

studies that have linked EFs to particular genetic variants. We propose to test whether a genetic risk score for BD will predict EFs in a sample of approximately 700 individuals from the Colorado Community Twin Sample (CTS) and Longitudinal Twin Sample (LTS). The risk score will be a count of the number of alleles that confer risk on a standardized composite BD score in an independent discovery sample of approximately 1,050 participants (based on SNPs $p < 0.001$). Markers in the same region tend to be highly correlated due to Linkage Disequilibrium (LD), therefore all redundant SNPs with an $r^2 > 0.2$ will be removed from the risk score. This should leave us with a risk score of 700 SNPs or less out of the 700,000 genotyped. There will also be a proof of concept analysis where we take this risk score and use it to predict functional brain activation in 30 of the individuals from the CTS (selected to be extreme on a Common EF factor) who performed three EF tasks in a magnetic resonance imaging (MRI) scanner. We predict that the risk score will correlate negatively with a Common EF factor, but not with two other EF components specific to working memory updating and task switching.

Analysis of oxytocin receptor gene as putative component of social behavior in family dogs

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Background: The oxytocin system is considered to have a key function in the regulation of social behavior, and probably mediate the psychosocial effects of human-animal interactions as well. The aim of the present study was to investigate whether the genetic variations of oxytocin receptor gene are associated with dogs' socio-cognitive skills.

Methods: Polymorphic variants were identified by direct sequencing of protein coding segment and the flanking regulatory un-translated regions of oxytocin receptor (OXTR) gene. This pilot experiment was performed on 3–3 individuals of 6 different dog breeds and wolves. The identified polymorphisms were genotyped by PCR based techniques. For the characterizing the behavioral phenotype we have constructed a test series containing five different sub-tests (greeting by a stranger, separation from the owner, problem solving, threatening approach, hiding), which revealed dogs' socio-cognitive skills when interacting with humans. The genotype–phenotype association was assessed statistically by ANOVA.

Results: Alignment of the obtained sequence segments of the OXTR gene revealed five novel (–212AG, –93TC, –73CG, –49CG, 19131AG) and three known (rs22927829, rs8679682, rs8679684) single nucleotide polymorphisms (SNP). The identified polymorphisms were subsequently genotyped in larger populations involving 71 German Shepherds, 104 border collies, 64 retrievers, 29 beagles and 44 wolves. The results confirmed that the identified SNPs are polymorphic not only in the dog breeds, but also in wolves, however allele frequencies differed among the investigated breeds as well as between dogs and wolves. Furthermore our preliminary results suggest that oxytocin receptor gene polymorphisms have an impact on dogs' socio-cognitive skills.

Conclusions: Our results indicate that the oxytocin receptor gene is polymorphic among the different dog breeds and may contribute to the genetic background of socio-cognitive behavior in dogs. The

differences of these genetic variations between dog and wolf populations might be related to domestication process of dogs.

Applying visual recognition software to yearbook photographs to assign zygosity of twin pairs in project TALENT

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Project TALENT is a US population representative study of more than 370,000 high school students first assessed in 1960. The sample includes >88,000 in sibships, including >4,500 twins. In 2011 we began obtaining yearbook photos of same-sex twin pairs to use for zygosity ratings. So far, photos have been obtained for 491 same-sex pairs (30.9 % of total). Digitally scanned images are put into gray-scale, cropped to remove non-face features (mainly hair), then translated and rotated in plane such that the vertical meridian of the face is vertically aligned. Images are resized into 256×256 pixels with equalization of the mean luminance and Root Mean Square (RMS) contrast among all images. Each image is parceled into a 10×10 lattice and passed through 40 Gabor filters (tuned to 5 scales and 8 orientations), producing a 4000-element coefficient vector. Similarity is calculated (within sex and race) as a Pearson's correlation between the corresponding vectors of two images. Within-pair resemblances are compared to similarity with all other photos based on a z-transformation of the r values. Preliminary results show strong correlations for twins in a pair. The algorithm is being evaluated for use in zygosity assignment with samples of adolescent twin pairs whose zygosity was determined by blood typing or genotyping.

Smoking and long-term labor market outcomes

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Smokers earn less than never smokers, but the estimates of the wage gap vary from 1 to 24 % in different studies. Most of the earlier studies have used cross-sectional information on annual earnings, not long-term income and earnings. The association of smoking with earnings may be attributed to confounding factors, such as familial factors. This paper uses twin data matched to register-based individual information to examine the long-term effects of smoking on labor market outcomes. Using the responses from the 1975, 1981 and 1990 questionnaires of the older Finnish Cohort, we linked annual taxable income/earnings and employment information from the official records of Statistics Finland for the 15-year period of 1990–2004. The analysis was restricted to working-age men born 1945–1957 and aged 33–45 in 1990 and 47–59 in 2004 ($N = 3,914$ MZ and DZ individuals and 1,957 pairs), thus capturing their peak income/earnings period. Our preferred within-twin pair models control both for the shared environmental and genetic factors. The results show that smokers have lower long-term income and earnings, if the shared environmental and genetic factors are not accounted for (average annual income for never smokers of 26,870 euros and 23,000 euros for current smokers in 1981). Those 1975 smokers who quit by 1981 earned more in 1990–2004 than those who smoked also in 1981. In