](#)

WHO GETS ADDICTED MORE EASILY: MEN OR WOMEN? THE CASE OF TOBACCO.

The paradox: even though more men consume tobacco products, women are more sensitive to the negative effects of smoking.

GRÁFICO 5 EVOLUÇÃO DA PREVALÊNCIA DO CONSUMO DE TABACO NOS ÚLTIMOS 30 DIAS, 15-64 ANOS, POR SEXO, PORTUGAL | 2001, 2007, 2012, 2016/2017



Fonte: Balsa C., Vital C., Urbano C. IV Inquérito Nacional ao Consumo de Substâncias Psicoativas na População Geral, Portugal 2016/17. I relatório final. Lisboa: SICAD – Serviço de Intervenção nos Comportamentos Aditivos e nas Dependências; 2017.

source: www.sns.gov.pt

1 EM CADA 5 PORTUGUESES FUMA

População residente, 15 ou mais anos, 2014



20%

da população residente
com 15 ou mais anos fuma



10% DAS MORTES EM PORTUGAL SÃO DEVIDAS AO TABACO

Mortes atribuíveis ao tabaco, todas as idades, estimativas, 2016

**1 em cada 10
mortes/ano
é atribuída
ao Tabaco**



**1 morte
a cada
50 minutos**

Total de mortes



9.263
16,4%



2.581
4,7%

O TABACO CONTRIBUI PARA A MORTE POR DIVERSAS DOENÇAS

Mortes atribuíveis ao tabaco, todas as idades, estimativas, 2016



5.545
por cancro
(19,5% das mortes
por esta causa)



3.109
por doenças
respiratórias
crónicas
(46,4% das mortes
por esta causa)



2.165
por doenças
cérebro e
cardiovasculares
(5,7% das mortes
por esta causa)



805
por infeções
respiratórias
(12,0% das mortes
por esta causa)



227
por diabetes
(2,4% das mortes
por esta causa)

Fonte: Institute for Health Metrics and Evaluation (IHME), GBD Compare [Internet] Data Visualization, Seattle, WA, IHME, University of Washington, 2016 (Consult, 2017,29 set); Disponível em: <http://vizhub.healthdata.org/gbd-compare>
Inquérito Nacional de Saúde 2005/2006 e Inquérito Nacional de Saúde 2014

The Paradox: Although the prevalence of tobacco use is higher in men as compared to women, regardless of nationality, women find it harder to quit smoking than men.

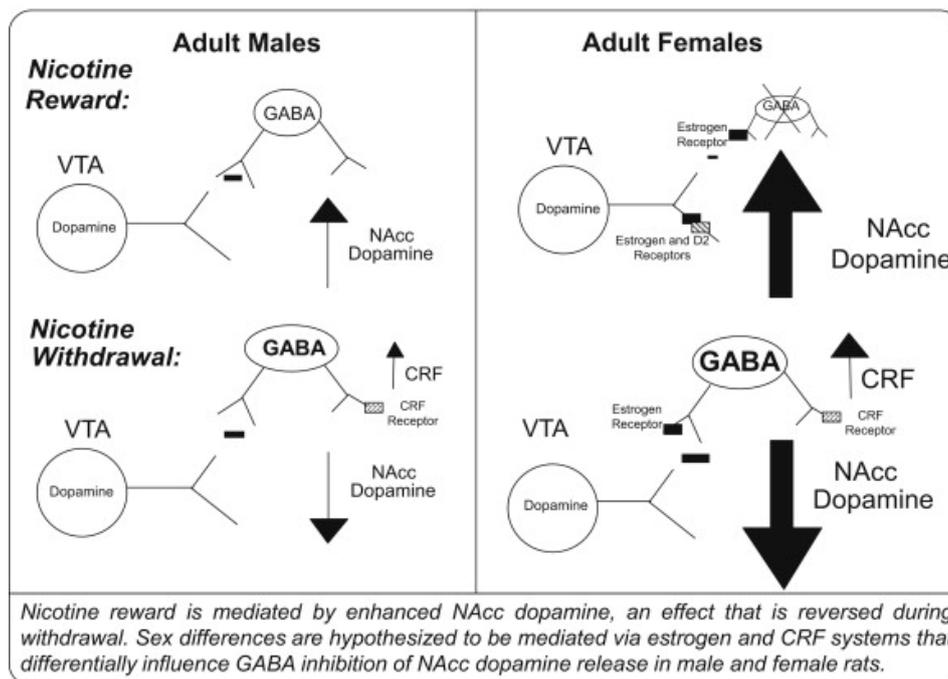
Why is that?

- Clinical studies suggest that **women are more sensitive to the rewarding effects of nicotine** than men and women smokers report more positive mood effects following cigarette use than men
- **Women experience more stress during smoking cessation and quitting.** During smoking abstinence, women report greater levels of anxiety, depression, and stress than men, display higher levels of cortisol (a biological marker of stress in humans) as compared to men, and more often that the anxiety-reducing effects of cigarettes are the main reason for continued smoking and relapse
- Early adolescent girls (ages 12-13) are especially sensitive to smoking addiction: report more symptoms of nicotine dependence and display a faster onset of withdrawal symptoms than boys

THE SCIENCE BEHIND WOMEN'S NICOTINE-SENSITIVITY:

- Animal research suggests that **estrogen promotes greater rewarding effects of nicotine** in females by enhancing dopamine release in the brain's reward center - Nucleus Accumbens (NAcc).
- During withdrawal, the brain's stress systems are more sensitive and promote a greater suppression of dopamine release in the NAcc of females versus males resulting in more unpleasant feelings.
- Taken together, females display enhanced nicotine reward via estrogen and amplified aversive effects of withdrawal via stress systems.

Hypothesized substrates mediating sex differences in nicotine use



For a review, see [O'Dell, L. E. & Torres, O. V. A mechanistic hypothesis of the factors that enhance vulnerability to nicotine use in females. Neuropharmacology 76, 566–580 \(2014\).](#)