

**Table S1. Neuropsychiatric risk loci with a reported effect on structural plasticity**

Gene or copy number variant	Gene name or description	Type of effect on spines and/or dendrites	Disease associations
<b>Cell adhesion</b>			
<i>NRXN1</i>	Neurexin 1	spine stability <sup>1</sup>	SZ <sup>2</sup> and ASD <sup>3</sup>
<i>NLGN3</i>	Neuroigin 3	spine density <sup>4</sup>	ASD <sup>5</sup>
<i>CNTNAP2</i>	Contactin associated protein like 2 (CASPR2)	spine and dendrite stability <sup>6-8</sup>	ID and/ or ASD <sup>9</sup>
<i>L1CAM</i>	L1 cell adhesion molecule	dendritic arborization <sup>10</sup>	ASD <sup>5</sup> and ID <sup>11</sup>
<i>DSCAM</i>	Down syndrome cell adhesion molecule	dendrite and spine development <sup>12</sup>	ASD <sup>5</sup>
<i>CNTN4</i>	Contactin 4	neurite outgrowth <sup>13</sup>	SZ <sup>14</sup>
<i>NCAM1</i>	Neuronal cell adhesion molecule 1	neurite outgrowth <sup>15</sup>	ASD <sup>5</sup>
<i>PCDH10</i>	Protocadherin 10	spine density <sup>16</sup>	ASD <sup>16</sup> and SZ <sup>17</sup>
<b>Glutamate receptors</b>			
<i>GRIA1</i>	AMPA subunit GluA1	spine size <sup>18</sup>	SZ <sup>14</sup> and ID <sup>19</sup> ASD <sup>5</sup>
<i>GRIA2</i>	AMPA subunit GluA2	spine density <sup>20</sup>	ASD <sup>5</sup>
<i>PRRT2</i>	AMPA auxillary protein	spine density <sup>21</sup>	Epilepsy <sup>22</sup>
<i>CACNG2</i>	AMPA auxillary protein (TARP γ2)	dendritic arborization <sup>23</sup>	ID <sup>24</sup>
<i>CACNG3</i>	AMPA auxillary protein (TARP γ3)	dendritic arborization <sup>23</sup>	DD <sup>25</sup>
<i>GRIN2A</i>	NMDAR subunit GluN2A	dendritic arborization <sup>26</sup>	SZ <sup>14</sup> , epilepsy <sup>27</sup>
<i>GRIN2B</i>	NMDAR subunit GluN2B	spine density <sup>28,29</sup>	ASD <sup>5</sup>

