

E X C H A N G E

DO *TOXOPLASMA*-INFECTED SUBJECTS HAVE BETTER LEADERSHIP SKILLS? COMMENT ON PAPER “PUPPET MASTER: POSSIBLE INFLUENCE OF THE PARASITE *TOXOPLASMA GONDII* ON MANAGERS AND EMPLOYEES”

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Houdek (2017) performed a thorough literature survey to demonstrate that latent infection by protozoan parasite *Toxoplasma* could have specific effects on personality traits and cognitive performance. These effects could, among other things, influence an infected individual’s career outcome, as well as the inner workings of teams and firms. Based on published data on specific *Toxoplasma*-associated behavioral changes, he made several predictions concerning possible impacts of *Toxoplasma* infection on the career outcome of affected persons. Most of the suggested impacts are negative, however, some predict possible positive effects of the infection on the career outcome. Later hypotheses are rather contra intuitive and ‘sexy’, and therefore they have a potential for attracting the attention of the professional as well as the general audience. Houdek suggests, for example, that due to an increased concentration of testosterone leading to higher masculinity and dominance, the infected men could have better leadership skills and executive abilities. This conclusion, however, appears to contradict an anecdotal observation published in the first paper reporting the behavioral effects of toxoplasmosis in humans (Flegr & Hrdý, 1994). It was mentioned there that among the professors of the Faculty of Science, Charles University, out of 29 members that were *Toxoplasma-free*, 10 were members in senior positions (heads of department, vice-deans, and deans). In the same study, out of 14 *Toxoplasma*-infected members, only one

subject was the head of a department. Houdek is aware about the probable transient nature of increased level of testosterone, as well as about cumulative nature of many negative effects of toxoplasmosis. Therefore, he suggests that positive effects of the *Toxoplasma* infection on the career outcome can also be just as transient. Here, I decided to test five Houdek’s predictions concerning the better career output of infected subjects.

In one of our ongoing studies, we had already collected questionnaire data from nearly forty thousand Czech volunteers, primarily members of the Facebook group ‘Guinea pigs’ (Kankova, Flegr, & Calda, 2015). Within our electronic questionnaire focusing on the sexual behavior of the Czech population, we included questions asking how many subordinates the responder presently had at his/her work, and how satisfied he/she was with his/her current economic situation. The questionnaire also contained the 12 items of the assertiveness scale of the International Personality Item Pool (Goldberg, 1999).

The assertiveness questions, the questions concerning the number of subordinates (proxy of the leadership skills) and the question on the satisfaction with current economic situation, were answered by 5075, 3689 and 4823 subjects, respectively, who knew their toxoplasmosis status. The population consisted of 45.9% men and 54.1% women and the prevalence of toxoplasmosis was 7.6% in men and 16.4% in women. The effect of toxoplasmosis was analyzed by multivariate ANCOVA with three binary factors: toxoplasmosis, sex, youth and their interactions, and two confounding variables: achieved education level, and size of the place where they spent their childhood. The output variable “number

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TABLE 1

| | subordinates | | assertiveness | | economic situation | |
|-------------------------|--------------|--------------------------|---------------|--------------------------|--------------------|--------------------------|
| | p | Partial eta ² | p | Partial eta ² | p | Partial eta ² |
| Intercept | 0.000 | 0.040 | 0.000 | 0.455 | 0.000 | 0.223 |
| size of place of living | 0.093 | 0.001 | 0.013 | 0.001 | 0.271 | 0.000 |
| education | 0.000 | 0.011 | 0.000 | 0.008 | 0.000 | 0.038 |
| toxoplasmosis | 0.002 | 0.003 | 0.322 | 0.000 | 0.010 | 0.001 |
| sex | 0.000 | 0.008 | 0.000 | 0.019 | 0.000 | 0.004 |
| youth | 0.000 | 0.023 | 0.000 | 0.012 | 0.002 | 0.002 |
| toxoplasmosis-sex | 0.006 | 0.002 | 0.932 | 0.000 | 0.299 | 0.000 |
| toxoplasmosis-youth | 0.656 | 0.000 | 0.852 | 0.000 | 0.329 | 0.000 |
| sex-youth | 0.216 | 0.000 | 0.082 | 0.001 | 0.555 | 0.000 |
| toxoplasmosis-sex-youth | 0.619 | 0.000 | 0.981 | 0.000 | 0.214 | 0.000 |

