Journal of Economic Behavior & Organization 141 (2017) 96–109

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

Competitive behavior, stress, and gender

Marja-Liisa Halko[a,b,*], Lauri Sääksvuori[c,d]

[a] Department of Political and Economic Studies, P.O. Box 17, 00014 University of Helsinki, Finland
[b] Department of Economics, School of Business, P.O. Box 21240, 00076 Aalto University, Finland
[c] National Institute for Health and Welfare, Centre for Health and Social Economics, P.O. Box 30, 00271 Helsinki, Finland
[d] Joint Research Centre, European Commission, Italy

ARTICLE INFO

Article history:
Received 11 November 2015
Received in revised form 16 March 2017
Accepted 27 June 2017
Available online 4 July 2017

JEL classification:
C91
D01
D03
J16
J24

Keywords:
Competitiveness
Experiment
Gender
Labour market
Stress

ABSTRACT

This paper investigates whether physiological measures related to chronic and acute stress predict individual differences in willingness to compete. We measure individuals' autonomic nervous system activity in a resting state as well as under non-competitive and competitive incentive schemes using heart rate variability (HRV) measurement. We find that both baseline HRV and competition-induced changes in HRV predict willingness to compete. Notably, we find that women with low baseline HRV, a marker associated with chronic stress exposure, are more likely to choose piece rate incentives over competitive incentives than women with high baseline HRV. We observe that men with large acute HRV response to forced competition are more likely to choose tournament pay over piece rate pay than men with small acute HRV response to competition. Our results suggest that HRV can predict individual differences in willingness to compete, but HRV does not close the gender gap in willingness to compete at the aggregate level.

1. Introduction

We frequently face a decision to compete or withdraw from competition in schools, workplaces and social networks. Various types of rankings and tournaments are frequently used in hiring, promotion and school choice. The prevalence of competitive incentives across our social and economic fabric suggests that individual differences in attitudes towards competition may play a large role in determining many important social and economic outcomes over the human lifespan.

An emerging body of economic research has documented significant relationships between individuals' willingness to compete and important outcomes in life. Research shows that competitiveness in economic laboratory experiments is, for example, positively correlated with a propensity to participate in a competitive high school entrance exam (Zhang, 2014) and to choose more prestigious high-school study tracks (Buser et al., 2014). It has also been shown that incentivized laboratory measures for competitiveness can predict labor market earnings (Buser et al., 2015) and industry choice (Reuben et al., 2015).

At the same time, there is substantial evidence that women are more reluctant to compete than men, even though there often are no gender differences in performance (Niederle and Vesterlund, 2007; Niederle and Vesterlund, 2011; Niederle

* Corresponding author at: Department of Political and Economic Studies, P.O. Box 17, 00014 University of Helsinki, Finland.
E-mail addresses: marja-liisa.halko@helsinki.fi (M.-L. Halko), lauri.saaksvuori@thl.fi (L. Sääksvuori).

http://dx.doi.org/10.1016/j.jebo.2017.06.014
0167-2681/

et al., 2013). Gender differences in competitiveness seem to emerge at an early age (Gneezy and Rustichini, 2004; Glätzle-Rützler and Sutter, 2014) and be stronger in math-related tasks than in writing-related tasks (Günther et al., 2010; Dreber et al., 2014). The gender gap in competitiveness is documented across several societies (e.g. Gneezy et al., 2009; Andersen et al., 2013; Almås et al., 2015), while there is evidence suggesting that men and women compete equally in certain societies and circumstances (Dreber et al., 2011; Cárdenas et al., 2012). There is also evidence showing that the typical gender gap observed in many Western societies can be reversed in matrilineal societies (Gneezy et al., 2009).

Despite a growing interest to understand the consequences of individual and gender differences in competitiveness, relative little is known about the underlying psychological and physiological mechanisms that may explain individual differences in competitiveness. Our study aims to contribute to the understanding of human competitiveness by investigating whether physiological measures often related to chronic and acute stress can predict individual differences in competitiveness.

