To simplify the inversion of this matrix, we decide to approximate the first term in (42). Since the data is sphered, a reasonable approximation seems to be $E\{\mathbf{x}\mathbf{x}^T g'(\mathbf{w}^T\mathbf{x})\} \approx E\{\mathbf{x}\mathbf{x}^T\}E\{g'(\mathbf{w}^T\mathbf{x})\} = E\{g'(\mathbf{w}^T\mathbf{x})\}\mathbf{I}$. Thus the Jacobian matrix becomes diagonal, and can easily be inverted. Thus we obtain the following approximative Newton iteration:

$$\mathbf{w}^+ = \mathbf{w} - [E\{\mathbf{x}g(\mathbf{w}^T\mathbf{x})\} - \beta\mathbf{w}]/[E\{g'(\mathbf{w}^T\mathbf{x})\} - \beta] \tag{43}$$

This algorithm can be further simplified by multiplying both sides of (43) by $\beta - E\{g'(\mathbf{w}^T\mathbf{x})\}$. This gives, after algebraic simplication, the FastICA iteration.

In practice, the expectations in FastICA must be replaced by their estimates. The natural estimates are of course the corresponding sample means. Ideally, all the data available should be used, but this is often not a good idea because the computations may become too demanding. Then the averages can be estimated using a smaller sample, whose size may have a considerable effect on the accuracy of the final estimates. The sample points should be chosen separately at every iteration. If the convergence is not satisfactory, one may then increase the sample size.