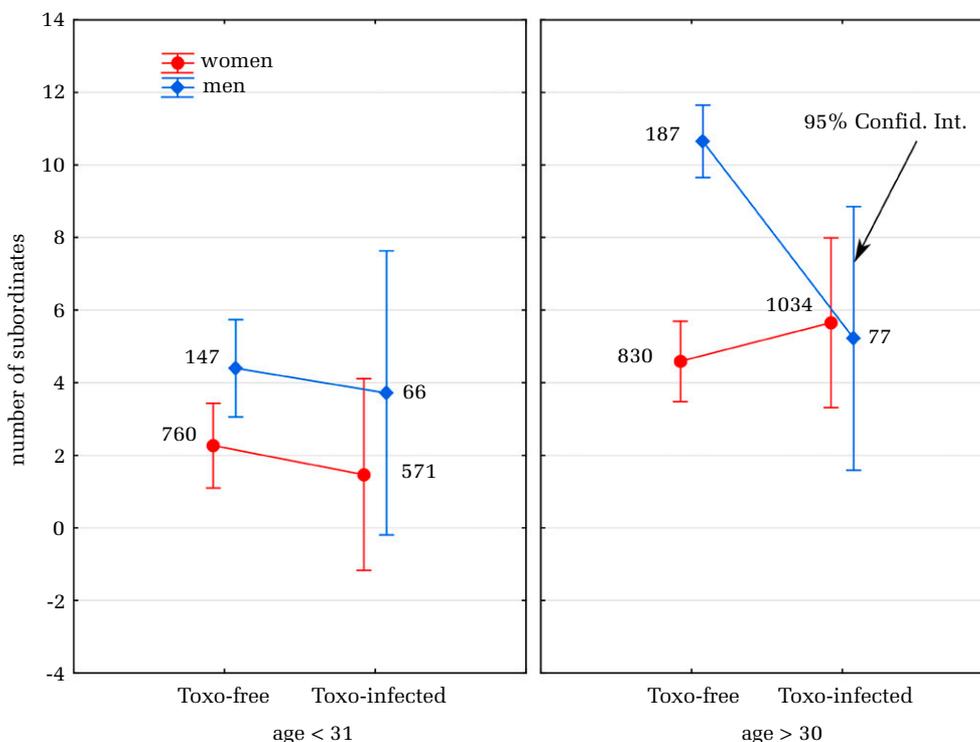
Results of three multivariate ANCOVAs for the output variables the number of subordinates, assertiveness, and satisfaction with personal economic situation. The values lower than 0.00005 were coded as 0.000.

of subordinates” had no-normal distribution; therefore this variable was log-transformed before the analysis. However, the results were qualitatively the same when a nonparametric test, namely the partial

Kendall correlation (controlled for age) was used for the analysis.

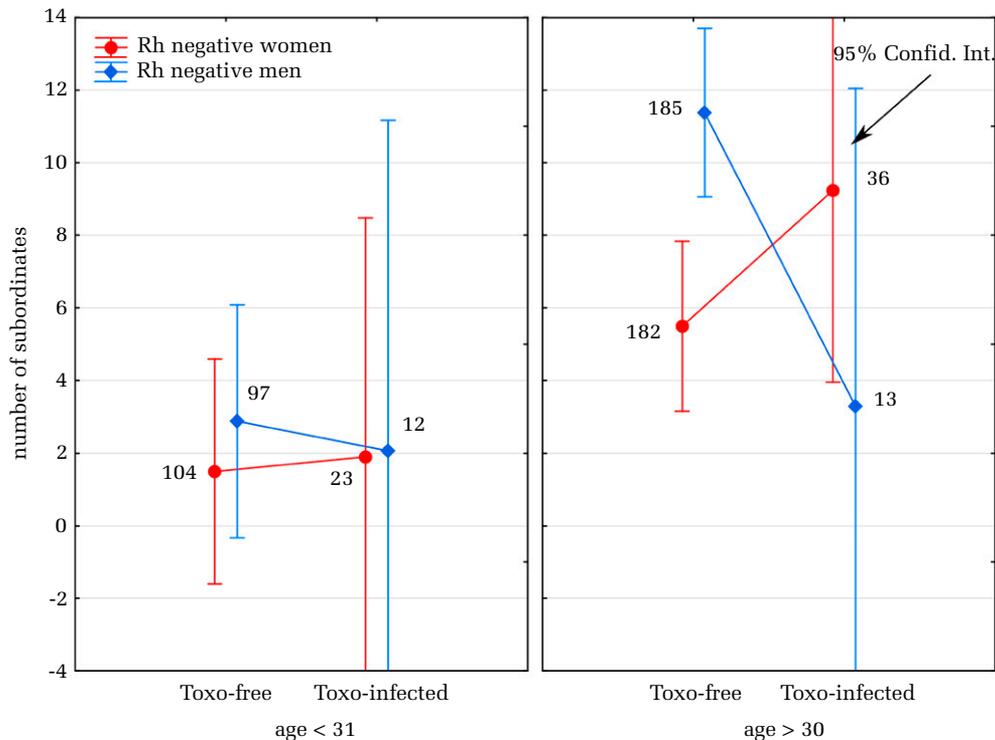
The results of the ANCOVA analysis (Table 1) showed significant effects of toxoplasmosis and

