TRYPTOPHAN PROMOTES INTERPERSONAL TRUST

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“Every kind of peaceful cooperation among men is primarily based on mutual trust and only secondarily on institutions such as courts of justice and police”, Albert Einstein once said. Indeed, interpersonal trust is an essential element of social life in general and an important determinant of cooperative behavior in particular (Pruitt & Kimmel, 1977; Yamagishi, 1986). After all, most people will only cooperate if they expect others to do so as well, making mutual trust an important precondition for establishing mutual cooperation.

Pharmacological studies in rats and humans suggest that the neurotransmitter serotonin plays a crucial role in promoting cooperative behavior (Crockett, 2009): while increasing the serotonin (5-HT) level by administering a selective serotonin reuptake inhibitor enhances cooperation (Knutson et al. 1998; Tse & Bond, 2002), lowering the serotonin level through tryptophan depletion reduces cooperation (Crockett et al., 2008; Crockett, Clark & Robbins, 2009; Wood et al., 2006). However, the link between serotonin and one of the most important determinants of cooperation, interpersonal trust, has remained largely uninvestigated. In the present study, we tested whether interpersonal trust can be promoted by administering the food supplement L-Tryptophan (TRP), the biochemical precursor of 5-HT. TRP is an essential amino acid contained in food such as fish, soy, eggs and spinach. The supplementation of TRP is known to increase plasma TRP levels and has been developed as a method to influence brain 5-HT synthesis (Markus et al., 2008).

We investigated the link between tryptophan supplementation and interpersonal trust in 40 healthy adults (4 male, 36 female; mean age = 19.4) with no cardiac, hepatic, renal, neurological or psychiatric disorders, personal or family history of depression, migraine and medication or drug use. Following Markus and colleagues (2008) women using contraception were tested when they actually used the contraception pill. On each experimental morning,
participants arrived at the laboratory at 9:30 a.m. Participants had been instructed to fast overnight; only water or tea without sugar was permitted. In addition, subjects were not allowed to use any kind of drugs before and during the experiment or to drink alcohol the day before their participation and arrival at the laboratory. Twenty participants were exposed to oral dose (powder) of 0.8 gr of TRP (supplied by AOV International Ltd.) and 20 to 0.8 gr of microcrystalline cellulose (Sigma-Aldrich Co. LLC), a neutral placebo, dissolved in 200 ml of orange juice. Written informed consent was obtained from all subjects; the protocol was approved by the local ethical committee (Leiden University, Institute for Psychological Research).

Participants were invited to the laboratory in (unacquainted) pairs. Upon arrival, they were individually asked to rate their mood on a 9 × 9 Pleasure × Arousal grid (Russell, Weis, & Mendelsohn, 1989) with values ranging from –4 to 4. Heart rate (HR) and systolic and diastolic blood pressure (SBP and DPB) were collected from the non-dominant arm with an OSZ 3 Automatic Digital Electronic Wrist Blood Pressure Monitor (Spiedel & Keller). One hour following the administration of TRP (which corresponds to the peak plasma concentration; Markus et al., 2008) or placebo, participants rated again their mood before having HR, SBP and DBP measured for the second time.

Next, after briefly meeting one another (and performing an unrelated computer task together), the pairs were presented with a behavioral Trust Game (Camerer & Weigelt, 1988), a task widely used in behavioral economics to measure interpersonal trust. Specifically, this task measures the extent to which one person (the trustor) trusts another person (the trustee), as indicated by money units transferred from trustor to trustee. The pairs were individually seated in two separate cubicles and were led to believe that one of them would play the role of trustor and the other one the role of trustee (in reality, both of them were trustor, and the trustee did not exist). The trustor had an endowment of €5, and could decide how much of this
amount to transfer to the trustee. Transferred money would be multiplied by three, after which the trustee could reciprocate by giving part of this tripled amount back to the trustor. Thus, by transferring eurocents to the trustee, the trustor could gain extra endowments, but only if the trustee would give enough money back. Thus, the amount transferred by the trustor is an indicator of interpersonal trust (Meijnders et al., 2009). As expected, participants transferred significantly more euros to the trustee (the other participant of the couple) in the TRP condition ($m = 3.57, SD = 1.33$) than in the placebo condition ($m = 2.61, SD = 1.26$), $t(38) = 2.35, p = .024$.

At the end of the experiment, participants again rated their mood before having HR, SBP and DBP measured for the third time. Consistently with previous finding (Côte et al., 2004), ANOVAs revealed that HR significantly decreased (82 vs. 74 vs. 70) after TRP supplementation, $F(2,76) = 8.34, p < .01$. In contrast, mood (0.9 vs. 1.0 vs. 0.9), BPD (75 vs. 74 vs. 75) and BPS (118 vs. 116 vs. 117) did not significantly change after the intake of TRP, $F's < 1$. This suggests that we can rule out an account of our results in terms of mood.

Our finding that TRP facilitates trustworthiness is in line with previous observations about the modulating role of serotonin in cooperative behavior (Crockett et al., 2008; Crockett, Clark & Robbins, 2009; Wood et al., 2006). Specifically, the present findings imply that serotonin plays a role in the development of interpersonal trust, which is an important determinant of social cooperation. Moreover, besides generating new insights on the social functions of serotonin, our results support the materialist approach of “you are what you eat” (Feuerbach, 1863)—the idea being that the food one eats has a bearing on one's state of mind. The food we intake may, hence, act as a cognitive enhancer modulating the way we think and perceive the world and others. In particular, the supplementation of TRP, or TRP-containing diets, may promote interpersonal trust in inexpensive, efficient, and healthy ways, thus supporting the “peaceful cooperation among men” Einstein was concerned about.
REFERENCES