<i>GRIN1</i>	NMDAR subunit GluN1	spine stability <sup>30</sup>	ASD <sup>5</sup> and epilepsy <sup>31</sup>
<b>Scaffold proteins</b>			
<i>SHANK3</i>	SH3 and multiple ankyrin repeat domains 3	dendrite and spine development <sup>32-34</sup>	ASD <sup>35 5</sup>
<i>ANK3</i>	ankyrin 3 (Ankyrin-G)	spine size and density, permits activity-dependent spine enlargement <sup>36</sup>	BD <sup>37</sup>
<i>DLG4</i>	discs large MAGUK scaffold protein 4 (PSD-95)	spine density and size, activity-dependent structural plasticity <sup>38, 39</sup>	ASD and/or ID <sup>40</sup>
<i>DLGAP1</i>	DLG associated protein 1 (GKAP/SAPAP1)	spine size <sup>41</sup>	ASD and/or ID <sup>40</sup>
<i>CASK</i>	Calcium/calmodulin dependent serine protein kinase	spine density and size <sup>42</sup>	ASD and/or ID <sup>40</sup> and DD <sup>25</sup>
<i>DISC1</i>	Disrupted in schizophrenia 1	spine density and size <sup>43</sup>	Mental illness <sup>44</sup>
<b>Calcium signaling</b>			
<i>CACNA1C</i>	Calcium channel Ca <sub>v</sub> 1.2	spine density <sup>45</sup>	BD <sup>38</sup> and SZ <sup>14</sup>
<i>CACNB4</i>	Calcium channel β subunit 4	spine density <sup>46</sup>	SZ <sup>47, 48</sup>
<i>CAMK2B</i>	Calcium/calmodulin dependent protein kinase II β	activity-dependent spine formation <sup>49</sup> and dendritic arborization <sup>50</sup>	ID <sup>51</sup>
<i>CAMK2A</i>	Calcium/calmodulin dependent protein kinase II α	activity-dependent spine formation <sup>49</sup>	ASD <sup>5</sup> and ID <sup>51</sup>
<i>ATP2B2</i>	ATPase plasma membrane Ca <sup>2+</sup> transporting 2 (PMCA2)	dendritic arborization <sup>52</sup>	ASD <sup>5</sup>
<b>GTPase signaling</b>			
<i>SYNGAP1</i>	Synaptic GTPase activating protein 1	spine formation, development and activity-dependent structural plasticity <sup>53-55</sup>	ID <sup>11</sup> , DD <sup>25</sup> and ASD <sup>3</sup>
<i>TRIO</i>	trio Rho guanine nucleotide exchange factor	dendrite development and activity-dependent structural plasticity <sup>56</sup>	ASD and/or ID <sup>40</sup>
<i>KALRN</i>	kalirin RhoGEF kinase	spine morphogenesis and activity-dependent structural plasticity <sup>57</sup>	DD <sup>25</sup>

<i>RAC1</i>	Rac family small GTPase 1	spine density and activity-dependent structural plasticity <sup>58</sup>	DD <sup>59</sup>
<i>PAK3</i>	p21 (RAC1) activated kinase 3 (β-PAK)	spine development <sup>60</sup>	ID <sup>11</sup>
<i>LIMK1</i>	LIM domain kinase 1	spine development and activity-dependent structural plasticity <sup>61</sup>	ASD <sup>5</sup>
<i>NF1</i>	Neurofibromin 1	spine development and activity-dependent structural plasticity <sup>62</sup>	ID <sup>11</sup>
<i>IQGAP1</i>	IQ motif containing GTPase activating protein 1	spine density <sup>63</sup>	DD <sup>25</sup>
<i>ARHGEF6</i>	Rho guanine nucleotide exchange factor 6	dendrite development and spine density <sup>64</sup>	ID <sup>11</sup>
<i>OPHN1</i>	Oligophrenin 1	dendrite and spine development <sup>65</sup>	ID <sup>11</sup> and DD <sup>25</sup>
<i>GIT1</i>	GPCR kinase 2 interacting protein 1	dendrite length and spine density <sup>66</sup>	SZ <sup>17</sup>
<i>BAIAP2</i>	BAI1 associated protein 2 (IRS p53)	spine density and decreased activity-dependent structural plasticity <sup>67</sup>	SZ <sup>17</sup>
<b>Copy number variant models</b>			
7q11.23 deletion	Williams-Beuren syndrome	Increased dendrite length and spine number <sup>68</sup>	ASD <sup>3</sup>
15q11-13 duplication	Dup15q syndrome	Increased spine turnover and decreased spine density <sup>69, 70</sup>	ASD <sup>3</sup> and SZ <sup>2</sup>
16p11.2 duplication	None	Increased dendrite arborization <sup>71</sup>	ASD <sup>3</sup> , and SZ <sup>2</sup>
22q11.2 deletion	DiGeorge / Velocardiofacial syndrome	Decreased spine density and stability and increased spine turnover, <sup>72, 73</sup>	SZ <sup>2</sup>

As different neuropsychiatric disorders often share the same risk factors, other disease associations exist that are not referenced herein. ASD, autism spectrum disorder; BD, bipolar disorder; CNV, copy number variation; DD, developmental disorder; GWAS, genome-wide association study; ID, intellectual disability; SZ, schizophrenia.

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