FIGURE 1
Effect of toxoplasmosis and gender on number of subordinates



The numbers denote amount of responders in particular groups. The means reflect, but not correspond to, number of subordinates as for 0-100 one point on the scale corresponded to one subordinate while for 101-140 one point on the scale corresponded to 10 subordinates. The code 141 meant 500 and more subordinates (this code was used by 14 participants).

FIGURE 2
Effect of toxoplasmosis and gender on number of subordinates in Rh negative responders



For the legend see the Fig. 1.

toxoplasmosis-sex interaction. The Figs. 1 and 2 illustrate the effects of toxoplasmosis on number of subordinates and the satisfaction of participants with their economic situation and also the absence of any effect of triple interaction toxoplasmosis-sex-youth.

The results suggest that the latent *Toxoplasma* infection could have impacts on career outcome. However, the observed effects contrasted with those based on prediction of Houdek (2017).

Prediction 1: Infected subjects should have higher number of subordinates due to increased concentration of testosterone in men and increased extroversion/warmth in women. In fact, the infected men had a lower number of subordinates. No effect of the infection on the number of subordinates was observed in women.

Prediction 2: Toxoplasmosis may be a partial culprit in the inequality in leading positions in men and women due to their specific (positive) effect on the level of testosterone in men. In fact, toxoplasmosis had a very opposite effect on

the inequality in leading positions. Among the *Toxoplasma*-free participants, the men reported much higher numbers of subordinates than the women. In contrast, the number of reported subordinates was approximately same in the *Toxoplasma*-infected men and women after the age 30 (actually it was a little bit lower in men).

Prediction 3: The career dynamics of the *Toxoplasma*-infected subjects would look like “shine brightly and burn out”, as they would more frequently fail at their task due to their lower consciousness. This prediction can be right, however, we found no formal evidence for it as the effects of triple interaction toxoplasmosis-sex-youth and binary interaction toxoplasmosis-youth were not significant. However, the negative effects of toxoplasmosis on the number of subordinates and on the self-reported economic situation seem to be much stronger after the age 30.

Prediction 4: The effects of toxoplasmosis on career outputs should be stronger in

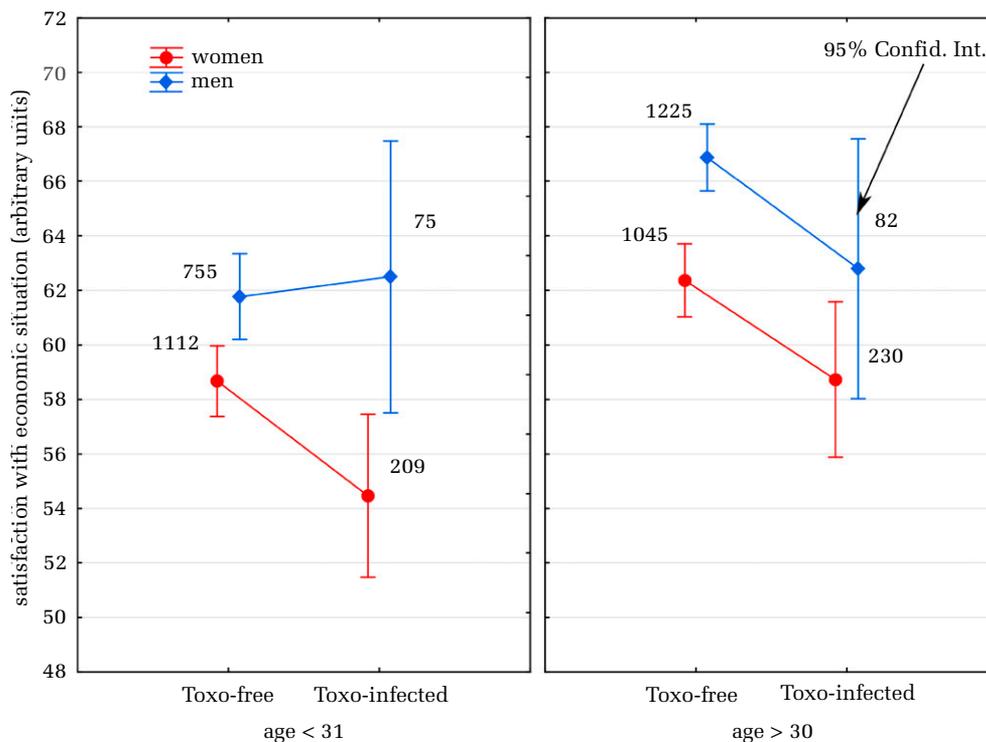
subjects with the blood group Rh minus because the Rh positive subjects, namely Rh positive heterozygotes, are protected against most of the negative effects of toxoplasmosis. This prediction is most probably right, despite the fact that (due to low number of Rh negative, *Toxoplasma*-infected men) the corresponding effects were not significant. The comparison of the figures 1 with 2 and 3 with 4 suggests that the effect of toxoplasmosis on the number of subordinates and the satisfaction with economic situation is stronger in Rh negative subjects than that observed in the whole population.

