Stan code for 2-parameter hierarchical IRT model

```
data {
  int<lower=1> I;              // # questions
  int<lower=1> J;              // # persons
  int<lower=1> N;              // # observations
  int<lower=1, upper=I> ii[N];  // question for n
  int<lower=1, upper=J> jj[N];  // person for n
  int<lower=0, upper=1> y[N];   // response for n
  int<lower=1, upper=2> psychosis[J]; // status
}

parameters {
  vector[2] xi[I];             // alpha/beta pair vectors
  vector[2] mu;                 // vector for alpha/beta means
  vector<lower=0>[2] tau;       // vector for alpha/beta residual sds
  cholesky_factor_corr[2] L_Omega;
  vector[2] psychosis_int;       // effect of psychosis on severity
  vector[J] epsilon;             // severity for person j
}

transformed parameters {
  vector[J] severity;
  vector[I] discriminativeness;
  vector[I] difficulty;
  for (j in 1:J){
    severity[j] =  psychosis_int[psychosis[j]] + epsilon[j];
  }
  for (i in 1:I) { // rename variables for readability
    discriminativeness[i] = xi[i,1];
    difficulty[i] = xi[i,2];
  }
}

model {
  matrix[2,2] L_Sigma;
  L_Sigma = diag_pre_multiply(tau, L_Omega);
  for (i in 1:I){
    xi[i] ~ multi_normal_cholesky(mu, L_Sigma);
  }
  L_Omega ~ lkj_corr_cholesky(4);
  mu[1] ~ normal(0,1);
  tau[1] ~ normal(0,1);
  mu[2] ~ normal(0,5);
  tau[2] ~ normal(0,1);

  psychosis_int ~ normal(0,.5);
  epsilon ~ normal(0,.5);

  y ~ bernoulli_logit( (discriminativeness[ii] .* severity[jj])  - difficulty[ii]);
}

generated quantities {
  corr_matrix[2] Omega;
  Omega = multiply_lower_tri_self_transpose(L_Omega);
}
```