The objective of our paper is threefold: (i) to measure individuals' autonomic nervous system activity in a resting state as well as under non-competitive and competitive incentives in a real-effort task (adding up sets of five two-digit numbers), (ii) to investigate whether heart rate variability, a robust biomarker of stress-induced autonomic nervous system activity, can predict individual and gender differences in competitiveness, and (iii) to examine whether the relationship between autonomic nervous system activity and willingness to compete is mediated by self-confidence and risk preferences.[1]

Stress is the body's response to the changes in the environment that create taxing demands.[2] The stress response is geared to maintain our physiological and mental health in the face of *acute stressors* that are relatively contained events with limited duration. The acute stress response largely helps healthy individuals to adapt to new challenges and typically does not impose a health burden (Nelson, 2005; Rivers and Josephs, 2010). However, under repeated exposure to unremitting psychological or physiological stress acute stress reactions may progress to *chronic stress*. Acute and chronic stress reactions are shown to have distinct physiological (McEwen, 2007) and behavioral effects (McEwen, 2012; Kandasamy et al., 2014). Exposure to psychological or physiological stress for a prolonged period may lead to reduced bodily responses to acute stressors by downregulating corticosterone responses during chronic stress (Rich and Romero, 2005). Chronic, but not acute, stress has also been associated with structural changes in the human brain (McEwen, 2007). Overall, the effects of chronic stress on neural, cardiovascular, immunological and reproductive health are morbid (Nelson, 2005; Sapolsky, 2005). Importantly, a number of studies have lately recognized the importance of gender in people's physiological responses to stressful events and experiences (Holt-Lunstad et al., 2001; Tytherleigh et al., 2007).

In this study, we measure participants' autonomic nervous system activity using heart rate variability (HRV) measurement. HRV is a well-established physiological indicator of stress-induced activation of the autonomic nervous system (Task Force, 1996; Acharya et al., 2006; for a systematic review and meta-analysis assessing HRV as an indicator of stress in healthy adults, see Castaldo et al., 2015).[3] Low HRV values generally signal high sympathetic (stimulative) nervous system activity and occur during the states of high mental and environmental stress. Low HRV values in a resting state are associated with chronic mental and physical stress (Task Force, 1996; Acharya et al., 2006).[4] By contrast, high HRV values in a resting state are associated with high parasympathetic (inhibitory) activity of the autonomic nervous system. Thus, high HRV values in a resting state are interpreted as signals for fast physiological recovery and good emotional regulation ability (Task Force, 1996; Acharya et al., 2006). While HRV in a resting state has been interpreted as a proxy of chronic stress, short-term changes in HRV indicate acute engagement of the sympathetic nervous system and do not enable us to assess the adaptiveness of this response.

[1] Our interest to investigate the role of self-confidence and risk preferences is motivated by existing literature which has documented significant relationships between different stress measures and economic preferences. For example, Goette et al. (2015) find that acute stress increases competitive confidence among individuals with low trait anxiety scores, whereas acute stress decreases confidence among highly anxious individuals. There is also an increasing number of investigations linking physiological measures of acute and chronic stress to risk preferences (Porcelli and Delgado, 2009; Ceccato et al., 2015).

[2] Many types of stressors, like having to perform in a competitive environment, may lead to a stress response, which is adaptive for coping in the short-term, but may over time have a pathological impact on person's mental and physical well-being. In colloquial language, stress is often used to only describe body's negative reactions to challenges. This practice also often applies to epidemiological work which tries to quantify the overall impact of chronic stress on health outcomes and estimate the costs of work-related stress in certain geographical areas and business sectors. For example, the American Psychological Association (APA, 2009) reports that 55 percent of the employees in the U.S. consider themselves to be less productive at work as a result of work-related stress. In the same vein, according to the APA (2007), 52 percent of the U.S. employees report that they have considered or made a decision about their career such as looking for a new job, declining a promotion or leaving a job based on work-related stress.

[3] The approaches to investigate the causes and consequences of stress broadly fall into two categories: self-reported questionnaires and physiological measures. The advantage of physiological measurements is that they provide direct, objective and easily quantified measures of the body's physiological stress response. In addition to HRV measurements, galvanic skin conductance measurements are often used to measure acute stress responses. There measurements typically complement each other (Lo and Repin, 2002). Our investigation in this paper is limited to the measurement of HRV. The relative benefits of HRV measurement, arguably, include a better ability to predict certain chronic illnesses and unobtrusive measurement sensors which do not interfere with daily activity in naturally-occurring situations.

[4] A number of empirical investigations have related HRV to multiple physiological and psychological concepts. For example, a number of epidemiological studies suggest that HRV in a resting state serves as an independent predictor of future health outcomes and as a proxy for underlying cardiovascular diseases processes (Dekker et al., 2000; Zulfiqar et al., 2010). In addition, resting HRV has been associated at least with effective coping strategies, attention control, generalized anxiety disorder and depression (Appelhans and Luecken, 2006). We note that HRV has been empirically related to a wide variety of physiological and psychological concepts which makes it a relatively non-specific proxy for overlapping stress-related concepts.