Prediction 5: *Toxoplasmosis could affect the quality of relationships between men and women in workplaces or the prevalence of sexual harassment in firms as the infected men have higher testosterone levels and the infected women tend to exhibit more warmth.* In fact, both *Toxoplasma*-infected men and women reported to have problems with too low sexual

desire (men: $p = 0.028$, $\text{Tau} = 0.04$; women: $p = 0.041$, $\text{Tau} = 0.03$), lower frequency of sexual intercourses within past 365 days (men: $p < 0.00001$, $\text{Tau} = -0.08$; women: $p = 0.049$, $\text{Tau} = -0.03$), and men also reported lower numbers of sexual partners within past 365 days ($p = 0.005$, $\text{Tau} = -0.05$). More details on specific effects of toxoplasmosis on sexual life of men and women can be found in our recent publication (Flegr & Kuba, 2016).

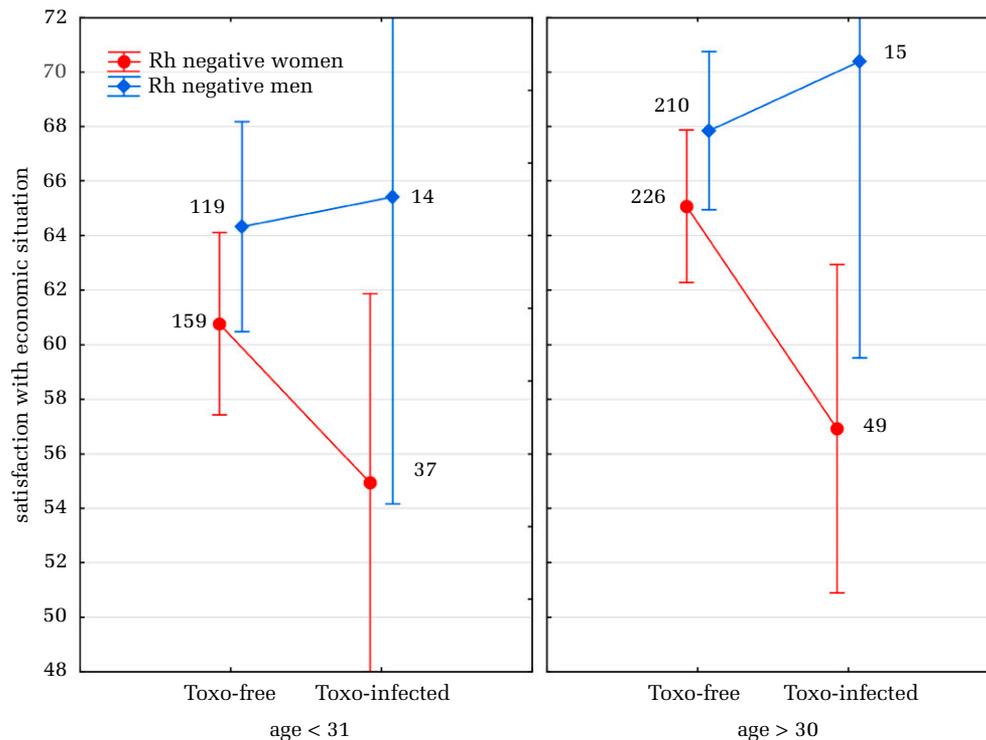
The most probable explanation for the contradiction between the theoretical predictions and the empirical data is that other effects of toxoplasmosis, possibly its effects on the health of infected subjects, cancel out the behavioral effects of increased concentration of testosterone and higher extroversion. It has been published that toxoplasmosis increases incidence and morbidity of many disorders, including some cardiovascular diseases, mental health disorders and certain types of cancer, for review see (Flegr, Prandota, Sovickova, & Israili, 2014). In the

