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A Latent Variable Model for brain serotonin levels as measured by cerebral serotonin transporter and 5-HT$_{2A}$ receptor binding *in vivo*

Today, it is not possible to non-invasively measure the extracellular levels of serotonin (5-HT) *in vivo*. However, indirect measurements can be obtained by positron emission tomography (PET) techniques. A non-linear structural equation model is proposed for describing the association between 5-HT$_{2A}$ receptor binding and serotonin (5-HT) transporter binding as measured by PET imaging. The approach is based on a biological model where the 5-HT$_{2A}$ receptor and serotonin transporter measurements are expressed non-linearly by a common regulator, e.g. the raphe serotonergic output. The proposed model makes it possible to study the association between latent brain 5-HT levels and other end-points, for instance development of mood disorders.

Methods for obtaining approximate maximum likelihood estimates are discussed and new model diagnostic methods based on cumulative residuals are presented.