More facts about covariance:

If $X_1, \dots, X_n$ are random variables that are not necessarily independent, know $Var(X_1 + \dots + X_n) = \sum_{i=1}^{n} Var(X_i) + 2\sum_{i<j} Cov(X_i, X_j)$

If X_i, X_j are independent, then

$$Cov(X_i, X_j) = E(X_i X_j) - E(X_i)E(X_j)$$
$$\downarrow \text{by indep}$$
$$= E(X_i)E(X_j) - E(X_i)E(X_j)$$
$$= 0$$

For this reason, i.e. since "X_i, X_j independent" implies "$Cov(X_i, X_j) = 0$" then if $X_1, \dots, X_n$ are all independent, or even just pairwise independent, then $Var(X_1 + \dots + X_n) = \sum_{i=1}^{n} Var(X_i) + 2\sum_{i<j} \underbrace{Cov(X_i, X_j)}_{=0 \text{ by indep}} = \sum_{i=1}^{n} Var(X_i)$.