FIGURE 3
Effect of toxoplasmosis and gender on self-reported satisfaction with personal economic situation



The numbers denote amount of responders in particular groups. The responders used 0-100 scale to rate the satisfaction with their personal economic situations.

FIGURE 4
Effect of toxoplasmosis and gender on self-reported satisfaction with personal economic situation in Rh negative responders



For the legend see the Fig. 3.

present study, several health-related variables were monitored. It was observed that infected men reported to have visited a higher number medical specialists within the past two years ($p = 0.032$, $\text{Tau} = 0.04$) while infected women more frequently reported to have worse mental health ($p < 0.0001$, $\text{Tau} = 0.07$), to have more psychiatric disorders diagnosed by medical specialists, ($p = 0.002$, $\text{Tau} = 0.06$), and consumed more types of drugs prescribed by medical doctors ($p = 0.006$, $\text{Tau} = 0.05$) (Flegr & Escudero, 2016). It must be admitted, however, that our data also showed very strong effects of the infection with the bacterium *Borrelia burgdorferi* (the cause of Lyme borreliosis) on the physical health of our responders (much stronger than the effects of toxoplasmosis). At the same time, this infection had no effects on the number of subordinates or on the satisfaction with personal economic situation. Possibly, some more specific effects of latent toxoplasmosis (its effects on mental health?) or on motivation (Flegr, Novotná, Lindová, & Havlíček, 2008) are responsible for the observed impacts of the

Toxoplasma infection on the career outputs. There are some indirect indices for lower ambitiousness of the infected subjects. The present electronic questionnaire contained also a short projective test. The subjects were asked if they would be born as an animal in their next life, which of ten different animals they would prefer to be. In the *Toxoplasma*-free men, the most popular animal was the lion and in women the dog. In the *Toxoplasma*-infected men the most popular animal was dog and in the infected women the cat. It is indicative that the largest negative difference between popularity in the *Toxoplasma*-infected and *Toxoplasma*-free men, i.e., the largest *Toxoplasma*-associated decrease in popularity, suffered the lion ($p < 0.0001$, $\text{Tau} = -0.07$), the dog (n.s.) and the largest increase in popularity underwent the cat ($p < 0.0001$, $\text{Tau} = 0.09$) and the squirrel ($p < 0.0001$, $\text{Tau} = 0.09$). In the women, popularity of all animals was higher in the *Toxoplasma*-infected raters. However, the smallest increase was in the dog (n.s.) and the parrot (n.s.), and the lion (n.s.) while the largest was in the

cat ($p < 0.0001$, Tau = 0.09) and the mice ($p < 0.0001$, Tau = 0.09). These results suggest that infected men and women have lower ambitiousness than their *Toxoplasma*-free peers (or they would all enjoy turning into cats, which the cats parasite *Toxoplasma* must greatly enjoy).

DISCUSSION

There are several explanations for the difference between present empirical data and Houdek's theoretical predictions. Most likely, the toxoplasmosis-associated increase of testosterone is just transient, and after some time it returns to its original (or an even lower) level, possibly due to cumulative negative effects of latent toxoplasmosis on human health (Flegr & Escudero, 2016). A very similar phenomenon has been already described (Kaňková et al., 2007). Women infected with *Toxoplasma* for less than two years give birth to 2.5 more sons than daughters, while the women infected for a longer time give birth to significantly more daughters than sons. The long term negative effect of toxoplasmosis on offspring sex ratio is more important than the transient positive effect of toxoplasmosis on the offspring sex ratio, as the secondary sex ratio (fraction of newborn males) correlates negatively with prevalence of toxoplasmosis in particular countries (Dama, Novakova, & Flegr, 2016). Despite the fact that our data brought no formal proof for this, Houdek could be right when saying: "*Toxoplasma*-positive people can achieve high positions, but their performance may decline due to a decrease in conscientiousness, increased neuroticism, and possible health risks." Houdek (2017) p. 71.

