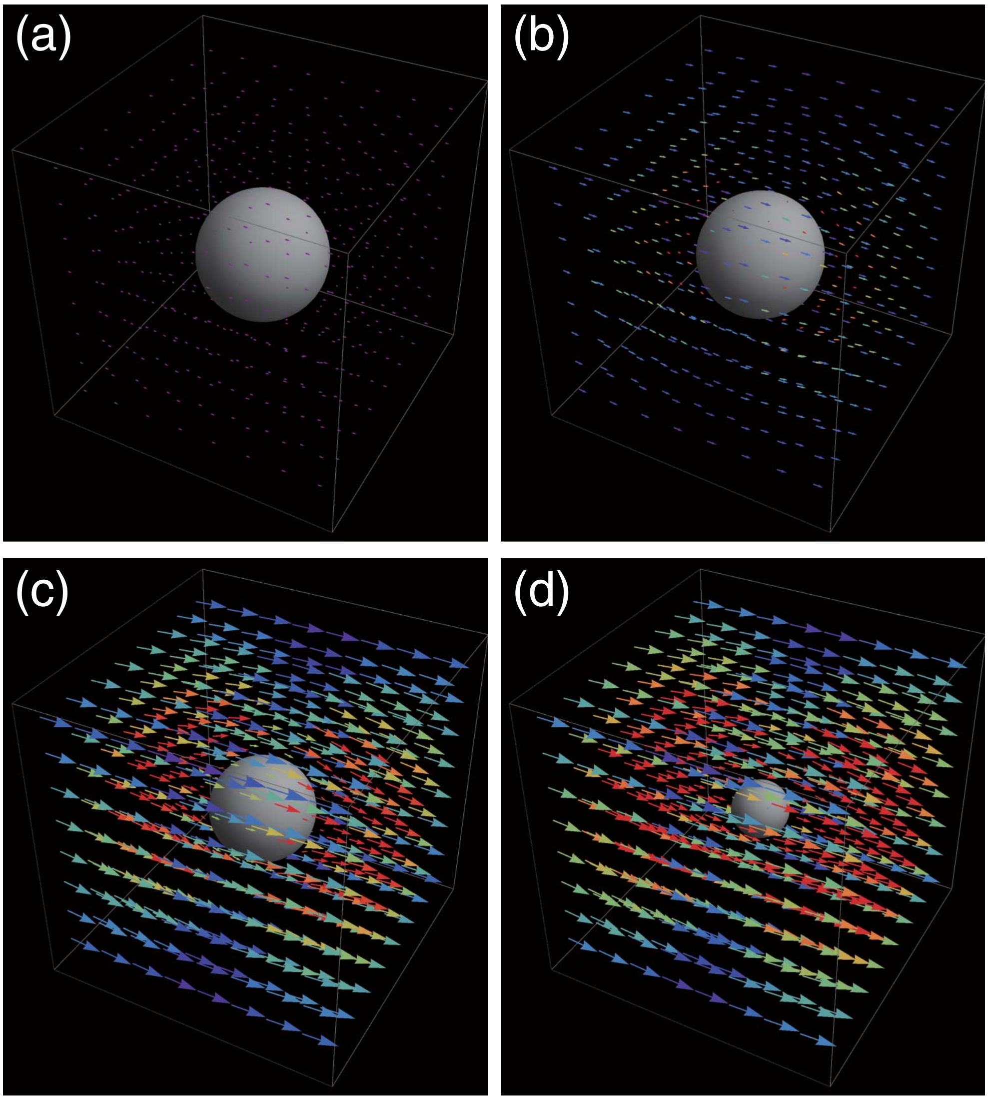

Fig. 5. 4-dimensional Stokes flow on the 3-dimensional hypersection. a: $x_3 = 0.0$, b: $x_3 = 0.3$, c: $x_3 = 0.6$, and d: $x_3 = 0.9$.

This solution indicates that the velocity profile in the hypercylinder is always quadratic and the dimension is the only coefficient of the polynomial. Figure 6 shows the profiles for the same value of k. The velocity distribution tends to be smaller and flatter with increasing dimensions. Note that the pressure has dimensions of force per unit facet so that the coefficient itself has different interpretations depending on n.

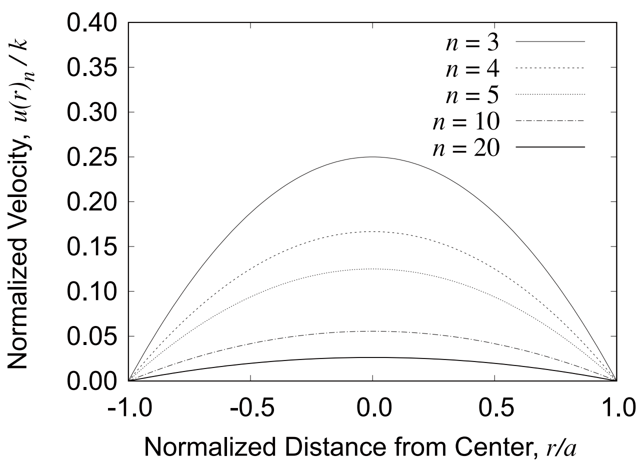

Fig. 6. Velocity profiles for Hagen-Poiseuille flow for different n.

6. Discussion

The effect of the hyperspherical obstacle is localized with increasing number of dimensions n, for both the potential flow and the Stokes flow. For this reason, we conclude that the effect of a hyperspherical obstacle decreases with increasing dimensions. This is because the fluid can avoid the obstacle by moving between dimensions. The visualization of the flow in 4-dimensional space revealed how such evasion occurs. Similar behavior is observed in the Hagen-Poiseuille flow.

The visualization of the flow in four-dimensional space, however, does not improve our understanding of hyperspace. The information obtained from the visualization of four-dimensional Stokes flow can be predicted based on three-dimensional one. One of the reasons is that we consider an axisymmetric flow which shows the same charac-