Limitations of present study

The participants provided information, about their *T. gondii* infection status themselves. Some of them probably provided incorrect information and some of them may have provided obsolete information because they acquired the infection only after their test for anti-*T. gondii* antibodies had been done. However, an independent analysis showed excellent (99.5%) agreement between the toxoplasmosis status reported by 3,827 subjects during registration to Guinea Pigs community and the toxoplasmosis status obtained in serological tests performed in our laboratory (Flegr, 2017). The same study also reported very good (99.2%) agreement in 393 responders who signed their questionnaire in a previous epidemiological study and also reported

their toxoplasmosis status during registration (Flegr, 2017). The subjects also self-reported how many subordinates they have. It is probable that this information can be imprecise or even biased. The personality profiles of *Toxoplasma*-infected and *Toxoplasma*-free subjects differ (Flegr, 2010). The infected subjects have, e.g., lower conscientiousness, and therefore it is possible that they do not know how many subordinates they, in fact, have. Because of this, the infected subjects could report to have less subordinates, despite having the same (or a higher) a number of subordinates than the *Toxoplasma*-free subjects. Therefore, it would be important to confirm the results of the present study and the original study performed on the university professors using independent empirical case control studies, i.e., by comparing the seroprevalences of toxoplasmosis in subjects in various working positions.

CONCLUSIONS

The present data confirmed that *Toxoplasma* infection probably had certain effects on career outcome. However, in most subjects, various effects of toxoplasmosis on human physiology and behavior or even the nonspecific effects of impaired health status have probably had stronger impacts than the more specific, but weaker, effects of the changed levels of hormones and neurotransmitters. These conclusions are based on the analysis of data of just one very large new and one small already published study and both these studies were originally designed to solve unrelated questions. Therefore, the results and conclusions must be considered only preliminary until the results of other independent and specifically designed studies will be available.

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E X C H A N G E

A REPLY TO: DO *TOXOPLASMA*-INFECTED SUBJECTS HAVE BETTER LEADERSHIP SKILLS? COMMENT ON PAPER “PUPPET MASTER: POSSIBLE INFLUENCE OF THE PARASITE *TOXOPLASMA GONDII* ON MANAGERS AND EMPLOYEES”

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In my perspective article (Houdek, 2017b), I speculated on the possible impacts the parasite *Toxoplasma gondii* could have on the decision-making of infected managers and employees and their career outcomes. One of the predictions was: “toxoplasmosis increases extroversion (i.e., social dominance and sociability), which would be particularly beneficial for salespeople, managers, and team leaders” (p. 71), and further “*Toxoplasma*-positive men... appear more masculine and dominant to women... [so] *Toxoplasma*-positive people can achieve high positions” (p. 74). However, my systematic review suggested that *Toxoplasma*-positive people have lower conscientiousness, increased neuroticism, and bigger health risks, so that “their career dynamics would look like a supernova, burning bright but perishing young” (p. 71).

This prediction is certainly difficult to properly test, since it requires detailed longitudinal information about the dynamics of career outcomes and at the same time information on the timing of *Toxoplasma gondii* infection, and the data are not readily available. As a simple example illustrating how difficult it is to empirically identify toxoplasmosis’ influence e.g. on men’s higher dominance and executive role, let us consider a study (Wong, Ormiston, & Haselhuhn, 2011) that found that firms whose male CEOs have masculine faces achieve superior financial performance. However, there is also a positive association between a CEO’s facial masculinity and various fraudulent and misreporting practices (Jia, Lent, & Zeng, 2014). Therefore, even if this particular influence of toxoplasmosis exists and increases the likelihood of a promotion, the infected individual can end up without subordinates. It will depend on the effects’ sizes and on number of confounding factors, whether masculinity eventually

leads to better leadership or greater dishonesty. Moreover, in their commentary to my paper, (COMMENT, 2017) have mentioned that toxoplasmosis’ influence on men’s dominance through increased testosterone levels in infected individuals could only be temporary, and the infection may eventually result in a lower baseline testosterone. In the end, *Toxoplasma gondii* infection would result in a tendency of infected people to be on the lower end of the company hierarchy. But without data on career dynamics and infection status (and testosterone levels), it is impossible to test which of these explanations of career trajectories are valid (furthermore, they depend on testosterone as the true mediator of the effect).

TOXOPLASMOSIS AND LEADERSHIP POSITIONS (NUMBER OF SUBORDINATES)

In their timely commentary, (COMMENT, 2017) use survey data showing that *Toxoplasma*-positive men have fewer subordinates than non-infected men, and also that *Toxoplasma* infection had effect on assertiveness neither in men nor in women. COMMENT further claim that the most likely explanation why the *Toxoplasma* effects mentioned in my paper (such as extroversion or masculinity of the infected) may not play a role in career dynamics is that toxoplasmosis generally impairs the health of infected people. If *Toxoplasma*-positive people have worse health in general, this effect alone (Havelaar, Kemmeren, & Kortbeek, 2007) may overshadow the much smaller effects of behavioral manipulation of hosts by the parasite.

I agree that the explanation is valid and likely, however, the evidence used in (COMMENT, 2017; Flegel & Escudero, 2016) is neither based on

a case-control study, nor on data from population-representative birth cohort, but from a publicly available online questionnaire (Facebook-based snowball method (Kankova, Flegr, & Calda, 2015)). Such questionnaire surveys suffer from serious selection biases.

First, toxoplasmosis testing is not typical in the general population, since the clinical disease is confined only to risk groups (to illustrate: although, according to very conservative estimates, more than 100,000 people can be infected in France each year, only about 800 are hospitalized, moreover frequently with HIV-associated infections (Vaillant et al., 2005)). Testing for latent toxoplasmosis can occur during treatment of other illnesses, and especially in women during pregnancy (Tenter, Heckeroth, & Weiss, 2000), so it can be expected that *Toxoplasma*-positive respondents *who know their infection status* are disproportionately selected from a population with worse health or women who had children, therefore groups with a lower likelihood of being in leadership positions. On the other hand, there are a substantial number of people who are *Toxoplasma*-positive, but don't know their infection status, because toxoplasmosis is clinically asymptomatic. Second, there is the notorious objection that top managers and executives are not willing to fill in questionnaire surveys (Cycyota & Harrison, 2006) and that the low response rate of this demographic can result in the survey results being applicable only to the specific traits of the subgroups willing to participate or willing to completing a study (Zhou & Fishbach, 2016). Such unfavorable selection of questionnaire survey respondents means that toxoplasmosis' effects on career dynamics wouldn't be easy to uncover this way.

Stronger extroversion and masculinity also may not necessarily lead just to a higher number of subordinates (as a variable of leadership skills and/or executive abilities); in addition, *Toxoplasma*-positive people may be disproportionately represented in the "independent professions" (actors, artists, counselors, photographers, journalists etc.) and other professions where people possessing these traits are frequently present, such as team sports (Eagleton, McKelvie, & Man, 2007) or politics (Berggren, Jordahl, & Poutvaara, 2017). In any case, I agree with COMMENT that large-scale case-control studies, absent insofar, would be necessary. They would enable us to compare the prevalence of toxoplasmosis in company hierarchy or in different professions to better estimate the potential influence

(or its absence) of toxoplasmosis on various career outcomes.

INFLUENCE OF TOXOPLASMOSIS ON IMPULSIVITY (TIME PREFERENCES)

Another speculation of mine was that *Toxoplasma*-positive people may possess a "carpe diem" personality, i.e. greater delay aversion. In general, it can be expected that managers who decide rashly and thoughtlessly won't be successful in the organizational environment. Moreover, business white-collar crime is predicted by low behavioral self-control and high hedonism (Blickle, Schlegel, Fassbender, & Klein, 2006). On the other hand, the impacts of impulsive, excitement-seeking, and open-to-experience personality on career outcomes will be context-dependent (by sector, corporate culture and temporary conditions; see also a research program on fast and frugal heuristics, Gigerenzer, & Gaissmaier, 2011). Spontaneity and impulsivity may more often lead to entrepreneurship and innovation (Wiklund, Yu, & Patzelt, 2017; but see Nicholson, 1998) or higher activity in business (Grinblatt & Keloharju, 2009), and thus have a positive impact on career outcomes. These and other personality traits of course have biological determinants; e.g. De Neve, Mikhaylov, Dawes, Christakis, & Fowler (2013) found a specific genotype associated with the tendency to occupy a leadership position, and they speculate that the given gene could influence leadership role via its effect on traits of impulsivity.

Current evidence on toxoplasmosis' effect on impulsivity is mixed. One reason may be that in different studies, impulsivity is represented by different scales and behavioral data, reflecting different psychological constructs. A study from Germany (N=1,000) using Disinhibition subscale of the Sensation Seeking Scale showed *Toxoplasma*-positive young men (20–59 years old) to be more impulsive (Cook et al., 2015). Impulsivity was measured by agreement with statements such as "I like wild "uninhibited" parties" or "I enjoy watching many of the "sexy" scenes in movies" etc. A New Zealander study (N=1,037) using non-suicidal self-injury, suicide attempt, criminal convictions, and traffic-related offenses and accidents as proxies for impulse control found no relationship with toxoplasmosis (Sugden et al., 2016). A Czech study (N=857) using Cloninger's Temperament and Character Inventory found that "*Toxoplasma*-positive subjects [young men/military conscripts] are on average more reflective, tend to require more detailed

information when making an opinion and are not easily distracted. *Toxoplasma*-positive subjects are also more reserved, slow, controlled; they do not waste their energy and feelings. They tend to be organized, methodical, and prefer activities with strict rules and regulations.” (Flegr et al., 2003, pp. 262-263).

In our recent observational study (Houdek, Flegr, & Zouhar, 2017), we focus on more business-relevant impulsivity measures, meaning a choice between monetary rewards received on different timescales. We used the dataset from (Flegr, Hoffmann, & Dammann, 2015), which was aimed at the general public and contains questions on the respondents’ time preferences, i.e. their impulsivity measured by willingness to give up an immediate reward to receive a larger one later. Respondents replied to hypothetical questions “What would you prefer to get? \$1000 now or \$100 every year for 25 years” or “What would you prefer to get?: \$ 3400 today or \$ 3800 after 30 days?” etc. After controlling for age, gender, education, wealth, health, RhD (manifestation of the disease depends on the RhD blood group) and other characteristics, *Toxoplasma*-positive people showed robustly as more patient. The dataset also contains a number of other questions about one’s life satisfaction, confidence, willingness to risk in monetary matters, etc. However, none of these variables seemed to be influenced by a *Toxoplasma gondii* infection. But since the dataset comes from a questionnaire survey, it suffers from the selection biases discussed earlier. Nonetheless, our positive result of toxoplasmosis’ influence on lower temporal discounting in infected people could be a false positive mediated by a wide range of personality traits and other individual characteristics that could be correlated with the infection.

CONCLUSION

Using the example of the parasite *Toxoplasma gondii*’s influence on leadership skills, the commentary by COMMENT and my reply highlighted several theoretical and practical problems (especially the absence of suitable data) tied to studying biological drivers of behavior in the corporate sphere. However, given the growing field of organizational and leadership research showing how idiosyncratic individual decision-making styles and personal traits impact both private and professional decision-making of executives (Davidson, Dey, & Smith, 2015; Houdek, 2016;

Malmendier, Tate, & Yan, 2011; Sunder, Sunder, & Zhang, 2017), biological mechanisms may become more and more needed tools to explain specific decision-making patterns.

As I further state in (Houdek, 2017a, 2017b), there are many biological influences on behavior and decision-making that haven’t been tested in the corporate sphere at all. Just to name a few, laboratory studies suggest e.g. that emotions such as happiness, fear or disgust can be transferred by means of human odors (de Groot, Semin, & Smeets, 2017; de Groot, Smeets, Kaldewaij, Duijndam, & Semin, 2012); for example, sniffing negative-emotion-related odorless tears from women can even reduce men’s sexual arousal and salivary levels of testosterone (Gelstein et al., 2011). The microbiome of the human gut can play a role in mood or social signals’ processing (Forsythe, Kunze, & Bienenstock, 2016; Mayer, Knight, Mazmanian, Cryan, & Tillisch, 2014) etc. The logistics of such research would, however, meet with obvious obstacles in a real organizational environment. Nevertheless, it is possible to implement empirical organizational studies using more easily available data on the physiology of decision-making, e.g. the impact of sleep deprivation on professional decisions (Cho, Barnes, & Guanara, 2017), the influence of polluted or stale air or allergens on cognitive performance or productivity of employees and managers (Chang, Graff Zivin, Gross, & Neidell, 2016; MacNaughton et al., 2017; Marcotte, 2017) etc., which remain understudied themes in managerial literature as well.

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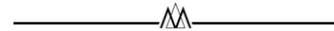
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